



JRC SCIENCE FOR POLICY REPORT

# Preparatory study on textiles for product policy instruments

*Ecodesign*

*EU Green Public Procurement*

*EU Ecolabel*

**1<sup>st</sup> milestone**

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115 **Foreword**

116 This document is the 1<sup>st</sup> milestone of the preparatory study on textile products, which aims to provide a basis  
117 on which the European Commission can consider the development of ecodesign requirements, green public  
118 procurement criteria and revised EU Ecolabel criteria for textile products. In particular, the 1<sup>st</sup> milestone  
119 addresses scope, market, user behaviour, current EU Ecolabel criteria, and current EU Green Public Procurement  
120 criteria. The preparatory study is developed within the legal framework of the Regulation setting ecodesign  
121 requirements for sustainable products (based on COM(2022) 142 final) and the EU Ecolabel Regulation  
122 66/2010. The project is led by the Joint Research Centre of the European Commission, addressing the request  
123 from the Directorate-General for Environment (DG ENV) and the Directorate-General for Internal Market,  
124 Industry, Entrepreneurship and SMEs (DG GROW).

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# 139 1 Introduction

## 140 Context

141 On 4 December 2023 the co-legislators reached a provisional agreement on a compromise text for a Regulation  
142 on Ecodesign for Sustainable Products (ESPR) <sup>(1)</sup>. The ESPR delivers on the commitments made in both the  
143 European Green Deal <sup>(2)</sup> and the Circular Economy Action Plan <sup>(3)</sup> to make the European Union (EU) regulatory  
144 framework fit for a sustainable future and to ensure that products placed on the EU market become increasingly  
145 sustainable.

146 The ESPR aims to reduce the environmental impacts of products across their life cycle and to improve the  
147 functioning of the EU's internal market. It proposes to do this by building on the successful approach pioneered  
148 under the current Ecodesign Directive <sup>(4)</sup>, which applies to energy-related products only. The ESPR proposes to  
149 extend the Ecodesign Directive to cover a very broad range of physical products and to strengthen its provisions.  
150 This would enable the ESPR to set a range of far-reaching ecodesign requirements for specific product groups,  
151 to improve product circularity, energy performance and other environmental sustainability aspects. Ecodesign  
152 requirements can be related to the performance of the product or information that must accompany the  
153 product. A Digital Product Passport (DPP) will be required to hold and convey the information in question, with  
154 traceability features.

155 The ESPR provides a general framework for these rules, with specific product requirements to be set at a later  
156 stage via delegated acts dedicated to a particular product or to groups of similar products. These delegated  
157 acts will also serve as the reference for the adoption of implementing acts, which should establish minimum  
158 mandatory Green Public Procurement (GPP) requirements for public contracts.

159 Article 34(3) of the ESPR establishes synergies between the mandatory ecodesign legislative framework and  
160 the EU Ecolabel, which is the EU's official voluntary label for environmental excellence awarded to best-in-class  
161 products. The ESPR and EU Ecolabel requirements must be coherent and synergic to guarantee that products  
162 awarded the EU Ecolabel comply with the ESPR requirements set in the relevant delegated act. The EU Ecolabel  
163 remains regulated by the EU Ecolabel Regulation <sup>(5)</sup>.

164 On 30 March 2022 the EC presented the EU Strategy for Sustainable and Circular Textiles <sup>(6)</sup> which aims, *inter*  
165 *alia*, 'to tackle fast fashion and textile waste and to make textiles more durable, repairable, reusable and  
166 recyclable'. The Textile Strategy lays out a forward-looking set of actions, which includes setting ecodesign  
167 requirements for textiles under the framework of the ESPR proposal <sup>(7)</sup>. The Textile Strategy also announces a  
168 revision of the EU Ecolabel criteria for textile products to support its uptake among producers and offer  
169 consumers an easily recognisable and reliable way to choose eco-friendly textile products.

170 Since 2019, the EC has supported the project 'Product Environmental Footprint Category Rules (PEFCR): apparel  
171 and footwear', hereinafter named PEFCR A&F <sup>(8)</sup>. Part of the textile industry leads this project, which aims to  
172 establish rules for the calculation of the Product Environmental Footprint. Once produced, the PEFCR can be

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<sup>1</sup> ESPR final compromise text for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products, amending Regulation (EU) 2023/1542 and repealing Directive 2009/125/EC. Available at [this link](#).

<sup>2</sup> The Green Deal. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. The European Green Deal. COM(2019) 640 final. Available at [this link](#).

<sup>3</sup> The Circular Economy Action Plan. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A new Circular Economy Action Plan For a cleaner and more competitive Europe. COM(2020) 98 final. Available at [this link](#).

<sup>4</sup> Ecodesign Directive. Directive 2009/125/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for energy-related products. Available at [this link](#).

<sup>5</sup> EU Ecolabel Regulation. Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel. Available at [this link](#).

<sup>6</sup> Textile Strategy. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. EU Strategy for Sustainable and Circular Textiles. COM(2022) 141 final. Available at [this link](#).

<sup>7</sup> Proposal of ESPR by European Commission. Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC. COM(2022) 142 final. Available at [this link](#).

<sup>8</sup> 'Product Environmental Footprint Category Rules (PEFCR): apparel and footwear', available at [this link](#). Last accessed on 3 February 2024. It will set rules on the calculation and reporting of life cycle environmental impacts of apparel.

173 used by the industry to voluntarily quantify and report the environmental impacts of specific textile products.  
174 The EC follows the development of the PEFCR A&F project as an observer.

## 175 **Aim**

176 In this context, this report describes the preparatory study on textile products, which is hereinafter referred to  
177 as the PS. The PS aims to provide the scientific and technical basis for:

- 178 — the future development of the ecodesign requirements for textile products to be defined in a  
179 delegated act within the framework of the ESPR;
- 180 — the future development of the mandatory EU GPP requirements for textile products within the  
181 framework of the ESPR;
- 182 — the future revision of the EU Ecolabel criteria for textile products <sup>(9)</sup>, within the framework of the  
183 ESPR and the EU Ecolabel Regulation.

## 184 **Methodology**

185 The PS will follow the structure prescribed by the Methodology for Ecodesign of Energy-related Products (MEErP)  
186 (MEErP, 2011). This methodology has over many years proved to be comprehensive and effective for preparing  
187 product-related legislation, and is therefore also deemed fit for non-energy-related products. The MEErP  
188 consists of seven tasks:

- 189 — **Task 1 on scope** defines the boundaries of the system under analysis. It identifies the textile  
190 products included in the scope of the PS and their categories. Additionally, it analyses legislative  
191 and voluntary frameworks at global, EU and Member State level.
- 192 — **Task 2 on market** investigates the market structure, trends and other market characteristics of  
193 the products in the scope.
- 194 — **Task 3 on user behaviour**. It describes how users relate to the products in the scope. It  
195 investigates:
  - 196 (a) aspects influencing the design of the products, identifying potential barriers and restrictions  
197 to possible ecodesign measures, due to social, cultural or infrastructural factors;
  - 198 (b) aspects influencing the modelling of environmental impacts and costs of the products in the  
199 life-cycle perspective, identifying behaviour not directly quantifiable with conventional  
200 standard tests on the products.
- 201 — **Task 4 on technologies** entails a general technical analysis of the products in the scope in order  
202 to describe the average products on the market, as well as the best available technologies (BAT)  
203 and the best not yet available technologies (BNAT).
- 204 — **Task 5 on environmental and economic analysis** of the average products on the EU market.  
205 It defines *base case* products, which are a conscious abstraction of the reality for practical reasons,  
206 and it represents a specific product category. The description of the base case is the synthesis of  
207 tasks 1 to 4 and the starting point for the following tasks. The base case is analysed via models  
208 based on Life Cycle Assessment (LCA) and Life Cycle Costing (LCC).
- 209 — **Task 6 on design options** investigates the monetary consequences of the design options in terms  
210 of cost within the life cycle for consumers and society. Environmental costs and benefits are also  
211 investigated using the Least Life Cycle Costs (LLCC) and the BAT. The BNAT indicate long-term  
212 possibilities.
- 213 — **Task 7 on possible policy scenarios** gathers the results of all previous tasks and investigates  
214 suitable policy means to achieve the potential improvements in the environmental impacts of the  
215 assessed products, as well as estimating economic impacts on consumers and the industry. Finally,  
216 it assesses the robustness of the outcomes via a sensitivity analysis.

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<sup>9</sup> EU Ecolabel criteria for textile products. Commission Decision of 5 June 2014 establishing the ecological criteria for the award of the EU Ecolabel for textile products. Commission Decision (2014/350/EU). Available at [this link](#).

217 The methodology used will be adapted to the specific features of the textile product group and the requirements  
218 set by the ESPR.

219 In addition to following the tasks set by the MEERp, the PS will include all elements of the Preliminary Report,  
220 to be used for the revision of the EU Ecolabel criteria for textile products <sup>(9)</sup>, as set by the EU Ecolabel  
221 Regulation <sup>(5)</sup>.

222 Due to their aims, future mandatory EU GPP requirements and future revised EU Ecolabel criteria of products  
223 included in the scope of the PS will be built up from the ecodesign requirements.

## 224 **Involvement of stakeholders**

225 The development of the PS will include the direct involvement of stakeholders following the principles of the  
226 Sevilla process <sup>(10)</sup>, which will enable the JRC to verify with stakeholders the work under development and  
227 collect additional evidence on the investigated topics.

228 **Table 1** reports the stages of the project that will require the participation of registered stakeholders. Any  
229 organisation, institution and citizen can register as a stakeholder by filling in a form on a dedicated webpage <sup>(11)</sup>.  
230 Stakeholders will be able to register at any stage of the development of the PS.

231 **Table 1.** Development of the preparatory study

Milestone	Topic addressed	Date
Initial questionnaire <sup>(12)</sup>	Definitions, scope, market analysis, user behaviour, ecodesign aspects, EU Ecolabel, EU Green Public Procurement	30 March 2023 – 8 May 2023
1 <sup>st</sup> milestone	Scope, market, user behaviour, current EU Ecolabel criteria, current EU Green Public Procurement criteria	23 February to 22 April 2024 <sup>(*)</sup>
2 <sup>nd</sup> milestone	Technologies, and analysis of base cases from environmental and economic perspectives	To be communicated
3 <sup>rd</sup> milestone	Analysis of ecodesign aspects, design options, policy scenarios, and information requirements, including elements to be included in the Digital Product Passport	To be communicated

232 The number and topics of the milestones could be modified to improve the involvement of the stakeholders during the development of the  
233 preparatory study.

234 <sup>(\*)</sup> The 1<sup>st</sup> milestone includes the following steps in 2024: (a) from 23 February to 15 March, registered stakeholders may read the working  
235 document before the online consultation meeting; (b) on 18 and 19 March, registered stakeholders and JRC will attend the online  
236 consultation meeting; (c) from 20 March to 22 April, registered stakeholders will be able to provide comments in writing to the working  
237 document.

238 For each milestone, the stakeholder consultation will include the following steps:

- 239 • The JRC will communicate by email to all registered stakeholders the time and steps of the  
240 specific consultation. In the same email, the JRC will provide the working document(s) related  
241 to the milestone. All documents will be uploaded on the project's website <sup>(13)</sup>.
- 242 • Registered stakeholders will read the working document(s) before the online consultation  
243 meeting.
- 244 • JRC and registered stakeholders will attend the online consultation meeting. In this meeting,  
245 registered stakeholders will be able to have open discussions with the JRC and among  
246 themselves.
- 247 • Registered stakeholders will provide comments on the working document(s).

---

<sup>10</sup> With the 'Sevilla process', the Joint Research Centre of the European Commission works together with scientists, industry, non-governmental organisations (NGOs), national authorities and international institutions to take decisions that are underpinned by solid scientific and technical data, and that are based on consensus and transparency. The process is clearly structured within the framework of the Industrial Emissions Directive (2010/75/EU), and it is legally defined in Commission Implementing Decision 2012/119/EU available at [this link](#). More information is available at [this link](#). The process in the preparatory study on textiles is not legally defined, but it will follow the principles of the "Sevilla process".

<sup>11</sup> Stakeholders can participate in the development of the preparatory study on textile products by registering via this [web form](#).

<sup>12</sup> Initial questionnaire. Preparatory Study on textiles for product policy instruments – the initial questionnaire. Available at [this link](#).

<sup>13</sup> The textile project website is available at [this link](#). Documents will be uploaded in the dedicated section available at [this link](#).

248                   • The JRC will publish on the project’s website <sup>(13)</sup> a document containing anonymised written  
249                    comments submitted by the registered stakeholders with the corresponding answers of the  
250                    JRC.

251 All entities involved in the stakeholder consultations will have enough time to actively participate in the process.

252

253 This version of the PS reports the 1<sup>st</sup> milestone and it includes some of the information collected by the initial  
254 questionnaire <sup>(12)</sup>.

255

## 256 **Structure of the preparatory study – 1<sup>st</sup> milestone**

257 After this introduction, Section 2 provides the definitions of words and expressions used in the document.

258 Section 3 defines the scope and describes the products included in it, providing also a first insight into their life-  
259 cycle stages and main environmental burdens. This brief description provides the reader with a basic knowledge  
260 useful to better understand the topics investigated in the following sections.

261 Section 4 analyses legislation and strategies at different levels: EU, Member State, third country, and global,  
262 the latter describing initiatives of the United Nations. Section 4 is completed by the analysis of the most relevant  
263 test methods, standards and environmental labels used internationally by the textile industry.

264 Section 5 analyses the market of the textile products belonging to the scope. The analysis is performed at  
265 global, EU and Member State levels. Additionally, Section 5 investigates the market of the main elements  
266 affecting the manufacturing of the products included in the scope. The market analysis includes some insights  
267 into the market structure, most common business models, and it reports the main characteristics of the value  
268 chain. A specific subsection is dedicated to market competitiveness, which is affected by the different costs  
269 that companies face around the world due to the different requirements related to environmental protection.  
270 Section 5 concludes with a subsection analysing the lifespan of products, because it largely affects the market  
271 and the demand for new products.

272 Section 6 analyses user behaviour, which will be relevant for: (1) modelling the products in the economic and  
273 environmental assessment, and (2) the analysis of possible ecodesign requirements within the ecodesign  
274 aspects listed by Article 5 of the ESPR. The section addresses the behaviour before and after the purchase, as  
275 well as behaviour related to the disposal of the textile product.

276 Section 7 analyses the current EU Ecolabel criteria for textile products in light of their revision. Facts and figures  
277 of the current criteria are reported as well as the suggestions received via the initial questionnaire. The section  
278 describes the relationship between the new mandatory ecodesign framework (ESPR) and the revision of the EU  
279 Ecolabel criteria for textile products. To explore potential synergies with other officially recognised Ecolabels,  
280 Section 7 provides a detailed comparison of the criteria for textile products set by the EU Ecolabel, Blue Angel  
281 and Nordic Swan.

282 Section 8 collects information for the future development of mandatory EU GPP criteria. To this aim, this section  
283 assesses the current public procurement of apparel in the EU, and the current status of the voluntary EU GPP  
284 criteria.

## 285 **2 Definitions**

286 This section lists the definitions of terms and expressions used in the document. It will be complemented with  
287 more definitions as the project goes through its three milestones (see Section 1).

### 288 **Textile product**

289 'Textile product' means any raw, semi-worked, worked, semi-manufactured, manufactured, semi-made-up or  
290 made-up product which is exclusively composed of textile fibres, regardless of the mixing or assembly process  
291 employed, as well as a product containing at least 80% textile fibres by weight.

292 The definition of textile product is aligned with the definition provided by the Textile Labelling Regulation  
293 (TLR) <sup>(14)</sup>.

### 294 **Apparel textile**

295 'Apparel textile' means a textile product worn as clothing or a clothing accessory by a person to clothe or adorn,  
296 principally to protect from the outer environment and very often to express their personal identity and/or  
297 belonging to a specific social group, with symbolic meanings and aesthetic values.

### 298 **Technical textile**

299 Technical textiles are textile products meeting technical rather than aesthetic criteria, even if, for certain  
300 markets like workwear or sports equipment, both types of criteria are met. Technical textiles bring a functional  
301 answer to a wide range of specific requirements: lightness, resistance, reinforcement, filtration, fire retardancy,  
302 conductivity, insulation, flexibility, absorption and so on. The definition does not depend on the raw material,  
303 the fibre or the technology used, but on the end use of the product itself. Technical textiles can be used by  
304 professionals or not.

305 Apparel textiles meeting the definition above are defined as *technical apparel textiles*.

306 The definition of technical textiles is aligned with the definition provided by the European Economic and Social  
307 Committee <sup>(15)</sup>.

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<sup>14</sup> Textile Labelling Regulation. Regulation (EU) No 1007/2011 of the European Parliament and of the Council of 27 September 2011 on textile fibre names and related labelling and marking of the fibre composition of textile products and repealing Council Directive 73/44/EEC and Directives 96/73/EC and 2008/121/EC of the European Parliament and of the Council. Available at [this link](#).

<sup>15</sup> CCMI/105, Technical textiles, Brussels, 17 April 2013, OPINION of the European Economic and Social Committee on Growth Driver Technical Textiles. (own initiative opinion). Rapporteur: Ms Butaud-Stubbs. Corapporteur: Ms Niestroy. Available at [this link](#). Last accessed on 30 March 2023.

## 308 **3 Scope**

309 This section selects and describes the products included in the scope of the PS. The first subsection (Section  
310 3.1) reports the thought process followed to select the scope in accordance with the framework set by the ESPR.  
311 The second subsection (Section 3.2) lists the products included in the scope and specifies those that are  
312 excluded. The final subsection (Section 3.3) describes two important aspects of textile products that apply to  
313 the products in the scope, i.e. the life-cycle stages and their main environmental burdens. This last section is  
314 the essential basis for fully understanding a number of topics addressed in subsequent sections about  
315 environmental labels (Section 4.5) and market analysis (Section 5). Nevertheless, the topics mentioned in  
316 Section 3.3 will be detailed in the following milestones, when the PS addresses tasks 4 and 5 of the MEErP.

### 317 **3.1 Selection of the scope**

318 Within the framework of the European Industrial Strategy <sup>(16)</sup>, the Annual Single Market Report 2021 <sup>(17)</sup>  
319 identifies the products included in the **industrial ecosystem of textiles**: *‘transformation of natural (e.g.  
320 cotton, flax, wool), man-made and artificial (synthetic polyester and viscose) fibres into yarns and fabrics,  
321 production of yarns, home textiles, industrial filters, technical textiles, carpets and clothing. The ecosystem also  
322 includes production of footwear and leather.’*

323 The EC is currently working on the first ESPR Work Plan, based on a report <sup>(18)</sup> entitled ‘Ecodesign for Sustainable  
324 Products Regulation – preliminary study on new product priorities’, hereinafter referred to as the **Product  
325 Priorities Study**. It suggests a number of product groups and horizontal measures that may be suitable  
326 candidates for prioritisation under the ESPR, once it enters into force. The first Product Priorities Study served  
327 as the basis for an open public consultation <sup>(19)</sup>. Among the many product groups in the scope of the ESPR, the  
328 Product Priorities Study assesses a product group named **‘textiles and footwear’**, which includes products  
329 belonging to the industrial ecosystem of textiles. Respondents to the open public consultation agreed to  
330 prioritise this product group (58% of respondents), and they considered it of highest priority (68% of  
331 respondents). 38% of respondents considered that apparel should be prioritised, followed by footwear (25%)  
332 and home/interior textiles (18%).

333 The scope of the PS was defined following the Product Priorities Study, and the selection criteria reported in  
334 Article 5(2) and Article 16 of the ESPR.

335 Within the product group textiles and footwear, the Product Priorities Study identifies four main subgroups: (1)  
336 apparel textiles, (2) home/interior textiles (e.g. bed linen, towels, tablecloths, curtains), (3) footwear, and (4)  
337 technical textiles not included in previous subgroups, usually or also meant for consumers, such as truck covers  
338 (tarpaulins) and cleaning products, or specifically meant for industry (automotive, construction, medical,  
339 agriculture, etc.). Although it is not specified in the Product Priorities Study, the subgroups apparel textiles,  
340 home/interior textiles and technical textiles are understood to be products containing at least 80% by weight  
341 of textile fibres, as defined by the TLR <sup>(14)</sup>. This interpretation of subgroups is also adopted in the PS.

342 The product group textiles and footwear is considered to be too heterogeneous for the setting of common  
343 ecodesign requirements. This heterogeneity is driven by the specific functions and end uses of each subgroup,  
344 as reported in **Table 2**, as well as their material and chemical compositions. The specific function of a product  
345 requires specific tests to be performed on the product to verify its performance.

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<sup>16</sup> European Industrial Strategy. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe’s recovery. COM(2021) 350 final. Available at [this link](#).

<sup>17</sup> Annual Single Market Report 2021. Accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe’s recovery. SWD(2021) 351 final. Available at [this link](#).

<sup>18</sup> Product Priorities Study. Ecodesign for Sustainable Products Regulation (ESPR) – preliminary study on new product priorities. Available at [this link](#).

<sup>19</sup> New product priorities for Ecodesign for Sustainable Products. Available at [this link](#). Last accessed on 5 February 2024.

346 **Table 2.** Function and intended use of subgroups in the textiles and footwear product group

Subgroup	Function and intended use
Apparel textiles	Apparel textiles have the following functions and intended uses: (1) protect the human body from the outer environment, such as preventing heat loss, exposure to the sun, penetration of water, etc.); (2) comply with legal obligations related to public body exposure; (3) self-representation, driven by expression of personal identity and/or expression of belonging to a specific social group, with symbolic meanings and aesthetic values.
Home/interior textiles <sup>(a)</sup>	Most home/interior textiles have at least two functions: (1) protect the object they are used on/with, e.g. a cushion case protects the enveloped cushion, a tablecloth protects the table underneath, a curtain protects the indoor environment by filtering the light coming from outside, etc.; (2) decorate the home/interior environment.  Products like towels have the function of drying the body or parts of the body after they have become wet (e.g. after washing, swimming, etc.).
Footwear <sup>(b)</sup>	Footwear has similar functions to apparel: (1) protect the feet from the outer environment; (2) self-representation, driven by expression of personal identity and/or expression of belonging to a specific social group, with symbolic meanings and aesthetic values.
Technical textiles	Technical textiles have specific technical (non-aesthetical) functions according to their final application. Two examples are reported.  Textile cleaning products have the function of removing dust and dirt from surfaces, interacting with detergents and other cleaning chemicals.  Reusable textile absorbent hygiene products have the function of handling fluids, delivering protective properties like absorption, protecting the environment from unintentionally released body waste. In particular, reusable baby diapers must be flexible, so that they are comfortable and adaptable to changing body size.

347 <sup>(a)</sup> Construction products, as defined in Regulation (EU) No 305/2011, are not considered home/interior textiles.

348 <sup>(b)</sup> According to Directive 94/11/EC <sup>(20)</sup>, 'footwear' means all articles with applied soles designed to protect or cover the foot, including parts  
349 marketed separately. Due to the significant relative weight of soles in the overall weight of a footwear article and to the fact that  
350 soles are seldom composed of textile fibres, footwear products are seldom textile products.

351 The identified subgroups were further analysed following criteria reported in Article 5(2) and Article 16 of the  
352 ESPR. Article 16 of the ESPR states the following:

353 *When prioritising products to be covered by ecodesign requirements, the Commission shall analyse the potential*  
354 *contribution of those products to achieving Union climate, environmental and energy efficiency objectives, taking*  
355 *into account the following criteria:*

356 a) *the potential for improving the product aspects listed in Article 5(1) without entailing disproportionate*  
357 *costs, [...];*

358 b) *the volume of sales and trade of the product within the Union;*

359 c) *the distribution of the climate and environmental impacts, energy use, resource use and waste*  
360 *generation across the value chain;*

361 d) *the need to regularly review and adapt delegated acts adopted pursuant to Article 4 in light of*  
362 *technological and market developments.*

363 Article 5(2) of the ESPR states the following:

364 *Ecodesign requirements shall be established for a specific product group <sup>(21)</sup>. They may be differentiated for*  
365 *any specific product that belongs to that product group.*

366 *Where two or more product groups display one or more similarities allowing a product aspect referred to in*  
367 *paragraph 1 to be effectively improved based on common ecodesign information or performance*

<sup>20</sup> Directive 94/11/EC of European Parliament and Council of 23 March 1994 on the approximation of the laws, regulations and administrative provisions of the Member States relating to labelling of the materials used in the main components of footwear for sale to the consumer. Available at [this link](#).

<sup>21</sup> Article 2 of the ESPR establishes the following definition: 'product group' means a set of products that serve similar purposes and are similar in terms of use, or have similar functional properties, and are similar in terms of consumer perception.

368 requirements<sup>(22)</sup>, such requirements may be established horizontally for those product groups (“horizontal  
369 *ecodesign requirements*”).

370 For all subgroups of the textiles and footwear product group reported in the Product Priorities Study, the  
371 following subsections report information related to the three main scope selection criteria pointed out by Article  
372 16: (a) potential for improvement (Section 3.1.1), (b) volume of sales and trade in the EU (Section 3.1.2), and  
373 (c) the distribution of the climate and environmental impacts, energy use, resource use and waste generation  
374 across the value chain (Section 3.1.3). Point (d) of Article 16 was not considered because there is no delegated  
375 act on textiles and footwear products to be reviewed.

376 Information related to the textiles and footwear sectors is reported with a granularity that changes according  
377 to the aims of the specific studies. The subsequent sections (from 3.1.2 to 3.1.3) try to interpret the available  
378 data in the most holistic way to meet the requirements set by Article 16 of the ESPR.

### 379 **3.1.1 Potential improvement considering ecodesign aspects in Article 5(1) of the ESPR**

380 The analysis reported in this section is only a first indicative investigation of potential improvements based on  
381 a literature review. Once the scope is defined, specific improvement potential will be assessed via environmental  
382 and economic assessments in the following stages of the PS. In particular, this will be performed in the following  
383 milestones addressing tasks 5 to 7 of the MEeRP (see Section 1).

384 Article 5(1) of the ESPR lists the following ecodesign aspects:

- 385 — durability;
- 386 — reliability;
- 387 — reusability;
- 388 — upgradability;
- 389 — reparability;
- 390 — possibility of maintenance and refurbishment;
- 391 — presence of substances of concern;
- 392 — energy use and energy efficiency;
- 393 — water use and water efficiency;
- 394 — resource use and resource efficiency;
- 395 — recycled content;
- 396 — possibility of remanufacturing;
- 397 — possibility of recycling;
- 398 — possibility of recovery of materials;
- 399 — environmental impacts, including carbon and environmental footprint;
- 400 — expected generation of waste.

401 Many studies underline the great potential for improvement regarding ecodesign aspects of apparel textiles. In  
402 particular, the literature suggests six most important ecodesign aspects:

- 403 — Increasing all features of product **durability** (Ellen MacArthur Foundation, 2017; Bauer et al.,  
404 2018; Claxton and Kent, 2020; Goworek et al., 2020; Niinimäki et al., 2020; Botta and Magnusson,  
405 2022; Cooper and Claxton, 2022a; OVAM, 2022; TAUW, 2023).

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<sup>22</sup> Article 2 of the ESPR establishes the following definitions:  
‘*ecodesign requirement*’ means a performance requirement or an information requirement aimed at making a product, including processes taking place throughout the product’s value chain, more environmentally sustainable;  
‘*performance requirement*’ means a quantitative or non-quantitative requirement for or in relation to a product to achieve a certain performance level in relation to a product parameter referred to in Annex I;  
‘*information requirement*’ means an obligation for a product to be accompanied by information as specified in Article 7(2).

- 406 — Possibility of **maintenance** and how best to use the textile product during its lifetime (Ellen  
407 MacArthur Foundation, 2017; Bauer et al., 2018; OVAM, 2022).
- 408 — **Reparability** (Bauer et al., 2018; Niinimäki et al., 2020; Botta, 2021; EEA, 2022a; OVAM, 2022;  
409 TAUW, 2023).
- 410 — Regulating the **presence of substances of concern**, from the perspective of eliminating or  
411 reducing the use of these substances (Ellen MacArthur Foundation, 2017; Bauer et al., 2018;  
412 Niinimäki et al., 2020; Mohapatra and Gaonkar, 2021; EEA, 2022b; OVAM, 2022; TAUW, 2023;  
413 Dodd and Gama, 2017).
- 414 — **Recycled content and possibility of recovery of materials** (Ellen MacArthur Foundation,  
415 2017; Bauer et al., 2018; Niinimäki et al., 2020; ECOS et al., 2021; EEA, 2022b; OVAM, 2022).
- 416 — **Possibility of recycling** (Niinimäki et al., 2020; ECOS et al., 2021; EEA, 2022b; OVAM, 2022;  
417 TAUW, 2023).
- 418 Most of the studies listed above do not specify the kind of requirements, but they suggest focussing on the  
419 specific ecodesign aspect to best decrease the environmental impacts of the apparel:
- 420 • Significant improvement potential is associated with increasing the product lifespan, which  
421 could be achieved by increasing the physical and emotional durability<sup>(23)</sup> of the product,  
422 improving product care, and facilitating/supporting reparability. Increasing the durability of  
423 products is considered an effective strategy to decrease the environmental impacts of this  
424 product group. It was estimated that, over the last 20 years, the use time of apparel decreased  
425 by 36%, with each product used only seven or eight times on average (Ellen MacArthur  
426 Foundation, 2017). This results in a significant amount of waste originating from used apparel.  
427 Extending the lifespan of 50% of apparel by an extra 9 months of active use would reduce  
428 carbon, water and waste footprints by around 4-10% each (WRAP, 2017a).
  - 429 • The literature reports a relevant concern about the hazards of substances used and contained  
430 in apparel textiles. The use of alternative substances with a reduced hazard profile is  
431 considered a crucial aspect to pursue.
  - 432 • In line with the Circular Economy Action Plan, the literature considers product circularity  
433 aspects to show good improvement potential, such as increasing the recycled content and  
434 promoting recyclable products.
- 435 Only Bauer et al. (2019), OVAM (2022) and TAUW (2023) further suggest specific criteria that would decrease  
436 the environmental footprint of apparel textiles.
- 437 Most of the ecodesign aspects listed above could also be valid for home/interior textiles and footwear, which  
438 are usually included in studies focusing on generic textile products. This is the case of studies like Ellen  
439 Macarthur Foundation (2017), ECOS (2021), and Mohapatra and Gaonkar (2021). However, any ecodesign  
440 requirement under a specific ecodesign aspect should always consider the specific function that the textile  
441 product performs. Therefore, the potential adoption of the same ecodesign aspects for apparel textiles and  
442 home/interior textiles should consider that the two subgroups, and their categories, perform different functions.  
443 This distinction is one of the numerous factors driving the grouping of textile products that are included in the  
444 scope of the PS.
- 445 The literature review did not reveal specific studies about potential improvements to generic technical textiles.  
446 This could be explained by the numerous specific applications of the technical textiles that are adopted in many  
447 sectors.
- 448 The literature review showed that apparel textiles, but also to some extent home/interior textiles and footwear,  
449 have the potential for improvement under various ecodesign aspects. In the following milestones, the PS will  
450 assess all the ecodesign aspects set out in Article 5(1) of the ESPR.

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<sup>23</sup> Emotional durability is the product's ability to stay relevant and desirable to the consumer (Anthesis, 2015).

### 3.1.2 Amount of sales and trade in the EU

Information reported in the PRODCOM database<sup>(24)</sup> was processed and analysed to quantify the amount of sales and trade in the EU in the textiles and footwear subgroups. The classification of products into subgroups was based on the European Statistical System, which is described in detail in Section 9.1.

The analysis targeted the market indicators production, import, export and apparent consumption<sup>(25)</sup> of the EU-27<sup>(26)</sup> in 2019. This year was chosen because it was the latest year free from market disruptions, such as the COVID-19 pandemic (2020) and the increase of EU energy prices (2022). **Table 3** reports the results of the analysis, which show that the apparel textiles subgroup has the largest share of the market for all market indicators expressed in value and the largest share of the import and apparent consumption expressed in mass.

**Table 3.** Economic indicators of textiles and footwear in the EU-27 in 2019

Subgroup	Production		Import		Export		Apparent consumption	
	Mass (bn kg)	Value (bn EUR)	Mass (bn kg)	Value (bn EUR)	Mass (bn kg)	Value (bn EUR)	Mass (bn kg)	Value (bn EUR)
Apparel textiles	0.8	33	4.67	80.84	0.62	36.02	4.85	77.82
Home/interior textiles	1.83	14.87	2.04	12.09	0.59	4.9	3.28	22.07
Footwear	0.57	19.83	1.72	21.27	0.28	14.46	2.01	26.64
Technical textiles	3.65	18.07	0.69	4.03	0.79	6.24	3.55	15.86

N.B. Colour shades from red to white rank the subgroups from the largest to the smallest share of the economic indicator. Figures related to economic indicators expressed in mass could be underestimated because some PRODCOM codes did not contain information. This is caused by the data collection system that allows Member States to avoid, in specific cases, reporting information expressed as quantity of goods. More information is available in Section 9.1.

Source: own analysis using PRODCOM dataset DS-056120 (data extracted on 15 November 2023)

### 3.1.3 Environmental impacts and waste generation across the value chain

The literature shows that environmental impacts caused by textile products were studied using numerous levels of granularity. Most of the studies focused on 'textiles', 'textile sector', 'textile industry', without clearly specifying which subgroup was included. In this screening of the literature, the term 'textiles' is assumed to include apparel textiles, home/interior textiles and technical textiles.

The literature seems to treat the terms 'apparel', 'clothing' and 'garments' as synonyms, which raises doubts on whether clothing accessories are always included; whereas it addresses footwear separately. The same literature refers to 'fashion', which forms a major component of the product group 'apparel and footwear', and it can be understood as including the subgroups apparel textiles and footwear. The authors understand that fashion includes leather and fur apparel, which are not part of this PS in view of its focus on textile products according to the definition under the TLR.

**Table 4** reports the result of a literature review focusing on specific subgroups of the textile and footwear product group, or textiles in general. For the home/interior textiles, footwear and technical textiles subgroups only a few articles were found, showing the very limited attention paid by the scientific community to these subgroups. Most of the literature focuses on apparel textiles and textiles in general.

<sup>24</sup> PRODCOM database (Sold production, exports and imports – DS-056120). Available at [this link](#).

<sup>25</sup> The apparent consumption is defined as the sum of production and import, minus the export. Production, import and export refer to the entire EU. Therefore, the economic indicators used from the PRODCOM database were: PRODQNT and PRODVAl, which describe production with mass-related units and in euro, respectively; IMPQNT and IMPVAL, which describe import with mass-related units and in euro, respectively; EXPQNT and EXPVAL, which describe export with mass-related units and in euro, respectively.

<sup>26</sup> The 27 Member States are: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

482 **Table 4.** Literature studies investigating environmental impacts of textile products

Granularity of textile products in the literature	Reports and scientific papers	Number of studies
Apparel textiles	Cai and Choi (2020) reviewed 108 studies; Munasinghe et al. (2021) reviewed 57 studies.	108
Home/interior textiles	Kalliala and Nousiainen (1999).	1
Footwear	Gottfridsson and Zhang (2015); Quantis (2018); Jadhav and Jadhav (2020); Muthu (2020); Van Rensburg et al. (2020).	5
Technical textiles	Shishoo (1994); Sohail and Sun (2019); Aldalbahi et al. (2021).	3
Textiles in general	Amicarelli et al. (2022) reviewed 54 studies; Luo et al. (2023a) reviewed 107 studies.	107

483 *Source: own analysis*

484 In 2022, the European Environment Agency published a study analysing the environmental impacts of apparel  
 485 textiles, home/interior textiles and footwear (EEA, 2022b). **Table 5** reports an overview of the environmental  
 486 impacts related to the upstream supply chain of apparel textiles, home/interior textiles and footwear. Most of  
 487 the impacts generated by the subgroups investigated occur outside the EU and are due to apparel textiles  
 488 production. The contributions of footwear and home/interior textiles are very similar to each other.

489 **Table 5.** Environmental impacts related to the supply chain of textile products

Environmental aspect	Amount	Attribution of impacts (%)		Attribution to specific subgroup (%)		
		Inside EU	Outside EU	Apparel textiles	Home/interior textiles	Footwear
Use of primary raw materials	175 m t 391 kg/person	20	80	40	30	30
Water use	5 000 m m <sup>3</sup> 9 m <sup>3</sup> /person	Contribution not relevant	Most of the contribution	40	30	30
Land Use	180 000 km <sup>2</sup> 400 m <sup>2</sup> /person	8	92	43	23	35
Greenhouse gas emissions	121 m t CO <sub>2</sub> eq 270 kg CO <sub>2</sub> eq/person	25	75	50	30	20

490 *Source: EEA (2022)*

491 Huygens et al. (2023) performed an analysis of waste generation along the value chain of textile products  
 492 including apparel textiles, home/interior textiles and technical textiles. The analysis does not show which product  
 493 subgroup generates more waste, but it distinguishes between the generation of post-industrial, pre-consumer  
 494 and post-consumer waste. In 2019, the EU-27 generated 12.6 Mt of textile waste; 11% was post-industrial  
 495 waste, 3% was pre-consumer waste, and 86% was post-consumer waste (Huygens et al., 2023).

496 The review of the available literature on the environmental impacts caused by textile products showed that  
 497 apparel textiles is the most impactful and the most investigated subgroup in the textiles and footwear product  
 498 group.

## 499 **3.2 Proposed scope**

500 All products in the scope of the PS should be sufficiently homogeneous in terms of function, material  
 501 composition, chemical composition and technologies used. This homogeneity should allow the development of  
 502 common ecodesign requirements within the aspects listed in Article 5 of the ESPR, tailoring them to product  
 503 subgroups as appropriate.

### 504 **3.2.1 Products included in the scope**

505 The analysis reported in Section 3.1 revealed that, within the product group textiles and footwear, apparel  
 506 textiles is the most suitable subgroup to be addressed by the PS because it:

- 507 — has potential improvements already investigated by the literature (Section 3.1.1);
- 508 — has the largest share in the EU market (Section 3.1.2),
- 509 — produces the largest share of the environmental impacts, based on the available literature (Section  
 510 3.1.3).

511 **Table 6** reports all apparel textiles categories and their description. **Table 40** (Section 9.1.4) reports all  
 512 PRODCOM codes of products included in the scope of the PS. The identified product categories are aligned with

513 the ongoing work of the PEFCR A&F <sup>(8)</sup>. This alignment allows the JRC to use the work performed by the project  
 514 PEFCR A&F whenever it is appropriate within the frameworks of the ESPR and the EU Ecolabel.

515 **Table 6.** Product categories of apparel textiles included in the scope of the preparatory study

ID	Category	Description
01	T-shirts	Garment to cover the upper body to the elbow (e.g. singlets, vests, t-shirts, polo shirts, other short-sleeved shirts)
02	Shirts and blouses	Garment to cover the upper body including the entire arm (e.g. long-sleeved shirts, blouses, base layers)
03	Sweaters and mid-layers	Garment to keep the upper body warm and covered (e.g. pullovers, cardigans, hoodies, jerseys, sweatshirts, sweaters)
04	Jackets and coats	Garments to put on top of a shirt or sweater or to protect from the natural elements (e.g. blazers, suit jackets, overcoats, other light jackets, rain jackets, outdoor winter jackets, parkas, outdoor vests, anoraks)
05	Pants and shorts	Garment to cover the lower body, may protect from the elements (e.g. casual pants, outdoor pants, dress pants, jeans, sports pants, capri pants, shorts)
06	Dresses, skirts and jumpsuits	One-piece garment that covers both the upper and lower body, or the lower body only, other than pants and shorts (e.g. short- and long-sleeved, strapless, wrap, long and short, one-piece suits)
07	Leggings, stockings, tights and socks	Tight garment to cover the legs and/or feet. (e.g. opaque and sheer tights, pantyhose, fishnets, ankle socks, knee socks, low-cut socks)
08	Underwear	Garment worn under clothes, often next to the skin of the upper or lower body (e.g. boxers, briefs, panties, bras, body-shaping suits)
09	Swimwear	Garment worn for water-based or sun-based activities (e.g. bikinis, bathing suits, racing-style swimwear, board shorts)
10	Apparel textiles accessories	Hats – Garment to cover the head for warmth or as a fashion item (e.g. caps, flat caps, woollen hats/beanies, fedoras, panamas, bowlers, newsboys, berets); Scarves and ties – Garment worn around the neck for warmth or as a fashion item (e.g. warm and light scarves, buffs, neckerchiefs, headscarves, shawls, bowties); Belts – Flexible band or strap worn around the waist or over the shoulders used to secure or to hold up clothing such as pants (e.g. dress belts, casual belts, buckle belts, tie-up belts, suspenders); Gloves and mittens – Articles of clothing that protect hands and wrists from the elements or as a fashion item. Used in pairs (e.g. fingerless gloves, fashion gloves, outdoor sports gloves, mittens).

516 *Source: own production based on the ongoing work performed within the development of PEFCR A&F.*

517 Workwear and sportswear are included in the scope of the PS, as long as (1) they are apparel textiles (containing  
 518 at least 80% by weight of textile fibres, as defined above) and (2) they do not belong to the list of excluded  
 519 products defined in section 3.2.2.

520 Sportswear could be considered technical textiles due to its high performance in terms of thermoregulatory  
 521 properties <sup>(27)</sup>. Besides these thermoregulatory properties, sportswear and leisurewear have the same, or very  
 522 similar, features that allow these two types of products to be addressed in the same PS with the same ecodesign  
 523 requirements, which fall in the domain of the aspects listed by Article 5 of the ESPR.

524 Workwear apparel textiles not excluded from scope (as per section 3.2.2) and leisurewear also have same, or  
 525 very similar, features that allow these two types of products to be addressed in the same PS with the same  
 526 ecodesign requirements, which fall in the domain of the aspects listed by article 5 of the ESPR.

527 Nevertheless, this approach on workwear and sportswear will be reassessed when the PS addresses task 6 of  
 528 the MEErP on ecodesign options.

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<sup>27</sup> The textile industry certifies or reports the performance of sportswear following the guidelines contained in the technical report PD CEN/TR 16422:2012, available at [this link](#). Last accessed on 5 February 2024. These guidelines establish an evaluation system with three levels of performance related to thermoregulatory properties: (a) thermal insulation, (b) water vapour transmission (breathability), (c) air permeability, (d) water penetration resistance and repellence, and (e) liquid sweat management.

### 530 3.2.2 Products excluded from the scope

531 The following apparel textiles are excluded from the scope because they are very different to products included  
532 in the scope in terms of their function and physical characteristics:

- 533 • **smart textiles** <sup>(28)</sup>, which are textiles able to sense and react to environmental conditions  
534 and external stimuli (e.g. mechanical, thermal, and chemical stimuli) thanks to a number of  
535 sensors incorporated in the textiles;
- 536 • **electronic textiles** or **e-textiles** <sup>(28)</sup>, which are textile-based systems that exhibit an  
537 intended and exploitable response as a reaction either to changes in their  
538 surroundings/environment or to an external signal/input;
- 539 • **apparel textiles identified as personal protective equipment (PPE)** in accordance with  
540 Regulation (EU) 2016/425 <sup>(29)</sup>;
- 541 • **apparel textiles identified as medical devices or as an accessory for a medical**  
542 **device** in accordance with Regulation (EU) 2017/745 <sup>(30)</sup>.

543 Additionally, all **intermediate products**, such as fabrics, yarns, fibres, etc., are excluded from the scope of the  
544 PS, because their characteristics should be strictly related to the function of the specific apparel textile they are  
545 part of. For example, a cotton fabric should have different characteristics when used as a t-shirt component to  
546 when used as a table cloth. Exclusion of intermediate textile products from the scope of this PS does not exclude  
547 the possibility to set specific requirements and parameters on the intermediate textile product once incorporated  
548 in the selected products in the scope.

549 Aspects related to customised apparel textiles and upcycled apparel textiles <sup>(31)</sup> will be addressed in the impact  
550 assessment that will follow the PS in the policy-making process.

551 In accordance with Article 5(2) of the ESPR, the initial questionnaire <sup>(12)</sup> investigated the possibility to include in  
552 the scope further textile products, such as bed linen, kitchen textiles, towels and bathrobes, textile cleaning  
553 products, reusable textile hygiene products. The very different functions of these textile products <sup>(32)</sup> compared  
554 to apparel textiles does not allow the extension of the scope of the PS, because they cannot be considered  
555 similar to apparel. A product category with a different function to apparel textiles requires a specific study which  
556 includes the investigation of the user behaviour, the testing methods to check the performance of the products,  
557 and consequently a different approach when establishing ecodesign requirements. Additionally, a different  
558 function of the textile product affects the fate of its end-of-life. For example, during their use phase, textile  
559 cleaning products interact with many chemicals that are absorbed and could hinder the recycling processes.  
560 These aspects deserve to be addressed by a specific study different to this PS. In particular, due to their  
561 functions and technical characteristics, textile cleaning products and reusable textile absorbent hygiene  
562 products are considered technical textiles.

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<sup>28</sup> Definition of smart textiles is inspired by ISO/TR 23383:2020. Textiles and textile products — Smart (Intelligent) textiles — Definitions, categorisation, applications and standardization needs. Available at [this link](#). Last accessed on 5 February 2024.

<sup>29</sup> Personal protective equipment (PPE) Regulation. REGULATION (EU) 2016/425 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2016 on personal protective equipment and repealing Council Directive 89/686/EEC. Available at [this link](#).

<sup>30</sup> Medical devices Regulation. Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC. Available at [this link](#).

<sup>31</sup> Upcycled textiles meant here as textile products manufactured by making use of used and/or waste components of other textile products.

<sup>32</sup> *Bed linens* (bed sheets, pillowcases, duvet/blanket cover) have the function to cover the human body during sleep, and they have a decorative function for the bed.

*Kitchen textiles* (tablecloths, kitchen tea towels, napkins, aprons) have the function of protecting the surfaces they cover and have a decorative function for an interior environment.

*Towels and bathrobes* have the function of drying the body or parts of the body after they have become wet (e.g. after washing, swimming, etc.).

*Textile cleaning products* (floor cloths, dishcloths, dusters and similar cleaning cloths) have the function to remove dust and dirt from surfaces, interacting with detergents and other cleaning chemicals.

*Reusable textile absorbent hygiene products* have the function of handling fluids, delivering protective properties like absorption, protecting the environment from unintentionally released body waste. In particular, reusable baby diapers must be flexible, so that they are comfortable and adaptable to changing body size.

### 563 **3.3 Composition, life-cycle stages and main negative environmental impacts of** 564 **products included in the scope**

565 This section provides a literature review concerning the main characteristics of the textile industry in terms of  
566 composition and life-cycle stages (section 3.3.1), and negative environmental impacts (Section 0). Implicitly,  
567 this section refers to apparel textiles, which represent a major part of the textile industry production, import,  
568 export and apparent consumption (**Table 3**). An overview of the life-cycle stages of apparel textiles (Section  
569 3.3.1) and their main environmental impacts (Section 3.3.2) are essential bases to fully understand numerous  
570 topics addressed in the following sections. The main environmental impacts are crucial to understand the  
571 environmental areas addressed by environmental labels described in Section 4.5. Meanwhile, the description of  
572 the life-cycle stages is very important to put in context specific concepts addressed in the market analysis  
573 (Section 5), notably (1) manufacturing stages spread over different countries, (2) the main elements affecting  
574 apparel manufacture, (3) the characteristics of the value chain, and (4) global competitiveness related to costs  
575 of environmental compliancy.

576 The description reported in this section will be further detailed in the following milestone, when the PS addresses  
577 tasks 4 and 5 of the MEErP.

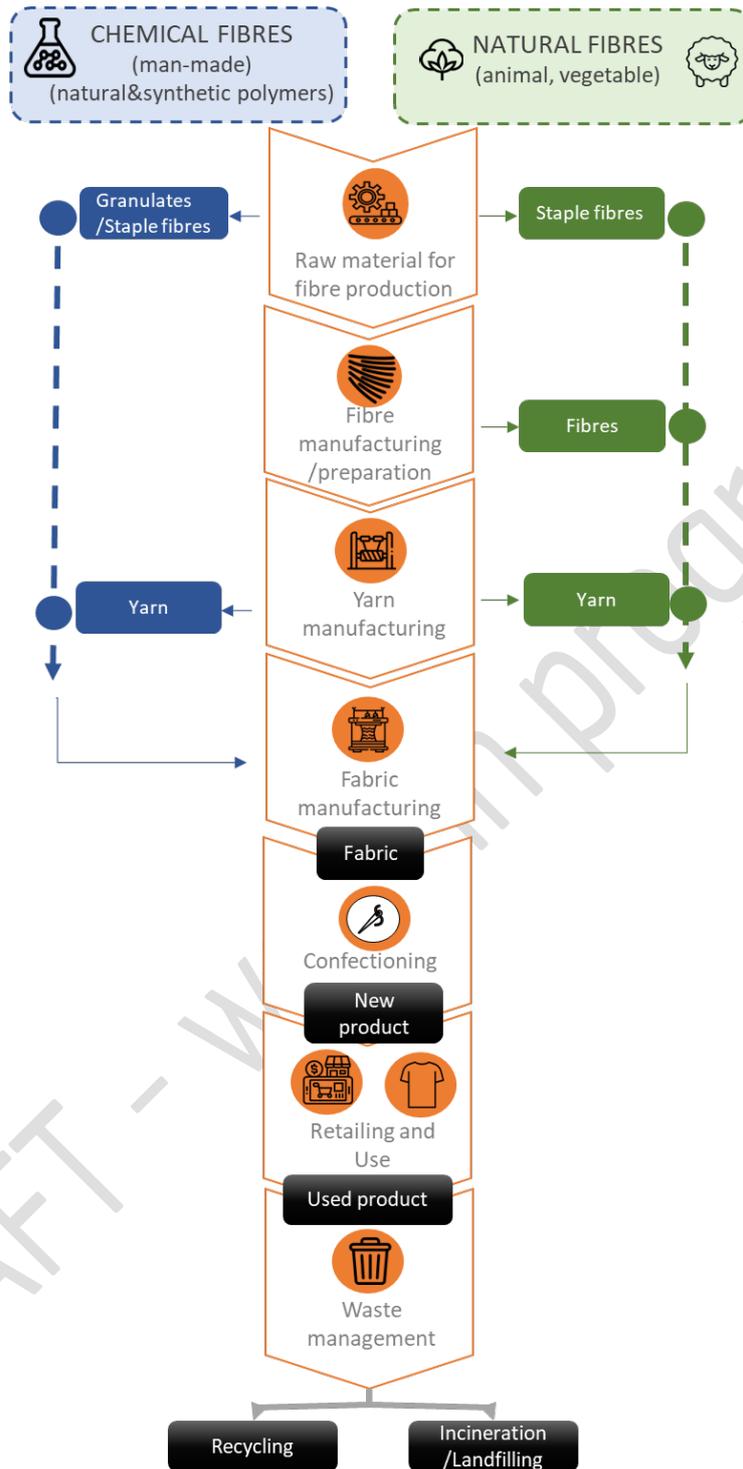
#### 578 **3.3.1 Composition and life-cycle stages**

579 The textile products included in the scope of the PS are mostly made of textile fibres – at least 80% by weight.  
580 The Textile Labelling Regulation 1007/2011 lists 50 different types of fibres, but not all of them are commonly  
581 used for manufacturing apparel textiles (e.g. carbon, ceramic, glass, and metal fibres). Textile fibres most  
582 commonly used by the apparel textiles industry were classified in the BREF on textiles (Roth et al., 2023) as  
583 follows:

- 584 • Natural origin fibres:
  - 585 ○ animal origin, including wool, silk and hair;
  - 586 ○ vegetable origin, including cotton, flax and jute.
- 587 • Chemical fibres (man-made):
  - 588 ○ natural polymer fibres / man-made cellulosic fibres (MMCF), including viscose, cupro,  
589 lyocell, acetate, triacetate;
  - 590 ○ synthetic polymer fibres, specifically organic polymers, including polyester (PES),  
591 polyamide (PA), acrylic (PAC), polypropylene (PP), elastane (EL).

592 Despite the fact that each apparel textile is produced with specific fibres and fibre combinations, technologies  
593 and resources, the life cycle of the apparel textiles can be described by eight distinct stages: (1) raw material  
594 for fibre production, (2) fibre manufacturing/preparation, (3) yarn manufacturing, (4) fabric manufacturing, (5)  
595 confectioning (often called 'Cut, Make-up and Trim' (CMT)), (6) retailing, (7) use, and (8) waste management.  
596 **Figure 1** shows these stages in a linear model that does not mark recycling routes, and it depicts some  
597 peculiarities of chemical and natural fibres. **Table 7** reports processes, technologies and resources used at each  
598 life-cycle stage of apparel textiles. Section 9.2 provides more details.

**Figure 1.** Main textile life-cycle stages



600

601

Source: own production adapted from McKinsey & Company (2022), icons from [www.flaticon.com](http://www.flaticon.com)

602

**Table 7.** Life-cycle stages of apparel textiles – processes, technologies and resources

Stage	Input	Process and technologies	Main resources	Output
(1) Raw material for fibre production	Cellulose from crops is used for vegetable origin fibres	Cultivation with subsequent processing.	Land Water Agrochemicals	Staple fibre
	Animals and insects are used for animal-based fibres	Animal farming with shearing and sericulture with silk extraction. Pre-treatments are needed.		

Stage	Input	Process and technologies	Main resources	Output
	Cellulose from wood pulp is used for man-made chemical fibres using natural polymers	Wood from various sources is dissolved with chemicals and further processed.	Energy Chemicals Land Fossil fuels	Staple fibre, Granulates
	Petroleum-based material is used for man-made chemical fibres using synthetic polymers	Specific chemicals and processes are used to produce specific polymers.		
(2) Fibre preparation / manufacturing	Natural staple fibre	Preparation stage usually includes scouring and/or cleaning processes before carding. The processes vary according to the natural fibre.	Energy Water Chemicals	Viscose solutions, Carded natural fibres
	Chemical granulates	No process required.	None	Granulates
(3) Yarn manufacturing	Carded natural fibres	Ring spinning (primarily for cotton) and open-end spinning (usually for wool).	Energy Water Chemicals	Yarns
	Viscose solutions, and dissolved granulates (for chemical fibres)	Extrusion of a solution for melt, wet and dry spinning. Drawing or air texturing is also performed.		
(4) Fabric manufacturing	Yarn (for weaving and knitting)  Fibres and filaments (for non-woven)	A two-dimensional structure is created by interlacing yarns.  Weaving is the predominant fabric manufacturing technique. It involves interlacing two sets of yarns at right angles on a loom.  Knitting is the second most used fabric manufacturing method. Yarns are interlooped using needles to form fabric on knitting machines.  Non-woven technology produces textile structures by bonding fibres or filaments together, either mechanically, thermally, or chemically.	Energy	Fabrics
Finishing processes	Yarn and/or Fabric	Numerous wet treatments for sizing, desizing, pre-treatment, dyeing, printing, finishing, coating, laminating, and many more. These treatments are applied based on the specific requirements of the final products, and are not applied sequentially. Each treatment utilises specific technologies and chemicals.	Chemicals Energy Water (dyeing)	Finished yarn, Finished fabric
(5) Confectioning	Fabric Non textile components	Product design, fabric spreading and cutting, product assembly, sewing and ironing.	Energy Manual labour	Apparel textiles
(6) Retailing	Apparel textiles	Transportation and sale via numerous channels, such as shops, on the internet.	Fuel (transport) Energy Manual labour	Apparel textiles owned by the user
(7) Use	Apparel textiles owned by the user	Washing, cleaning, drying, ironing, as well as wear and tear.	Water Energy Chemicals	Used apparel textiles
(8) Waste management	Used apparel textiles	Used apparel textiles are usually incinerated and landfilled. However, circular solutions are also possible, such as: apparel textile reuse, fabric recycling, fibre recycling (mechanical process), raw material recycling (chemical process).	Specific to the fate of the used product	Specific to the fate of the used product

### 604 **3.3.2 Main negative environmental impacts**

605 The textile production processes are characterised by a large use of resources and numerous emissions into  
606 water bodies and into the atmosphere. The European Environment Agency estimated that the textile industry is  
607 the fifth industrial sector for primary use of materials and greenhouse gas emissions, and the third industrial  
608 sector for water and land use (EEA, 2022b). Additionally, according to Gupta et al. (2022), the fashion and textile  
609 sector is the second most polluting in the world after the oil industry.

#### 610 **Impacts on land**

611 The fashion and textile industry plays a central role in deterioration of soil quality (Gupta et al., 2022). This is  
612 mainly related to the extensive production of natural origin fibres and man-made cellulosic fibres. Some direct  
613 examples are given by the excessive grazing of sheep and cashmere goats, the intensive cotton cultivation and  
614 the deforestation for cellulose supply, as well as the intensive cotton cultivation with intensive use of  
615 agrichemicals (Gupta et al., 2022).

#### 616 **Use and discharge into water**

617 The textile industry's water consumption is estimated to account for 4% of global freshwater extraction (Ellen  
618 MacArthur Foundation, 2017). The European Environment Agency reported that the production of clothing,  
619 footwear and household textiles purchased in the EU in 2020 was equal to 4 000 million m<sup>3</sup> of blue water<sup>(33)</sup>,  
620 meaning about 9 m<sup>3</sup> per person (EEA, 2022b). Water is mainly used in numerous stages of the entire life cycle  
621 of apparel textiles (**Table 7**). The BREF for the EU textile industry sets ambitious thresholds for emissions into  
622 water due to their highly negative effects. Numerous parameters are considered including carbon-load-related  
623 parameters (chemical oxygen demand (COD), biological oxygen demand (BOD), total organic carbon (TOC)),  
624 suspended solids, nitrogen and phosphorus compounds, metals, adsorbable organic halides (AOX), pesticide,  
625 flame retardants and many more. Use of dyes generates highly polluted wastewater. Also, other processes like  
626 production of polyester fibres and the treatment of knitted fabrics generate wastewater with a high load of  
627 heavy metals, such as antimony, and with a high hydrocarbon oil index (HOI), respectively (Roth et al., 2023).  
628 Additionally, when treating natural fibres, a series of substances, such as biocides, are released into the  
629 wastewater even before pre-treating the fibres (Zhang et al., 2022; Roth et al., 2023).

#### 630 **Use of chemicals**

631 Numerous life-cycle stages of apparel textiles involve the use of chemical substances and mixtures (hereafter  
632 called 'chemicals') (**Table 7**). Some of them are pesticides, solvents, surfactants, dyes and pigments, water and  
633 stain repellents, flame retardants, biocides and many more (Ellen MacArthur Foundation, 2017). Some of these  
634 chemicals are directly in contact with soil and water bodies, like during the cultivation of natural fibres using  
635 fertilisers and pesticides. Other chemicals are usually dissolved and released in the wastewater produced in  
636 several processes (Zhang et al., 2022; Roth et al., 2023).

637 Humans are also directly exposed to chemicals used in apparel textiles. Farmers and factory workers face  
638 exposure to these chemicals, and people wearing textile products are potentially at risk due to chemicals that  
639 remain bound to the products placed on the market (Ellen MacArthur Foundation, 2017).

#### 640 **Use of energy**

641 Almost all life-cycle stages of the apparel textiles have a significant energy consumption. In particular, some  
642 processes are highly energy-demanding, like the extraction of raw materials, specifically in the cases of fibres  
643 like silk or synthetic fibres, and production processes such as spinning, knitting, and weaving. Furthermore,  
644 thermal treatments are crucial during production, as well as in the use phase for washing, ironing and drying  
645 (Niinimäki et al., 2020; Munasinghe et al., 2021).

#### 646 **Generation of waste**

647 In 2019, the EU generated about 12.6 Mt of textile waste, including post-industrial, pre-consumer and post-  
648 consumer waste, representing 11%, 3% and 86% of the total, respectively. Nevertheless, regarding waste  
649 generation, it is not possible to distinguish the impact of apparel textiles from other textile products (Huygens  
650 et al., 2023).

---

<sup>(33)</sup> 'Blue' water is reported as 'surface water or groundwater that is consumed or evaporated during irrigation, industry processes or household use' in (EEA, 2022b).

651 Huygens et al. (2023) estimated that, in 2019, about 90% of post-industrial and pre-consumer waste was  
652 incinerated and landfilled, and about 10% was recycled. Additionally, in the same year, about 8.5 Mt of post-  
653 consumer waste was not separately collected and was sent to incinerators or landfilled. The majority of post-  
654 consumer waste that is separately collected is sent outside the EU as 'used product', producing negative  
655 environmental and social impacts (Lingås et al., 2023; Huygens et al., 2023).

656 Harmful substances could be released when apparel textiles are landfilled and incinerated. Degradation of  
657 textiles in landfills was estimated to release about 2 000 tonnes of hazardous substances annually in the EU.  
658 Additionally, uncontrolled incineration emits numerous harmful substances (Ellen MacArthur Foundation, 2017).

#### 659 **Emissions into the atmosphere**

660 The apparel industry is responsible for about 6.5% of global greenhouse gas emissions. This mainly depends  
661 on the use of energy and the sources employed for its production (Niinimäki et al., 2020). The European  
662 Environment Agency estimated that textile consumption in the EU in 2020 emitted 121 million tonnes of  
663 greenhouse gases. Around 75% of the emissions occurred outside Europe, specifically in Asian countries (EEA,  
664 2022b).

665 The BREF for the EU textile industry sets ambitious thresholds for emissions into the atmosphere due to their  
666 highly negative effects. Numerous parameters are considered including volatile organic compounds,  
667 formaldehyde, oil mist, dust, ammonia, carbon monoxide, sulphur oxides and many more (Roth et al., 2023).  
668 These compounds are generated in processes associated with thermal treatments, wet processes (coating,  
669 laminating and other finishing), and the use of agents and carriers in the production phase (Roth et al., 2023).

#### 670 **Pollution originated from textile fragmentation**

671 Due to the publication of recent studies highlighting the adverse environmental and health impacts of  
672 microplastics, the release of synthetic fragmented fibres from textile products is under the spotlight (Amobonye  
673 et al., 2021; Leslie et al., 2022). One of the leading sources of microplastics pollution is the fragmentation of  
674 synthetic textiles (Boucher and Friot, 2017). Fibres are released throughout the textile value chain, from the  
675 production phase to the end-of-use phase. During the manufacturing stages, microplastics are released into  
676 the atmosphere and into the wastewater produced. Household laundering during the use phase is another  
677 leading source of microplastics release into wastewater. During the end-of-use phase, landfilling, incineration  
678 and recycling are believed to be an important source of airborne and terrestrial microplastics (UNEP, 2020).  
679 Estimations of microplastics releases exhibit considerable uncertainty, with annual figures for the EU oscillating  
680 between 1 649 tonnes and 61 078 tonnes (DG ENV, 2023). This uncertainty is primarily attributable to the  
681 scarce data available regarding the production and use phases of the microplastics life cycle, and a complete  
682 lack of information for the disposal stage. The imprecision comes from the challenge of quantifying  
683 microplastics emissions, rather than any issues with the underlying assumptions of the baseline projection (DG  
684 ENV, 2023). Current patterns indicate that emissions of microplastics from textiles are projected to rise by  
685 approximately 22% by the year 2030 (DG ENV, 2023).

686 Once released into the environment, microplastics can be ingested by organisms, leading to physical and  
687 chemical impacts. Their small size and persistence make them difficult to remove from the environment, and  
688 they can act as vectors for other pollutants, including persistent organic pollutants (POPs) that can adhere to  
689 their surfaces (Xiang et al., 2022). The ubiquity of microplastics has prompted global concern, necessitating  
690 research into their environmental distribution, fate, and long-term implications.

691 Despite the biodegradability of natural fragmented fibres, their potential risk is still under evaluation, because  
692 their release could be associated with harmful substances (UNEP, 2020). The release of natural fragmented  
693 fibres is an emerging environmental concern that parallels the issues posed by synthetic fragmented fibres  
694 (microplastics). While the natural fragmented fibres are biodegradable, their widespread release into aquatic  
695 systems can still lead to ecological disruptions (Henry et al., 2019). The concern is that, similar to synthetic  
696 fragmented fibres, they can transport hazardous substances, introduce invasive species via attachment, and  
697 affect the feeding behaviour within food webs. Additionally, understanding the full environmental impact of  
698 natural fragmented fibres, including their degradation rates and interactions with aquatic life, remains a critical  
699 area to be explored.

700

701 **Table 8** provides an overview of important negative environmental impacts in the value chain of apparel textiles  
702 based on available literature:

- 703 — Climate impacts are mainly generated during the processes of bleaching / dyeing and finishing.  
704 — Fresh water is mainly affected during the use phase, the processes of bleaching / dyeing and  
705 finishing, and in raw material production.  
706 — The impacts on land use are mainly generated during the raw material production.  
707 — Impacts on both ecosystem quality and human health are mainly generated in raw material  
708 production, the processes of bleaching / dyeing and finishing, and during the use phase.  
709

DRAFT - work in progress

710 **Table 8** Negative environmental impacts across the global apparel value chain

Phase	Process	Climate (% in the value chain)	Water resources (% in the value chain)		Land use (% in the value chain)	Ecosystem quality (main factors)	Human health (main factors)
			Freshwater use	Water scarcity footprint			
Fibre production	Raw material production	12	21	33	56	Habitat loss when using land, Water use, Soil degradation, Agrochemicals use	Emission of harmful substances
	Material processing & sourcing	NA	NA	NA	NA	NA	NA
	Fibre preparation	NA	NA	NA	NA	NA	NA
Yarn and fabric production	Yarn preparation (spinning)	12	7	21	6	NA	NA
	Weaving, knitting, bonding	10	7	16	4	NA	NA
Textile production	Bleaching / dyeing and finishing	36	24	10	10	Chemicals released in fresh waters, High use of energy based on fossil fuels	Emission of harmful substances and due to the extraction and burning of fossil fuels
	Assembly	5	5	2	12	NA	NA
Consumption	Distribution and retail	1-11	< 1	< 1	< 1	NA	NA
	Use	14-24	35	18	13	High electricity consumption	Hazardous chemicals retained in the apparel textile
End-of-life	Collection and sorting	< 1	< 1	NA	< 1	NA	NA
	Landfilling / waste to energy	< 1	NA	NA	NA	NA	NA

711 Breakdown of phases is aligned with the analysis reported by [UNEP \(2020\)](#).

712 Source: own elaboration based on (Ellen MacArthur Foundation, 2017; Niinimäki et al., 2020; UNEP, 2020).

713

## 714 **4 Legislation, strategies and voluntary environmental labels relevant for** 715 **the textile sector**

716 The sound development of the PS includes a good understanding of the EU legislation (existing and in  
717 preparation) and legislation from outside EU. This will allow the proposed ecodesign requirements to establish  
718 synergies with other legislation and strategies at EU and global level. For this reason, this section analyses the  
719 textile legislative context at different levels: EU, Member State, and third country (Sections 4.1 and 4.2). Textile  
720 strategies promoted by the United Nations are addressed in Section 4.3.

721 The textile industry currently uses numerous standards to measure and identify numerous technical  
722 aspects/parameters of a textile product. Section 4.4 analyses and classifies many standards used by the textile  
723 industry because they could potentially be used to propose and/or verify ecodesign requirements, when the PS  
724 addresses tasks 6 and 7 of the MEErP.

725 Finally, Section 4.5 provides an overview of the voluntary environmental labels used in the textile sector. This  
726 analysis focuses on the type and the environmental aspects mostly addressed by these labels. This investigation  
727 is mainly important for the following points:

- 728 • the background for the revision process of the EU Ecolabel criteria for textile products (see  
729 Section 1);
- 730 • the identification of the most recognised negative environmental impacts of the textile  
731 industry;
- 732 • the identification of requirement areas, which could inspire future requirements;
- 733 • the analysis of possible information on environmental labels to potentially be reported in the  
734 Digital Product Passport.

### 735 **4.1 EU legislation**

736 Currently the EU has no specific legislation addressing the mandatory sustainability of textiles. As mentioned  
737 in Section 1, there are the current EU Ecolabel criteria for textile products<sup>(34)</sup>, which belong to a voluntary  
738 scheme for companies willing to show the good environmental performance of their products. Additionally, a  
739 number of EU legal acts have a direct impact on the placing on the market of textile products. Furthermore,  
740 profound changes in the EU acquis in the areas of consumer protection, consumer rights and product policy  
741 were, at the time of drafting this study, at different stages of the ordinary legislative procedure. In addition, a  
742 number of important policy documents, adopted by the Commission following the European Green Deal  
743 Communication, and mentioned in Section 1, address the relevance of textiles as a key product group. This  
744 section outlines the most relevant acts, existing and in preparation, related to textile products.

#### 745 **4.1.1 Existing EU legislation**

##### 746 **Textile Labelling Regulation (TLR)<sup>(14)</sup>**

747 The TLR applies to textile products and products with textile components made up of at least 80% by weight of  
748 textile fibres. It defines rules on:

- 749 • the labelling and marking of the fibre composition of textile products;
- 750 • the labelling or marking of textile products containing non-textile parts of animals;
- 751 • the determination of the fibre composition of textile products, including of textile fibre  
752 mixtures.

753 The Regulation, which is currently under revision, aims to improve the functioning of the internal market and  
754 provide accurate information to consumers. It sets out a framework on how the textile composition is to be  
755 declared and how fibre composition should be determined. The introduction of rules on labelling domains such

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<sup>34</sup> EU Ecolabel criteria for textile products. Commission Decision of 5 June 2014 establishing the ecological criteria for the award of the EU Ecolabel for textile products. Commission Decision (2014/350/EU). Available at [this link](#).

756 as sustainability and circularity, care, origin, size and presence of allergenic substances is currently under  
757 consideration, with a view to proposing a fundamental revision of the Regulation soon.

758

#### 759 **REACH Regulation** <sup>(35)</sup>

760 The Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) has the main  
761 purpose of ensuring the safe use of chemicals in the EU. More specifically, REACH aims to ensure a high level  
762 of protection of human health and the environment from risks resulting from the intrinsic properties of chemical  
763 substances, as well as the free circulation of substances on the internal market, while enhancing  
764 competitiveness and innovation. REACH regulates, amongst many other aspects, the restriction of the placing  
765 on the market and use of certain substances listed in its Annex XVII, including in some cases, the incorporation  
766 of substances into articles. Consequently, restrictions also cover recycled substances and the presence of  
767 restricted substances in recovered materials. The authorisation title of REACH applies to the placing on the  
768 market and use of substances of very high concern (SVHC), aiming at their progressive substitution by less  
769 hazardous substances or technologies and by subjecting their use to specific conditions.

770 A number of restrictions in Annex XVII to REACH specifically mention textiles in their scope. These include entries:  
771 4 - Tris (2,3 dibromopropyl) phosphate; 7 - Tris(aziridinyl)phosphin oxide; 8 - Polybrominated biphenyls; 18 -  
772 Mercury compounds; 20 - Organostannic compounds; 43 - Azocolourants and Azodyes; 46/46a - Nonylphenol  
773 and Nonylphenol ethoxylates; 47 - Chromium VI compounds (relevant to leather articles); 68 - C9-C14 PFCAs  
774 and 72 - CMRs in textiles and footwear. Other restrictions, of general application to articles placed on the market  
775 for supply to the general public, or covering all articles placed on the market, may also apply to textile articles,  
776 for instance entries 50 - (certain) polycyclic aromatic hydrocarbons; 51 and 52 (certain phthalates); 61 -  
777 Dimethylfumarate; and 63 - Lead and its compounds.

778 In addition, Article 33 of REACH sets up a supply chain communication duty requiring suppliers of articles  
779 containing SVHC above 0.1% to communicate certain information to the recipients of those articles.

780

#### 781 **Regulation on the classification, labelling and packaging of substances and mixtures (CLP)** <sup>(36)</sup>

782 Regulation (EC) No. 1272/2008 (CLP) focuses on the identification and classification of the intrinsic hazards of  
783 chemicals, i.e. the hazardous effects of chemicals on human health or the environment, and on communicating  
784 them to users of chemicals and decision makers (consumers, industry and authorities). Identifying the intrinsic  
785 hazardous properties of substances to derive a hazard classification is the first step in assessing chemical risks.

786 CLP requires manufacturers, importers and downstream users to classify hazardous substances and mixtures  
787 and provides rules on how to classify them, applicable throughout the EU. For a substance that has a harmonised  
788 classification (an entry in Annex VI to CLP), that classification is legally binding for the hazard classes and  
789 differentiations covered in the entry. The substances not covered in the entry, as well as mixtures, must be  
790 evaluated and self-classified. The hazard classification determines the appropriate labelling and packaging of  
791 the chemicals in the supply chain, in particular to protect workers, consumers and the environment.

792 Hazard classifications under CLP, including the new hazard classes defined in the recently adopted Delegated  
793 Commission Regulation (EU) 2023/707, are very relevant in determining obligations imposed by many relevant  
794 EU acts, including on products. Article 2(28) of ESPR refers to specific hazard classes under Annex VI of CLP to  
795 define "substances of concern", whereas under Regulation (EC) No. 66/2010 on the EU Ecolabel, its Article 6(6)  
796 specifies that an EU Ecolabel cannot be awarded to goods containing substances or mixtures meeting the  
797 criteria for certain hazard classifications in accordance with CLP.

798

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<sup>35</sup> REACH Regulation. Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC. Available at [this link](#).

<sup>36</sup> CLP Regulation. Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006. Available at [this link](#).

799 **POPs Regulation** <sup>(37)</sup>

800 The POPs Regulation focuses on persistent organic pollutants, and it implements the international obligations  
801 of the EU as a party to the Stockholm Convention. The objective of the Regulation is to protect human health  
802 and the environment from POPs by prohibiting, phasing out as soon as possible, or restricting the manufacturing,  
803 placing on the market and use of substances subject to the Stockholm Convention. Substances listed in Annexes  
804 I and II to the Regulation are, respectively, prohibited or limited, in terms of their manufacture, placing on the  
805 market and use, with some specific exemptions. Some of these restrictions are relevant to textiles, for instance  
806 those associated with certain brominated flame retardants (e.g. certain PBDEs), surface-active substances such  
807 as PFOS or PFOA, or substances with biocidal properties such as pentachlorophenol.

808

809 **Waste Framework Directive (WFD)** <sup>(38)</sup>

810 The WFD sets the basic concepts and definitions related to waste management, including definitions of waste,  
811 recycling and recovery. It lays down waste management principles, which contribute to the reduction of the  
812 adverse impact of waste management on human health or the environment, with an emphasis on waste  
813 prevention. The WFD contains provisions on waste prevention, encouraging the reuse of products and the setting  
814 up of systems promoting repair and reuse activities, including in particular for textiles (Article 9), and requires  
815 Member States to set up separate collection for textiles by 1 January 2025 (Article 11) in order to promote  
816 high-quality recycling. Article 9 of the Directive also promotes the reduction of the content of hazardous  
817 substances in materials and products by defining a reporting obligation that applies to suppliers of articles (as  
818 defined under REACH), requiring them to provide information regarding the presence of SVHC in articles,  
819 including textile articles, pursuant to Article 33 of REACH, to the European Chemicals Agency (ECHA), as of 5  
820 January 2021. This information is collected in a database, operated by ECHA, and access is provided to waste  
821 treatment operators and consumers.

822

823 **Unfair Commercial Practices Directive (UCPD)** <sup>(39)</sup>

824 The UCPD concerns unfair business-to-consumer commercial practices, and it aims to boost consumer  
825 confidence and make it easier for businesses, especially small and medium-sized enterprises, to trade across  
826 borders. It regulates unfair commercial practices that occur before, during and after a business-to-consumer  
827 transaction has taken place.

828 The Directive does not provide specific rules on environmental claims or specifically for textiles. However, it  
829 provides a legal basis to ensure that traders do not present environmental claims in ways that are unfair to  
830 consumers. It does not prohibit the use of 'green claims' as long as they are not unfair. On the contrary, the  
831 UCPD can help traders invest in the environmental performance of their products by enabling them to  
832 communicate these efforts to consumers transparently and by preventing competitors from presenting  
833 misleading environmental claims. The Directive states that claims should not be misleading and that all claims  
834 which lead a consumer to choose one product over another must be trustworthy. The Directive's Annex I lists  
835 which practices are considered unfair and misleading in all circumstances.

836 The proposal from the Commission for a Directive on empowering consumers for the green transition will amend  
837 the Unfair Commercial Practices Directive and the Consumer Rights Directive, introducing specific provisions to  
838 avoid greenwashing. See further details in Section 4.1.2.

839

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<sup>37</sup> POPs Regulation. Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants (recast) (Text with EEA relevance) Text with EEA relevance. Available at [this link](#).

<sup>38</sup> Waste Framework Directive (WFD). Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance). Available at [this link](#).

<sup>39</sup> Unfair Commercial Practices Directive (UCPD). Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council ('Unfair Commercial Practices Directive') (Text with EEA relevance). Available at [this link](#).

840 **Directive on empowering consumers for the green transition** <sup>(40)</sup>

841 The proposal from the Commission for a Directive on empowering consumers for the green transition will amend  
842 the Unfair Commercial Practices Directive (2005/29/EC) and the Consumer Rights Directive (2011/83/EU). It  
843 addresses problems identified with consumer information at the point of sale, in particular the fact that  
844 consumers lack reliable information for choosing more environmentally sustainable products, and aims to  
845 protect consumers against certain unfair commercial practices.

846 This is to be achieved through the improved participation of consumers in the circular economy by providing  
847 better information on the durability and reparability of certain products to consumers and stepping up the  
848 protection of consumers against unfair commercial practices by preventing: greenwashing, early obsolescence  
849 practices, use of unreliable and non-transparent sustainability labels and information tools. The co-legislator  
850 adopted this Directive on 20 February 2024.

851 **4.1.2 EU legislation in preparation**

852 **Proposal for a targeted amendment of the Waste Framework Directive** <sup>(41)</sup>

853 The overall objective of the WFD revision is to reduce environmental and climate impacts, increase environment  
854 quality and improve public health associated with textiles waste management in line with the waste hierarchy.  
855 The Commission proposal aims to make producers responsible for the full life cycle of textile products and to  
856 support the sustainable management of textile waste across the EU. This initiative also aims to accelerate the  
857 development of the separate collection, sorting, reuse and recycling sector for textiles in the EU, in line with the  
858 EU Strategy for Sustainable and Circular Textiles.

859 The Commission proposal intends to introduce mandatory and harmonised Extended Producer Responsibility  
860 (EPR) schemes for textiles in all EU Member States. According to this Commission proposal, producers will cover  
861 the costs of management of textile waste, which will also provide incentives to reduce waste and increase the  
862 circularity of textile products, resulting in a better design of products from the start. The proposal envisages  
863 that the contribution to EPR schemes will be adjusted based on the environmental performance of textiles (eco-  
864 modulation) based on parameters aligned with ecodesign requirements under the ESPR.

865

866 **Proposal for a Directive on substantiation and communication of explicit environmental claims**  
867 **(Green Claims Directive)** <sup>(42)</sup>

868 The Commission Green Claims Directive proposal will address greenwashing by tackling false environmental  
869 claims made to consumers, and stopping the proliferation of public and private environmental labels. Together  
870 with the proposal for a Directive on empowering consumers for the green transition, the proposal establishes a  
871 clear regime for environmental claims and labels. Their purpose is to ensure that consumers receive trustworthy  
872 information about the environmental credentials of the products they buy.

873 The proposal targets 'green claims' made by businesses that state or imply a positive environmental impact,  
874 lesser negative impact, no impact, or improvement over time for their products, services, or organisation. It  
875 requires that green claims are substantiated and this substantiation be verified *ex-ante*. This only concerns  
876 claims that are not covered by other EU rules, notably the ESPR and the TLR. The proposal also addresses  
877 environmental labelling schemes, stopping the proliferation of public and private labels and ensuring the  
878 transparency and robustness of labelling schemes.

879

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<sup>40</sup> Proposal for a Directive of the European Parliament and of the Council amending Directives 2005/29/EC and 2011/83/EU as regards empowering consumers for the green transition through better protection against unfair practices and better information. COM/2022/143 final. Available at [this link](#).

<sup>41</sup> Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste. COM/2023/420 final. Available at [this link](#).

<sup>42</sup> Green Claim Directive. Proposal for a Directive of the European Parliament and of the Council on substantiation and communication of explicit environmental claims (Green Claims Directive). COM/2023/166 final. Available at [this link](#).

## 880 **Proposal on common rules promoting the repair of goods** <sup>(43)</sup>

881 The proposal introduces a new 'right to repair' for consumers, both within and beyond the legal guarantee. It  
882 aims to provide consumers savings and support the objectives of the European Green Deal by reducing waste.  
883 The proposal will make it easier and more cost-effective for consumers to repair as opposed to replace goods.  
884 Additionally, it aims to promote the repair sector, incentivising sustainable business models.

## 885 **4.2 Legislation and initiatives in EU Member States and non-EU countries**

886 The publication of Directive (EU) 2018/851 <sup>(44)</sup> (the 2018 revision of the WFD) promoted the establishment of  
887 **Extended Producer Responsibility (EPR)** schemes for textile products in several Member States. For textile,  
888 France <sup>(45)</sup>, the Netherlands <sup>(46)</sup> and Hungary (Decree 80/2023) were pioneers in establishing systems where  
889 economic operators placing textile products on the market contribute to the collection, sorting, reuse, preparing  
890 for reuse and recycling infrastructure for the same products.

891 Other Member States establishing EPR schemes are Sweden (S02020:72), Greece (Law 4819/2021), and Spain  
892 (Law 7/2022), while Italy <sup>(47)</sup> and Denmark <sup>(48)</sup> are not far behind.

893 Within the national Climate Law, France is establishing the **Eco-Score** <sup>(49)</sup>, which is an online tool that provides  
894 the consumer with an idea about the environmental impacts of apparel, with specific characteristics (e.g. weight,  
895 fibre composition) selected directly by the consumer from a defined list. In the future, it is planned that economic  
896 operators will be able to report the environmental performance of their products via the Eco-Score, so that the  
897 Eco-Score will work as an environmental labelling tool. Additionally, it is planned to connect the Eco-Score with  
898 the EPR scheme to deploy eco-modulation.

899 The Dutch Government established the **Denim Deal** <sup>(50)</sup>, which aims to bolster the use of post-consumer  
900 recycled cotton in denim products marketed in the Netherlands. In particular, the signatories of the initiative  
901 aim to use 20% post-consumer recycled cotton fibres in 3 million pairs of jeans produced until the end of 2023.

902 The Luxembourg Ministry of the Economy developed the **Product Circularity Data Sheet (PCDS)** <sup>(51)</sup>, which  
903 aims to provide basic product information about the several steps of the supply chain. Information is gathered  
904 in five areas: general information, composition, design for better use, design for disassembly, and design for  
905 reuse.

906 In February 2023, the State of **California** (USA) introduced the **Responsible Textile Recovery Act** <sup>(52)</sup> with  
907 Senate Bill 707 (SB-707), which aims to establish an Extended Producer Responsibility scheme for textile  
908 products. The bill is currently under scrutiny before its implementation. The bill introduces the concept of a  
909 programme operator to oversee the implementation of a stewardship programme. Additionally, the bill would  
910 also establish a Textile Stewardship Recovery fund which would receive fees paid by programme operators. This  
911 fund will cover the costs associated with programme implementation and enforcement.

## 912 **4.3 Strategies of the United Nations**

913 The United Nations Environment Programme (UNEP) offers strategic guidance and promotes collaboration  
914 across sectors to foster a fair shift towards a sustainable and circular textile value chain. To this end, UNEP  
915 promotes numerous activities and publishes studies on its website <sup>(53)</sup>.

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<sup>43</sup> Proposal for a Directive of the European Parliament and of the Council on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394, Directives (EU) 2019/771 and (EU) 2020/1828. COM/2023/155 final. Available at [this link](#).

<sup>44</sup> Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Text with EEA relevance). Available at [this link](#).

<sup>45</sup> French Anti-Waste law for a circular economy. AGEC- Law n°2020-105, 10 February 2020. Available at [this link](#). Code de l'environnement [L.541-10-27](#). Code de l'environnement [R.543-214 to R.541-219](#). Last accessed on 17 December 2023.

<sup>46</sup> Dutch Decree on extended producer responsibility for textiles. Available at [this link](#). Last accessed on 17 December 2023.

<sup>47</sup> Announcement of the Italian EPR scheme. Available at [this link](#). Last accessed on 17 December 2023.

<sup>48</sup> The proposal of the Danish government (2022/2 BSF 63) was rejected by the Danish Parliament.

<sup>49</sup> Eco-Score. Available at [this link](#). Last accessed on 17 December 2023.

<sup>50</sup> The Demin Deal. Available at [this link](#). Last accessed on 17 December 2023.

<sup>51</sup> Product Circularity Datasheet. Available at [this link](#). Last accessed on 17 December 2023.

<sup>52</sup> SB-707 Responsible Textile Recovery Act of 2023. Available at [this link](#). Last accessed on 17 December 2023.

<sup>53</sup> United Nations environment programme. Building Sustainability and Circularity in the Textile Value Chain. Available at [this link](#). Last accessed on 17 December 2023.

916 In particular, UNEP proposes a roadmap with collective actions focusing on nine points (UNEP, 2023a):

- 917 1. Adopt globally sustainable and circular business models.
- 918 2. Contrast overconsumption and overproduction.
- 919 3. Design sustainable and circular textile products.
- 920 4. Improve product care and durability.
- 921 5. Reduce the emissions into the environment during the production stages.
- 922 6. Address social issues along the value chain.
- 923 7. Use of sustainable or recycled materials.
- 924 8. Improve the shared infrastructure of the value chain.
- 925 9. Develop a suitable textile waste management system that avoids landfilling and incineration of textile
- 926 products.

927 UNEP promotes the engagement of all stakeholders in the value chain to focus on the nine points of the  
928 roadmap (UNEP, 2023a).

#### 929 **4.4 Tests and standards**

930 Textile standards in Europe are coordinated by CEN-CENELEC<sup>(54)</sup>. Several working groups are related to the  
931 textile industry, mainly CEN/TC248 TEXTILES AND TEXTILE PRODUCTS. **Table 47** in Section 9.3 reports details  
932 of technical working groups and scientific committees.

933 The knowledge of the available standards in the textile sector is crucial in the development of the PS, because  
934 it provides an overview of the technical aspects/parameters of a textile product that can currently be measured  
935 via a commonly recognised test/method/tool. Specific standards could potentially be used to propose and/or  
936 verify ecodesign requirements, when the PS addresses tasks 6 and 7 of the MEErP.

937 Numerous standards used in the textile industry were classified and some of them were related to the ecodesign  
938 aspects reported in Article 5 of the ESPR (see Section 9.3):

- 939 • Standards directly related to the intrinsic durability of the textile product, which could address  
940 abrasion, pilling, colourfastness, dimensional stability, seam slippage, tear strength, etc.  
941 (**Table 48**). Specific textile frameworks already use some of these standards to address  
942 durability aspects of textile products. **Table 49** compares how durability parameters for  
943 textile products are tested by PEFCR A&F, EU Ecolabel criteria, Blue Angel criteria, and Nordic  
944 Swan Ecolabel criteria (see Section 4.5 for information about ecolabels and other  
945 environmental labels).
- 946 • Standards related to the functionality of the textile products, such as antifungal activity,  
947 antiviral activity, oil stain repellency, resistance to chlorinated water, resistance to insects,  
948 resistance to surface wetting, stain repellency, water repellency, water resistance after aging,  
949 wicking (**Table 50**).
- 950 • Standards used for textile characterisation, such as identification of dyestuff and fibres,  
951 thickness, mass per unit area and composition (**Table 51**), which could be a reference for  
952 characterising and referring to specific textile products.
- 953 • Standards for the identification of specific substances, such as alkylphenol ethoxylates  
954 (APEO), formaldehyde, and other chemicals (**Table 52**), which are of environmental concern  
955 as reported in Section 3.1.3.
- 956 • Standards related to the loss of fragmented fibres (**Table 53**), which are of environmental  
957 concern as reported in Section 3.1.3.

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<sup>54</sup> CenCenelec website. Available at [this link](#). Last accessed on 17 December.

958 • Standards potentially related to circularity and environmental aspects. Almost all of these  
959 standards are still under development (**Table 54**).

960 • Standards related to potential information on the care of textile products, because they  
961 describe and report labelling symbols (**Table 55**). Apparel properly maintained is more likely  
962 to have a longer lifespan (see Section 6).

963 Some of the standards available for the textile industry measure a specific parameter using different methods  
964 (e.g. Determination of the abrasion resistance on coated fabrics. Part 1 using taber abrader and Part 2 using  
965 martindale abrader). The selection of the method depends mainly on the laboratory equipment used for testing.

966 Only one standard was found addressing non-woven technology to measure the tensile strength and elongation;  
967 all the other standards focused on woven and knitted technologies.

968 The analysis did not reveal any standard capable of recognising whether a fibre is of virgin or recycled origin,  
969 or of identifying the type of fibres being mechanically recycled. Specific methods to verify this type of  
970 information will be investigated in the following milestone, when the PS addresses task 6.

971 In addition to the investigated standards, the textile industry widely deploys a multitude of other standards that  
972 are tailored to specific industrial sectors or regional contexts. Notably, several standards are of relevance,  
973 including those promulgated by organisations such as the AATCC (American Association of Textile Chemists and  
974 Colorists), ASTM (American Society for Testing and Materials), British Standards Institution, JIS (Japanese  
975 Industrial Standards), and the GB standards (National Standards of the People's Republic of China), and many  
976 more. By adhering to such comprehensive and recognised frameworks, the textile industry can foster  
977 consistency, reliability, and quality assurance throughout its global operations.

#### 978 **4.5 Voluntary environmental labels**

979 In general, there are many types of labels, addressing single or multiple environmental issues and covering  
980 different sectors and regions. See Section 9.4.1 for more information. Three ISO standards classify voluntary  
981 environmental labels as follows:

982 — **ISO Type I environmental labels** (ISO 14024:2018)<sup>(55)</sup>, known as **Ecolabels**, are defined as  
983 *'voluntary, multi-criteria-based and third party-verified labels that indicate an overall*  
984 *environmental preference in a life cycle perspective of a product or service within a specific product*  
985 *category*.

986 — **ISO Type II environmental labels** (ISO 14021:2016)<sup>(56)</sup>, known as **Self-declared**  
987 **Environmental Claims**, are neither third-party verified nor based on a Life Cycle Thinking  
988 approach. Many self-declared environmental claims on the EU market do not necessarily follow  
989 ISO 14021:2016.

990 — **ISO Type III environmental labels** (ISO 14025:2016)<sup>(57)</sup>, known as **Environmental**  
991 **Declarations**, are labels presenting *'quantified environmental information on the life cycle of a*  
992 *product to enable comparisons between products fulfilling the same function*'. The establishment  
993 of Product Category Rules ensures that the life-cycle assessment is performed with specific rules  
994 aiming to foster transparency and facilitate comparisons between different Environmental  
995 Declarations.

996 Global environmental labels used in the textile industry were recently analysed (Ranasinghe and Jayasooriya,  
997 2021) via an investigation including bibliographic research, the Ecolabel Index<sup>(58)</sup>, and the Global Ecolabelling  
998 Network<sup>(59)</sup>. Ranasinghe and Jayasooriya (2021) report that on 20 March 2021 there were 107 environmental

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<sup>55</sup> ISO 14024:2018. Environmental labels and declarations. Type I environmental labelling. Principles and procedures. Available at [this link](#). Last accessed on 12 January 2024.

<sup>56</sup> ISO 14021:2016. Environmental labels and declarations. Self-declared environmental claims (Type II environmental labelling). Available at [this link](#). Last accessed on 12 January 2024.

<sup>57</sup> ISO 14025:2006. Environmental labels and declarations. Type III environmental declarations. Principles and procedures. Available at [this link](#). Last accessed on 12 January 2024.

<sup>58</sup> Ecolabel Index. Website available at [this link](#). Last accessed on 12 January 2024.

<sup>59</sup> Global Ecolabelling Network. Website available at [this link](#). Last accessed on 12 January 2024.

999 labels for textiles in the world: 55 used in Europe, 54 used in the USA, 41 used in Asia, 18 used in Latin America,  
 1000 19 used in Oceania, and 12 used in Africa. When looking for the same information on 7 February 2024, the ITC  
 1001 Standard Map (<sup>60</sup>) provided 73 environmental labels for textiles used globally: 58 used in Europe, 50 used in  
 1002 USA, 54 used in Asia, 42 used in Latin America, 48 used in Oceania, and 45 used in Africa.

1003 **Table 9** reports the topics that were addressed the most by environmental labels for textiles globally in 2021.  
 1004 The majority of the concerns focused on the use of harmful chemicals and toxic substances, as well as natural  
 1005 resources. Additionally, specific global regions used environmental labels addressing specific topics: such as  
 1006 Europe with ‘Pesticides/herbicides/fungicides’, and Latin America with ‘Carbon/GHG offsets’.

1007 **Table 9.** Top topics addressed by environmental labels for textiles globally in 2021

Topic	Europe	USA	Asia	Latin America	Oceania	Africa
Toxics	X	X	X	X	X	X
Harmful chemicals	X	X		X	X	X
Natural resources	X	X	X		X	X
Pesticides/herbicides/fungicides	X					
Material use	X	X	X			
Waste		X	X	X	X	X
Energy use/efficiency			X	X	X	X
Carbon/GHG offsets				X		

1008 N.B. The topic ‘Toxics’ addresses harmful substances that are already prohibited or regulated; whereas the topic ‘Harmful chemicals’  
 1009 addresses substances that are known to be harmful to health, but are not officially banned. The authors of the referenced study use  
 1010 the term ‘Chemicals’ when referring to ‘Harmful chemicals’.

1011 The authors of the referenced study do not specify if the topic ‘Waste’ addresses any kind of waste generated along the value chain, or  
 1012 waste generated at a specific stage. No further explanation/specification is provided for other topics.

1013 *Source: Ranasinghe and Jayasooriya (2021)*

1014 **Figure 2** shows the topics addressed by environmental labels used for textiles in 2021 in Europe and their  
 1015 number. These environmental labels addressed most of the environmental impacts described in Section 3.3.2.

1016 The analysis showed that the textile industry largely relies on environmental labels, but most of the time actors  
 1017 do not state which ISO type standard they follow – if they follow any. This situation causes confusion for the  
 1018 consumers, who cannot identify governance, reliability, environmental scope and level of environmental  
 1019 ambition of all environmental labels. To fill this gap, some voluntary initiatives try to score, compare and  
 1020 describe some environmental labels (<sup>61</sup>). The lack of transparency of the numerous environmental labels could  
 1021 be further analysed in the 3<sup>rd</sup> milestone, when the PS addresses the content of the Digital Product Passport.

1022 Section 7 assesses in detail the EU Ecolabel criteria for textile products in light of their revision process, as  
 1023 described in Section 1. As established by Article 6(3.f) of the EU Ecolabel Regulation, the analysis performed  
 1024 considers other ecolabels used in the EU (Blue Angel (<sup>62</sup>) and Nordic Swan Ecolabel (<sup>63</sup>)) to enhance synergies.

1025 Further information about voluntary environmental labels used in Europe is reported in **Table 56** in Section  
 1026 9.4.2.

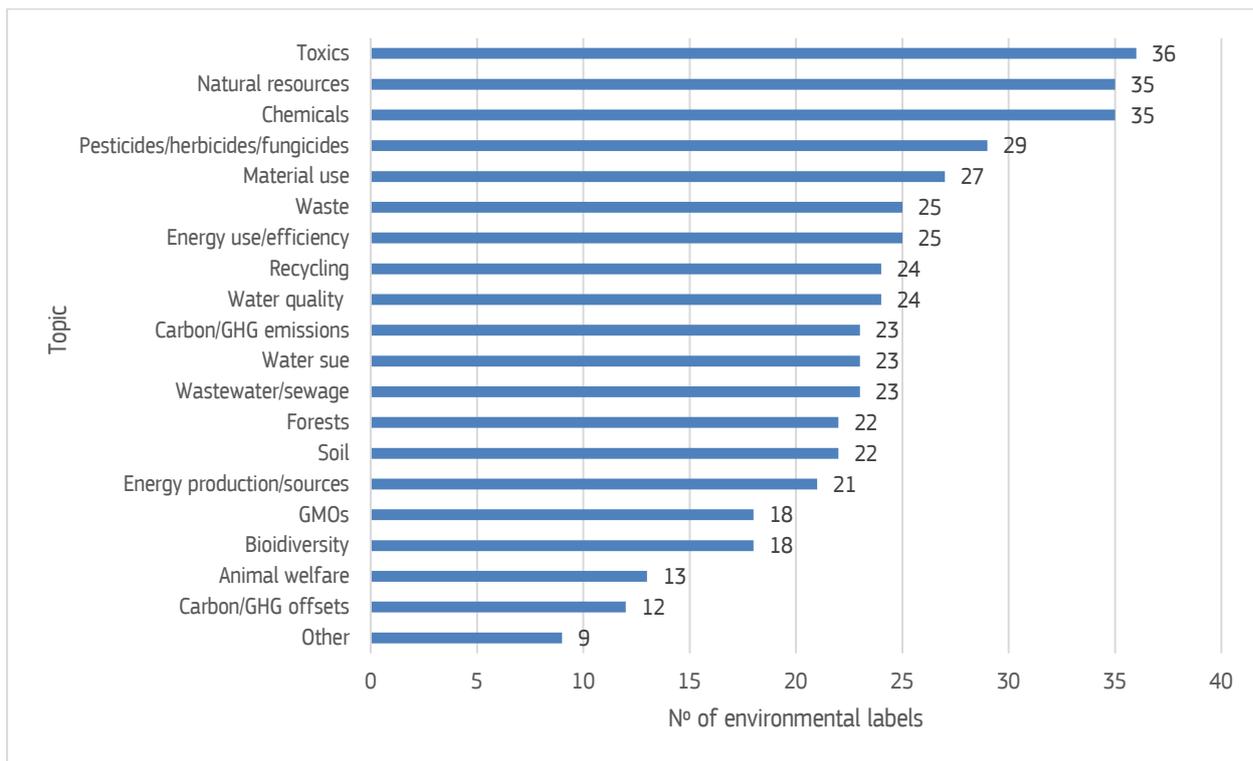
<sup>60</sup> ITC Standards Map App, selecting sectors of clothing and textiles. Available at [this link](#). Last accessed on 7 February 2024.

<sup>61</sup> ITC Standards Map App. Available at [this link](#). Last accessed on 7 February 2024.  
 Label Directory – Siegelklarheit. Available at [this link](#). Last accessed on 7 February 2024.  
 Labels Environnementaux. Available at [this link](#). Last accessed on 7 February 2024.

<sup>62</sup> Blue Angel – The German Ecolabel. Available at [this link](#). Last accessed on 7 February 2024.

<sup>63</sup> Nordic Swan Ecolabel. Available at [this link](#). Last accessed on 7 February 2024.

**Figure 2.** Main topics addressed by environmental labels used in 2021 in Europe



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N.B. The topic 'Toxics' addresses harmful substances that are already prohibited or regulated, whereas the topic 'Chemicals' addresses substances that are known to be harmful to health, but are not officially banned. The authors of the referenced study do not specify if the topic 'Waste' addresses any kind of waste generated along the value chain, or waste generated at a specific stage. No further explanation/specification is provided for other topics.

Source: (Ranasinghe and Jayasooriya, 2021)

DRAFT - WORK IN PROGRESS

## 1034 **5 Market analysis**

1035 This section analyses the market of the products included in the scope of the PS, addressing many aspects. The  
1036 information collected at this stage will feed into the following tasks of the MEErP, in particular task 4 to task 7.

1037 The first subsections analyse the market at different scales: global, EU and Member State (Sections 5.1, 5.2  
1038 and 5.3). Section 5.4 presents available market information of elements affecting the production and recycling  
1039 of apparel textiles. The market structure and the value chain are analysed in Section 5.5 and Section 5.6,  
1040 respectively. Section 5.7 analyses the competitiveness at global level, focusing on different environmental  
1041 compliance costs that companies placed in different countries must face. Section 5.8 analyses the lifespan of  
1042 the products included in the scope. This information is particularly crucial to build a suitable model for the  
1043 environmental and economic assessment, as well as the stock analysis (tasks 5 to 7 of the MEErP). The section  
1044 concludes with a brief comment about the penetration in the market of the environmental labels used in the  
1045 textile sector (Section 5.9).

### 1046 **5.1 The global market**

#### 1047 **Historical overview**

1048 In 1947, the Grant Agreement on Tariffs and Trade (GATT) was signed by 23 countries to promote free  
1049 movement of goods among signing countries. The GATT set the bases for the future institution of the World  
1050 Trade Organization (WTO) in 1994 <sup>(64)</sup>.

1051 From 1974 to 1994, under a special regime outside the GATT framework, the Multifibre Arrangement (MFA) set  
1052 rules for international trade of textile products. The MFA was a framework for bilateral agreements or unilateral  
1053 actions that established quotas <sup>(65)</sup> limiting imports into countries whose domestic industries could be damaged  
1054 by a quick rise of imports <sup>(66)</sup>. The MFA applied only to trade between developed and developing countries, but  
1055 not to trade among developed countries. Although the MFA did not comply with the principle of non-  
1056 discrimination established in the GATT, developed countries used it to protect their textile industry (Stephen  
1057 MacDonald, 2006).

1058 In 1995, within the establishment of the WTO and the revised GATT, the MFA was substituted by the Agreement  
1059 on Textiles and Clothing (ATC), which represented the 10-year-long transition towards an international textile  
1060 market without quotas <sup>(67)</sup>. The ATC applied to all the WTO members <sup>(68)</sup>. Between 1995 and the end of 2004,  
1061 quotas were gradually removed <sup>(69)</sup>.

1062 Since 1 January 2005, the trade of textile products among WTO members has been free of quotas.

1063 In June 2005, the European Commission signed a Memorandum of Understanding with China to keep the  
1064 imports of specific textile products <sup>(70)</sup> below some thresholds until the end of 2007. This action was intended  
1065 to prevent distortion of the European textile sector <sup>(71)</sup>.

1066 Since 2005, the European textile market has been completely open to imports of any product coming from any  
1067 country belonging to the WTO.

1068 In 2005, the removal of quotas from the global textile market caused an increase in production and employment  
1069 in Asian countries, such as China, India, Türkiye, Hong Kong, Bangladesh, and Indonesia (Hildegunn Kyvik Nordås,  
1070 2004). Already in the 1970s, textile production had started moving from Europe and North America mainly to  
1071

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<sup>64</sup> The General Agreement on Tariffs and Trade (GATT 1947) – the legal text available on [this World Trade Organization webpage](#), last accessed on 29 September 2023.

<sup>65</sup> A quota is a government-imposed trade restriction that limits the number or monetary value of goods that a country can import or export during a particular period (Adam Barone, 2022)

<sup>66</sup> Textiles: back in the mainstream – [World Trade Organization webpage](#), last visited on 29 September 2023.

<sup>67</sup> Textiles Monitoring Body (TMB) The Agreement on Textiles and Clothing – [World Trade Organization website](#), last accessed on 29 September 2023. Marrakesh Agreement Establishing the World Trade Organization – [World Trade Organization website](#), last accessed on 29 September 2023.

<sup>68</sup> The list of WTO members and dates of membership are available here: [https://www.wto.org/english/res\\_e/booksp\\_e/sli\\_e/4wtomembers.pdf](https://www.wto.org/english/res_e/booksp_e/sli_e/4wtomembers.pdf)

<sup>69</sup> Textiles: back in the mainstream – [World Trade organization webpage](#), last visited on 29 September 2023.

<sup>70</sup> Ten types of products were included in the Memorandum of Understanding between EU and China: pullovers, men's trousers, blouses, t-shirts, dresses, bras, flax yarn, cotton fabrics, bed linen, table and kitchen linen.

<sup>71</sup> EU – China textile agreement 10 June 2005. Available at [this link](#). Last accessed on 29 September 2023.

1071 Asia and other developing regions of the world<sup>(72)</sup>. In 1996, Asia was the predominant global exporter of  
 1072 apparel products, contributing to more than 32% of the world's apparel exports (ILO News, 1996). However, the  
 1073 general lack of transparency of the textile supply chain until the 2010s does not allow a description over time  
 1074 of EU textile outsourcing<sup>(73)</sup>.

1075 In September 2008, the financial crisis that originated in the USA rapidly affected major economies due to their  
 1076 interconnections. The EU experienced the Great Recession between 2008 and 2009. Following a brief period of  
 1077 recovery, many Member States subsequently became vulnerable to the sovereign debt crisis (Szczepanski,  
 1078 2019). This global crisis significantly impacted the European textile industry which had already been hit by  
 1079 offshoring and the increased competitiveness of the Chinese industry after 2005 (Maya Forstater, 2010).

1080 In 2020, the outbreak of the COVID-19 pandemic led to international economic and social disruptions, including  
 1081 the most significant global recession since the time of the Great Depression in the 1930s (Gita Gopinath, 2020).  
 1082 The main effects of the pandemic on the European textile industry were: (a) a decrease in production, (b) the  
 1083 conversion of traditional production, for some companies, into the manufacture of sanitary products or face  
 1084 masks, and (c) an extraordinary growth in sales via online channels (Vet et al., 2021).

1085 In 2022, two main factors negatively affected the competitiveness of the European textile industry. First, the  
 1086 increase of the energy price in Europe which was over six times that in the USA, China, and other Asian countries.  
 1087 In this context, numerous textiles and apparel companies either operated with a net loss or ceased their  
 1088 production activities (EURATEX, 2022b). Second, countries strongly supported their domestic textile industries,  
 1089 despite being minimally affected by the energy crisis (EURATEX, 2022b).

1090 **Table 10** sums up the historical events and international agreements affecting the European apparel sector.

1091 **Table 10.** Main historical events and international agreements affecting the European apparel sector

Year	Event
1974 to 1994	The Multifibre Arrangement (MFA), with the establishment of import quotas, protected the domestic market of developed countries from products produced in developing countries.
1995 to 2004	The Agreement on Textiles and Clothing (ATC) established a progressive removal of import quotas set with the MFA.
2005 onwards	Among members of the World Trade Organization (WTO), any trade of textile products were free of barriers – all import quotas were removed.
2005 to 2007	The Memorandum of Understanding between the EU and China allowed the monitoring of specific types of textile products imported from China. It aimed to prevent market distortions in the European textile sector.
2008	The Great Recession impacted the European textile sector.
2020	The COVID-19 pandemic led to global recession.
2022	The price of energy strongly increased in EU.

1092 *Source: own elaboration based on World Trade Organization website*

### 1093 Global figures

1094 Globally, the apparel sector includes two thirds of the textile industry (EURATEX, 2020; EURATEX, 2022a). It is  
 1095 part of one of the largest industries in the world, if teamed up with the footwear sector in the fashion industry  
 1096 (McKinsey & Company and BOF, 2016). **Table 11** reports the effects of the COVID-19 pandemic on the size of  
 1097 the fashion market from 2019 to 2021. The fashion market shrank about 4% and 21% at global and European  
 1098 scale, respectively. **Table 12** lists the largest global exporters and importers of apparel in 2019 in terms of  
 1099 value as reported by the World Trade Organization. A more detailed description of producing countries at specific  
 1100 phases of the apparel value chain is provided by a study published by the United Nations Environmental  
 1101 Programme (**Figure 3** and **Figure 4**)<sup>(74)</sup>.

1102 — The apparel export market is dominated by China and the EU, followed by Bangladesh, Vietnam,  
 1103 India and Türkiye.

<sup>72</sup> Globalization Changes the Face of Textile, Clothing and Footwear Industries. Available at [this link](#). Last accessed on 29 September 2023.

<sup>73</sup> Follow the Thread - The Need for Supply Chain Transparency in the Garment and Footwear Industry. Available at [this link](#). Last accessed on 29 September 2023.

<sup>74</sup> It is not clear to the authors which parameter, e.g. value, mass or any other, was used to develop the percentages reported in **Figure 4**, which is Figure 5 on page 16 of [UNEP\\_ \(2020\)](#).

- 1104 — The apparel import market is dominated by the EU and the USA, followed by Japan, the UK, Hong  
 1105 Kong, Canada and the Republic of Korea.
- 1106 — The role of China is prominent in all production phases of the value chain.
- 1107 — The role of the EU is prominent both in terms of exports and imports.

1108 **Table 11.** Market relevance of the apparel and apparel & footwear industries

Industry	Market	Economic parameter	Year	Reported value	Value (bn EUR) <sup>(a)</sup>	Source
Apparel and footwear	Global	Retail Sale Price	2019	USD 1 773 bn	1 644.3	(b)
			2021	USD 1 717 bn	1 592.3	
Apparel	European	Turnover	2019	EUR 72.8 bn	72.8 bn	(c)
			2021	EUR 65.3 bn	65.3 bn	(d)

1109 N.B. The retail sale price is the price declared by the producer or importer of the goods after deducting any tax included in that price.  
 1110 The turnover refers to the totals invoiced by the unit, and it corresponds to market sales of goods.

1111 <sup>(a)</sup> 1 USD = 0.92739 EUR Feb 08, 2024 10:12 UTC.

1112 Source: (b) Fashion United, based on Euromonitor <sup>(75)</sup>, (c) EURATEX (2020), (d) EURATEX (2022)

1113 **Table 12.** Top global exporters and importers of apparel in 2019

Rank	Exports			Imports		
	Country	Value (bn USD)	Share in world exports (%)	Country	Value (bn USD)	Share in world imports (%)
1	China <sup>(a)</sup>	152	30.8	EU	95	18.1
2	EU	43	8.8	USA	95	18.2
3	Bangladesh <sup>(b)</sup>	34	6.8	Japan	30	5.7
4	Vietnam <sup>(b)</sup>	31	6.2	United Kingdom	26	5.0
5	India	17	3.5	Hong Kong, China	11	NA
6	Türkiye	16	3.2	Canada <sup>(c)</sup>	11	2.1
7	Hong Kong, China	12	NA	Republic of Korea	11	2.1
8	United Kingdom	9	1.8	China <sup>(a)</sup>	9	1.7
9	Indonesia	9	1.7	Russian Federation <sup>(c)</sup>	8	1.5
10	Cambodia <sup>(b)</sup>	9	1.7	Switzerland	8	1.5

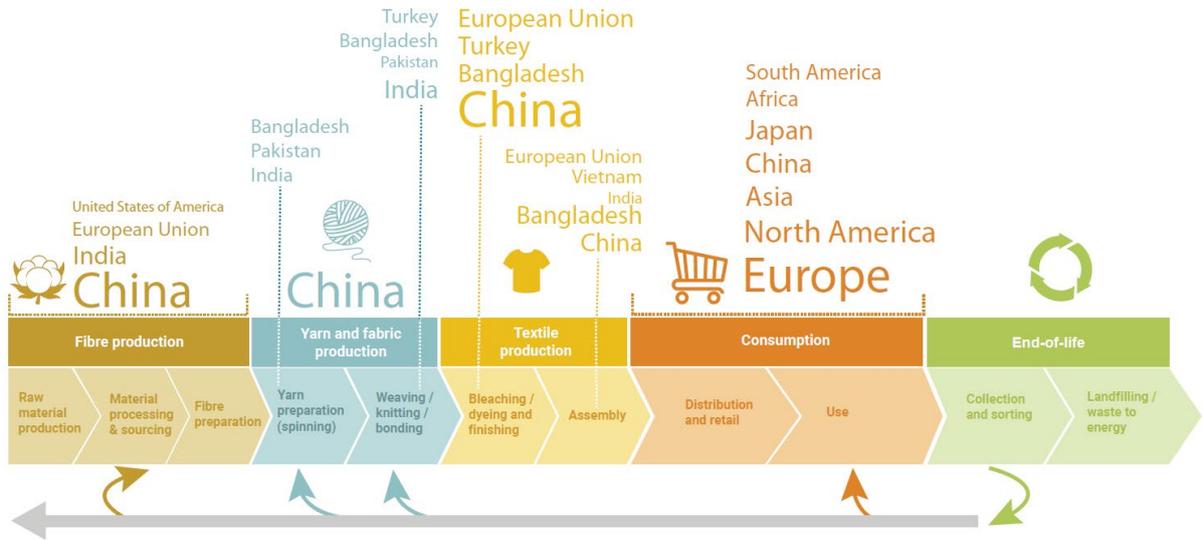
1114 <sup>(a)</sup> Includes significant shipments through processing zones. <sup>(b)</sup> Estimates of WTO. <sup>(c)</sup> Imports are valued free on board.

1115 Source: (WTO, 2020)

<sup>75</sup> Information collected from the website Fashion United, Global Fashion Industry Statistics, available [here](#), Euromonitor International, a market research provider, last accessed on 24 October 2023.

1116

**Figure 3.** Geographical breakdown of global apparel production and consumption – representation A



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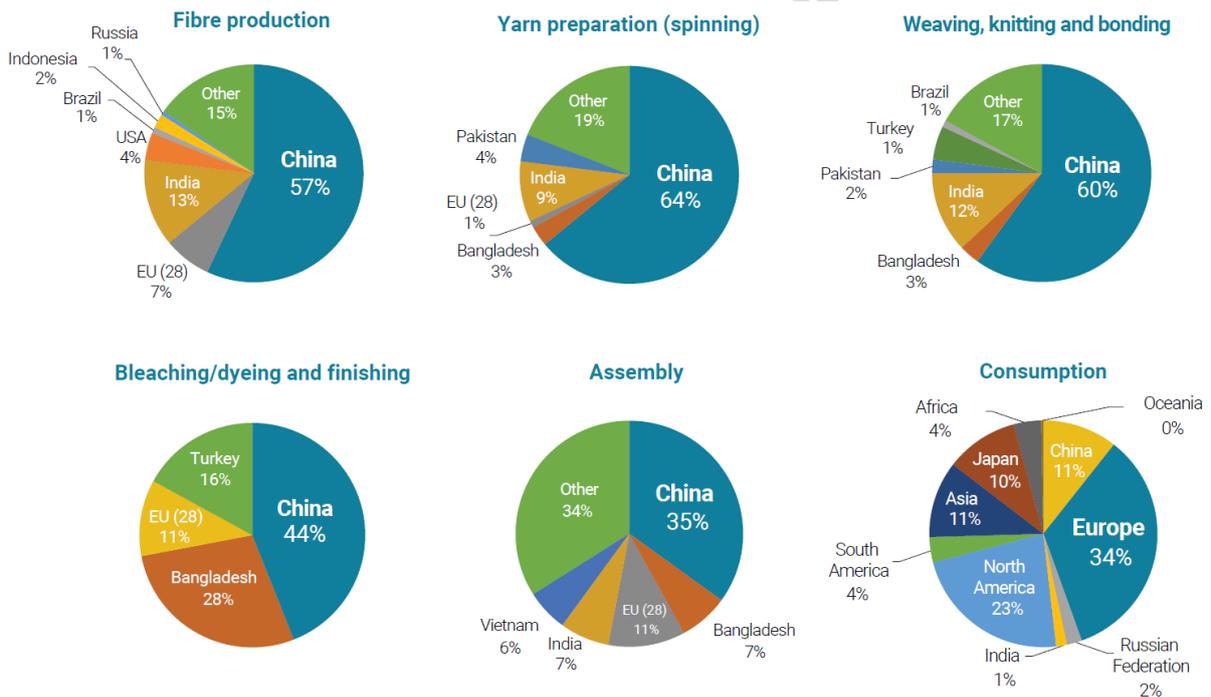
1119

N.B. The European Union is different to Europe.

Source: (UNEP, 2020)

1120

**Figure 4.** Geographical breakdown of global apparel production and consumption – representation B



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N.B. The EU figures include the United Kingdom. The EU is different to Europe.

Source: (UNEP, 2020)

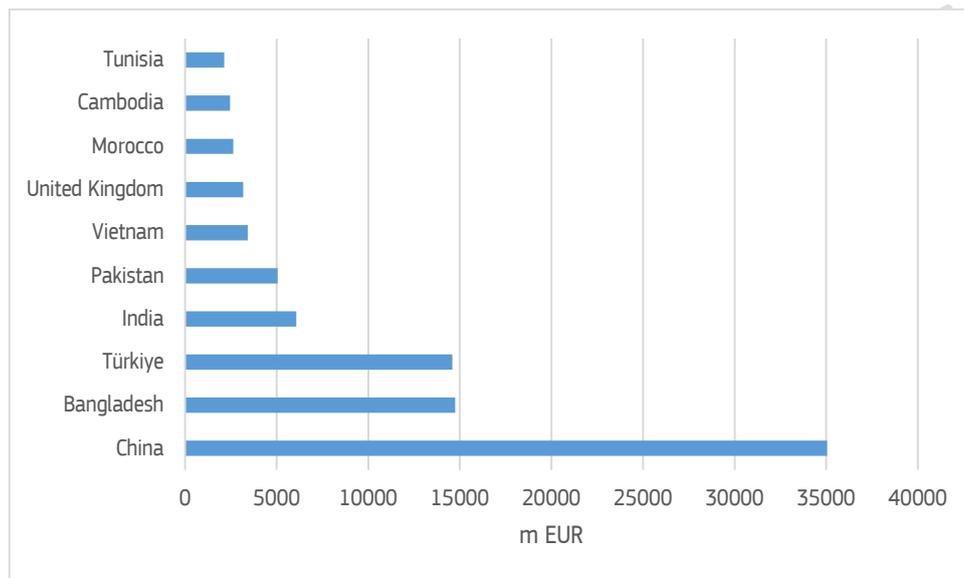
1124

1125 **EU global partners**

1126 Only a few key partners dominate the EU's trade interactions. In 2021, the top 10 EU suppliers of textiles and  
1127 apparel made up 84% of all EU imports from non-EU countries. In the same year, the top 10 export partners of  
1128 the EU purchased 68% of all exports to third countries. (EURATEX, 2022a) <sup>(76)</sup>: **Figure 5** and **Figure 6** show the  
1129 main EU suppliers and customers of textiles and apparel in 2021.

1130 The pivotal role of the EU goes beyond economics due to Europe's consolidated history and reputation in fashion  
1131 and design.

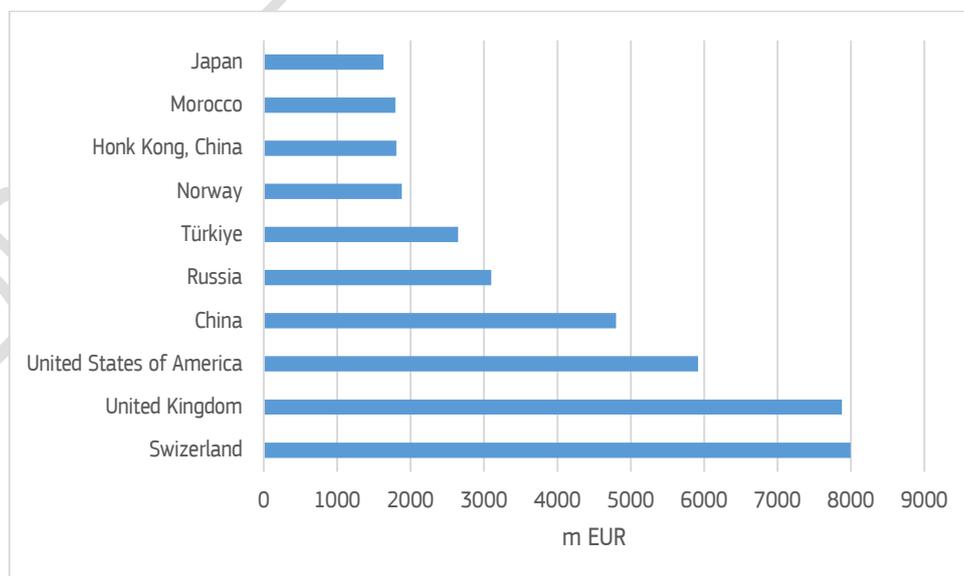
1132 **Figure 5.** The EU's main suppliers of textiles and apparel in 2021



1133  
1134

Source: EURATEX (2022a)

1135 **Figure 6.** The EU's main customers of textiles and apparel in 2021



1136

<sup>76</sup> EURATEX (2022) reports data as textile and clothing, which includes the following types of textile products: clothing and accessories, industrial and technical textiles, fabrics, home textiles, knitwear, man-made fibres, yarns, underwear, and workwear.

1137

Source: EURATEX (2022a)

## 1138 Innovation

1139 The European textile industry is an innovation leader worldwide. In 2019, more than 200 000 industrial designs  
1140 were released by the EU-27, compared to about 50 000 and 20 000 from USA and China, respectively.  
1141 Additionally, from 2015 to 2019, about 6 600 patents were filed by the EU-27, compared to about 6 000,  
1142 5 800, and 3 900, by the Republic of Korea, the USA and China, respectively (EURATEX, 2022a).

## 1143 5.2 The EU market

1144 The PRODCOM dataset<sup>(24)</sup> collects information about the apparel textiles market. This section reports an  
1145 analysis focusing on the evolution of market indicators of the EU-27 from 1995 to 2022. Details about data  
1146 used are available in Section 9.1. In particular, **Table 40** describes the codes used for the analysis and their  
1147 allocation to the specific product categories. Additionally, **Table 41** describes how codes merged or were  
1148 introduced over the years and specifies potential missing data.

1149 The available data allow an analysis of big trends over time, rather than interpretation of small changes, or  
1150 differences, in a specific year.

1151 The apparel textiles market in the EU-27 was affected by all the historical events reported in Section 5.1. **Figure**  
1152 **7** shows its evolution via four market indicators: production, import, export, and apparent consumption<sup>(25)</sup>.  
1153 These indicators were analysed from the perspective of the mass, the value and the value-to-mass ratio of the  
1154 apparel textiles. The analysis led to the following observations.

### 1155 *Apparent consumption*

1156 — Apparent consumption followed the evolution of imports in all analysed perspectives: mass, value  
1157 and value-to-mass ratio. This means that the market is largely affected by imported products.

1158 — From 2004 to 2005, the apparent consumption increased by 90% if expressed as mass, and 50%  
1159 if expressed as value. This corresponds to the year when import quotas were removed (**Table 10**).

### 1160 *Production*

1161 — From 2003 to 2009, production decreased by about 53% if expressed as mass and about 35% as  
1162 value, most probably due to the expected import quota removal in 2005 and the subsequent  
1163 increase in imports. Sector experts revealed that in those years many EU-27 producers relocated  
1164 their production to third countries.

1165 — From 2009 to 2019, production evolved relatively constantly, fluctuating between 0.7-0.9 billion  
1166 kg, and EUR 23.9-27.9 billion.

### 1167 *Export*

1168 — With the exception of a disruption around 2003-2004, export followed a relatively constant trend  
1169 in terms of mass, and a slightly increasing trend in terms of value.

1170 — Between 2009 and 2019, while production evolved relatively constantly in terms of mass and  
1171 value, exports increased by 63% and 110%, in terms of mass and value, respectively. These very  
1172 different increase rates led export to overtake production in terms of value from 2015 to 2022.  
1173 These figures are possible because, as reported in Section 9.1.2, PRODCOM accounts for every  
1174 time a product passes through EU customs. This means that a product could be imported and  
1175 subsequently exported without undergoing any mass modification, but with an increased value.  
1176 Most probably, after 2015, export has higher values than production because many EU companies  
1177 import products that afterwards are exported with a higher value.

### 1178 *Import*

1179 — The removal of the import quota established the largest change in the EU market of apparel  
1180 textiles. **Table 13** reports the change that occurred in the apparent consumption when comparing  
1181 two time intervals: 1995-2004 and 2005-2019, before and after the EU removed the import  
1182 quota. The apparent consumption of apparel textiles in general increased by 86% in mass and  
1183 27% in value. This increase was mainly driven by product categories like t-shirts (236% in mass  
1184 and 133% in value), pants and shorts (194% in mass and 58% in value), jackets and coats (129%

1185 in mass and 14% in value), and shirts and blouses (110% in mass and 38% in value) (**Table 13**).  
1186 For the majority of the product categories, the increase in mass is very much larger than the  
1187 increase in value. This could flag the purchase every year of more products at lower prices. More  
1188 details are reported in **Table 42** in Section 9.1.5.

1189 *Additional observations*

1190 — From 1996 to 2022, the value-to-mass ratio of export, production and import always had the  
1191 highest, middle and lowest value each year, respectively. Before 2000, the gap among these  
1192 market indicators was limited, but after 2002 the gap progressively increased.

1193 — In 2020, the COVID-19 pandemic strongly impacted the market: production, import and export  
1194 decreased by 27%, 20% and 16%, respectively.

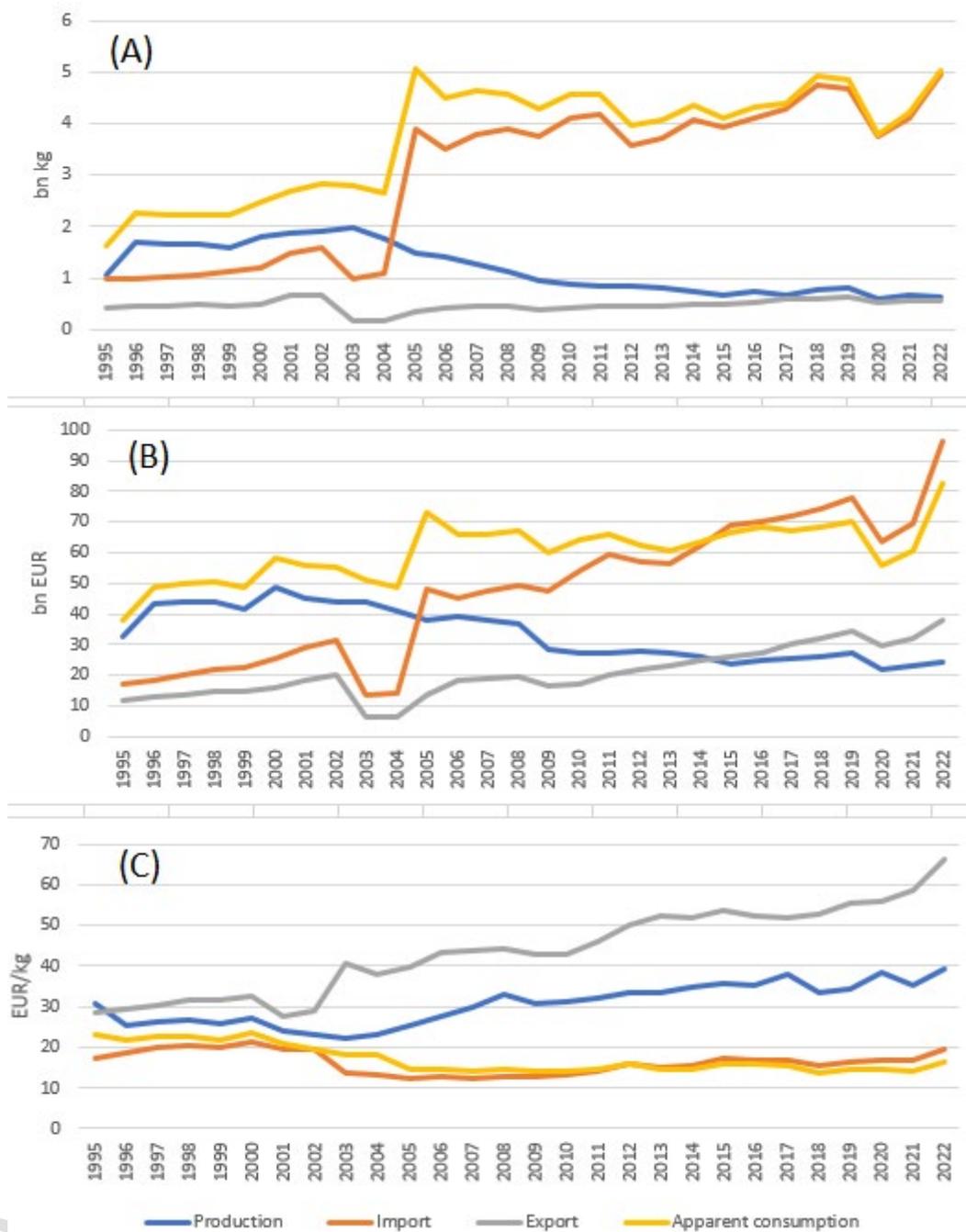
1195 The same market indicators were normalised by number of EU-27 citizens over the years to investigate the  
1196 possible impact of the change in the EU population. Nevertheless, the analysis provided the same trends over  
1197 the years (**Figure 18**).

1198 All apparel textiles categories were further investigated. The results of this analysis are reported in Section  
1199 9.1.5.

DRAFT - work in progress

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**Figure 7.** Market indicators for apparel textiles in the EU-27



(A) Total mass; (B) Total value; (C) Value-to-mass ratio

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

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1205 **Table 13.** Change of apparent consumption between the time intervals 1995-2004 and 2005-2019

Product category or subgroup	Change in mass (%)	Change in value (%)
1. T-shirts	236	133
2. Shirts and blouses	110	38
3. Sweaters and mid-layers	86	12
4. Jackets and coats	129	14
5. Pants and shorts	194	58
6. Dresses, Skirts and jumpsuits	33	20
7. Leggings, Stockings, Tights and socks	-33	-13
8. Underwear	15	-13
9. Swimwear	100	13
10. Accessories	11	20
Apparel textiles	86	27

1206 N.B. The change is calculated by comparing the average mass and the average value in the two time intervals.

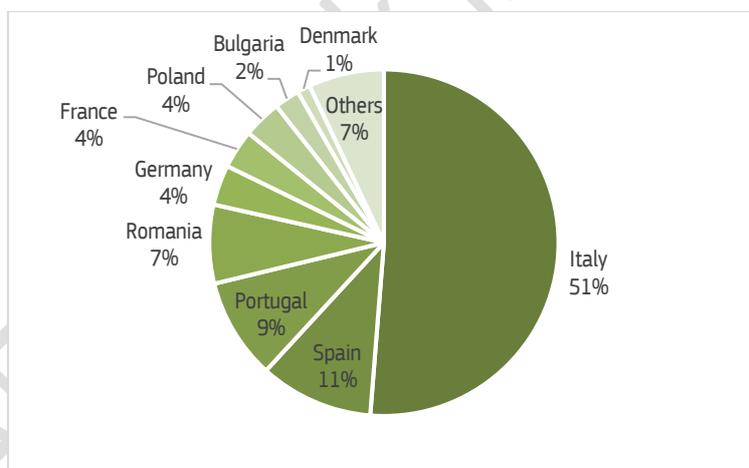
1207 More details are reported in **Table 42** in Section 9.1.5.

1208 *Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)*

### 1209 **5.3 Role of the EU Member States**

1210 The PRODCOM database was investigated to understand which Member States play a more relevant role in the  
 1211 apparel textiles market. **Figure 8** and **Figure 9** show the largest producers and exporters, respectively. The  
 1212 analysis focuses on 2019, because this is the last year without market disruptions. Italy accounted for half of  
 1213 the EU-27 production, followed by Spain, Portugal and Romania, which covered 11%, 9%, and 7% of the total,  
 1214 respectively. The most relevant exporters in 2019 were Italy, Germany, Spain and the Netherlands, with 19%,  
 1215 18%, 12%, and 10% of the total, respectively.

1216 **Figure 8.** Member States producing apparel textiles in 2019



Composition based on value

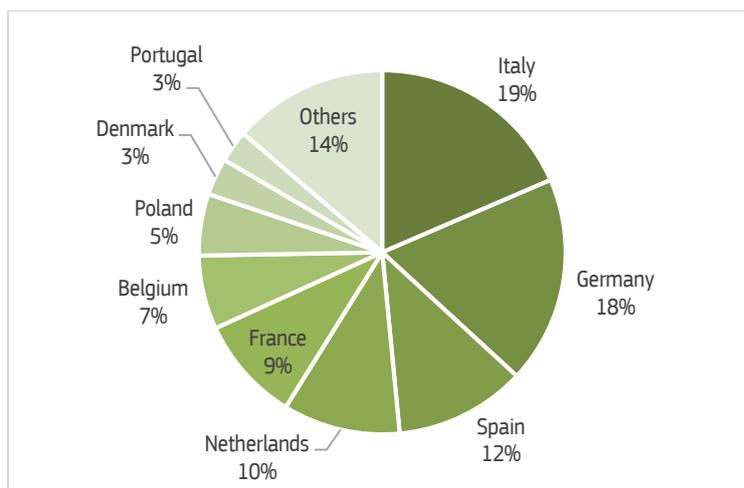
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1219 *Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)*

1220

**Figure 9.** Member States exporting apparel textiles in 2019



Composition based on value

1221

1222

1223

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

1224

The relevance of these countries is confirmed over the years. A recent study published by the EC recognises Italy, Germany, France and Spain as the most prominent Member States in the textile ecosystem (DG GROW, 2021a). These countries have the largest number of companies and generate the highest value in terms of production and turnover. Additionally, most of the EU companies operating in the textile ecosystem have their headquarters in Italy, Germany, France and Spain. central and eastern European Member States focus on more labour-intensive activities and generate a smaller share of turnover. Nonetheless, the main EU companies often locate certain production facilities in central and eastern Europe.

1231

The European Apparel and Textile Confederation (EURATEX) confirmed in their last report on key facts and figures that Italy is recognised as the largest contributor to the textile and clothing industry in the EU. Other important countries are Germany, France, Spain, the Netherlands and Portugal. These are also the countries that invest the most in innovation (EURATEX, 2022a).

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## 5.4 Main elements affecting the production of apparel textiles

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Section 3.3 describes the life-cycle stages of apparel textiles, reporting all the main elements that are crucial for production. This section analyses the market characteristics of these elements, which are fibres, chemicals, energy and water.

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### 5.4.1 Fibres

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In recent years, the estimates of textile fibre production followed an increasing trend going from 104-111 million tonnes in 2019 to 116-124 million tonnes in 2022 (Textile Exchange, 2020; Textile Exchange, 2023). About 54% of these fibres are polyester, about 23% cotton, about 6% man-made cellulosic fibres and 5% polyamide. From 2021 to 2022, the production of viscose increased from 1.4 million tonnes to 5.8 million tonnes. **Table 14** reports the estimates of textile fibre production for 3 recent years, showing that about 70% are chemical fibres, while about 30% have a natural origin.

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1247 **Table 14.** Estimates of global production of textile fibres

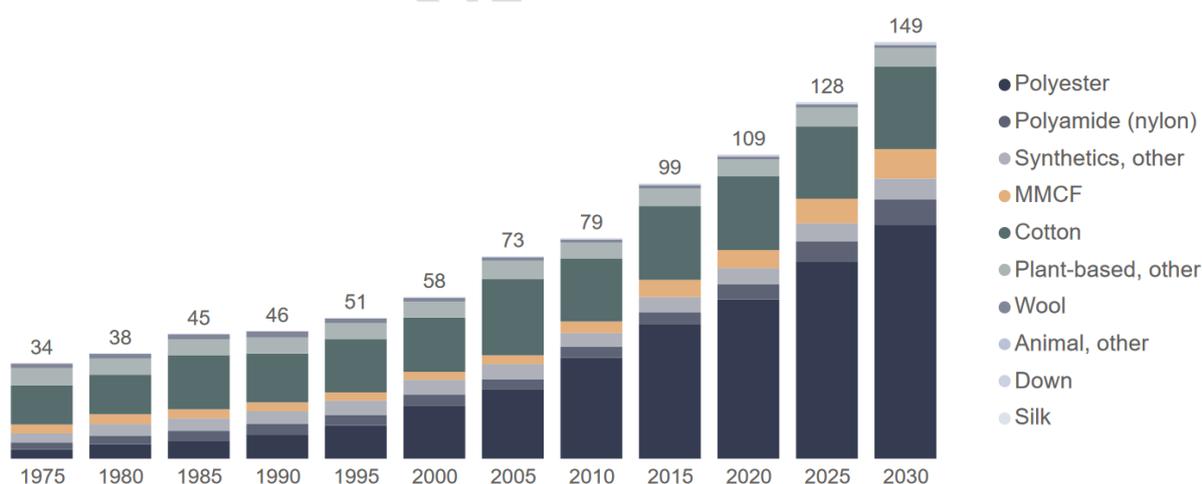
Rank	2019 <sup>(a)</sup>			2021 <sup>(b)</sup>			2022 <sup>(c)</sup>		
	Fibre	Mass (m tonnes)	Share of the total (%)	Fibre	Mass (m tonnes)	Share of the total (%)	Fibre	Mass (m tonnes)	Share of the total (%)
1	Polyester	57.70	52	Polyester	60.50	54	Polyester	63.30	56
2	Cotton	25.70	23	Cotton	24.40	22	Cotton	25.50	23
3	MMCFs	7.10	6	MMCFs	7.20	6	MMCFs	7.30	6
4	Other plant based	6.50	6	Other plant based	6.70	6	Polyamide	6.20	5
5	Polyamide	5.60	5	Polyamide	5.90	5	Other plant based	6.03	5
6	Wool-sheep	1.00	<1	Polypropylene	3.00	3	Viscose	5.80	5
7	Down	0.27	<1	Acrylics	1.70	2	Polypropylene	3.10	3
8	Other animal-based	0.05	<1	Viscose	1.40	1	Acrylics	1.60	1
9	Silk	0.16	<1	Elastane	1.20	1	Elastane	1.20	1
10	Acetate	NA	NA	Wool-sheep	1.00	<1	Wool-sheep	1.10	1
11	Acrylics	NA	NA	Acetate	0.90	<1	Acetate	0.90	<1
12	Cupro	NA	NA	Down	0.57	<1	Down	0.61	<1
13	Elastane	NA	NA	Lyocell	0.30	<1	Flax	0.38	<1
14	Flax	NA	NA	Modal	0.20	<1	Hemp	0.30	<1
15	Hemp	NA	NA	Silk	0.17	<1	Lyocell	0.30	<1
16	Lyocell	NA	NA	Other animal based	0.05	<1	Modal	0.20	<1
17	Modal	NA	NA	Cupro	0.02	<1	Silk	0.09	<1
18	Polypropylene	NA	NA	Flax	NA	NA	Other animal based	0.05	<1
19	Viscose	NA	NA	Hemp	NA	NA	Cupro	0.01	<1

1248 N.B. Estimates of total production were between: 104 m and 111 m tonnes in 2019; 113 m and 115 m tonnes in 2021; 116 m and 124 m  
 1249 tonnes in 2022.

1250 MMCF: man-made cellulosic fibres; NA: Not available.

1251 Source: adapted from <sup>(a)</sup> Textile Exchange (2020), <sup>(b)</sup> Textile Exchange (2022), <sup>(c)</sup> Textile Exchange (2023)

1252 **Figure 10.** Global fibre production: historical data and future projections (millions of tonnes)



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Source: Textile Exchange (2022)

1255 **Figure 10** shows the evolution of the production of specific fibres from 1975 to 2020, and it foresees quantities  
 1256 for 2025 and 2030. In the first 25 years (from 1975 to 2000), the total production increased by 49% (from  
 1257 39 million to 58 million tonnes), whereas in the second 20 years (from 2000 to 2020), the total production  
 1258 increased by 88% (from 58 million to 109 million tonnes). Future projections foresee a further increase up to  
 1259 149 million tonnes in 2030. The evolution of fibre production is mainly driven by the increase in production of  
 1260 polyester.

1261 Most of the fibres produced globally are of unknown origin, due to the difficulties of tracing information (see  
 1262 Section 5.6). Nevertheless, the available information shows the global dimension of fibre production, with China  
 1263 and India producing most of the fibres, and many more countries from all continents producing specific fibres  
 1264 (**Table 15**).

1265 **Table 15.** Location of production for specific textile fibres

Polyester (PES)	Cotton	MMCF	Polyamide (PA)	Wool	Other animal fibres
Unknown 70% China 13% Others 10% Türkiye 7%	Unknown 39% India 23% Others 17% China 13% USA 8%	Unknown 58% China 18% Others 16% India 5% Indonesia 3%	Unknown 81% China 15% Taiwan 3% USA 1%	Unknown 55% Australia 17% South Africa 15% New Zealand 10% Others 3%	China 88% Unknown 9% Hungary 2% Poland 1%

1266 N.B. MMCF: man-made cellulosic fibres.

1267 *Source: adapted from (Textile Exchange, 2022)*

1268 As mentioned in Section 3.1.1, the ESPR establishes two ecodesign aspects that address recycled material:  
 1269 recycled content and possibility of recycling. Within this framework, information about current recycled material  
 1270 and recycling plants is crucial for the potential future development of requirements within these two ecodesign  
 1271 aspects.

1272 The current global availability of recycled fibres is very limited (**Table 16**). The highest share of recycled  
 1273 material is available for polyester (15%) and wool (6%) fibres. However, almost all recycled polyester fibres  
 1274 come from recycling of plastic bottles, which are made of a specific type of polyester that is called polyethylene  
 1275 terephthalate (PET) (Textile Exchange, 2022). From 2020 to 2023 the estimates of recycled fibres were  
 1276 relatively constant (**Table 16**).

1277 **Table 16.** Estimated percentages (%) of recycled fibres in recent years

Fibre	2019	2020	2021	2022
Polyester (PES)	14	15	15	14
Wool	NA	6	6	7
Polyamide (PA)	NA	2	2	2
Cotton	NA	0.96	1	1
MMCF	NA	0.4	0.5	0.5

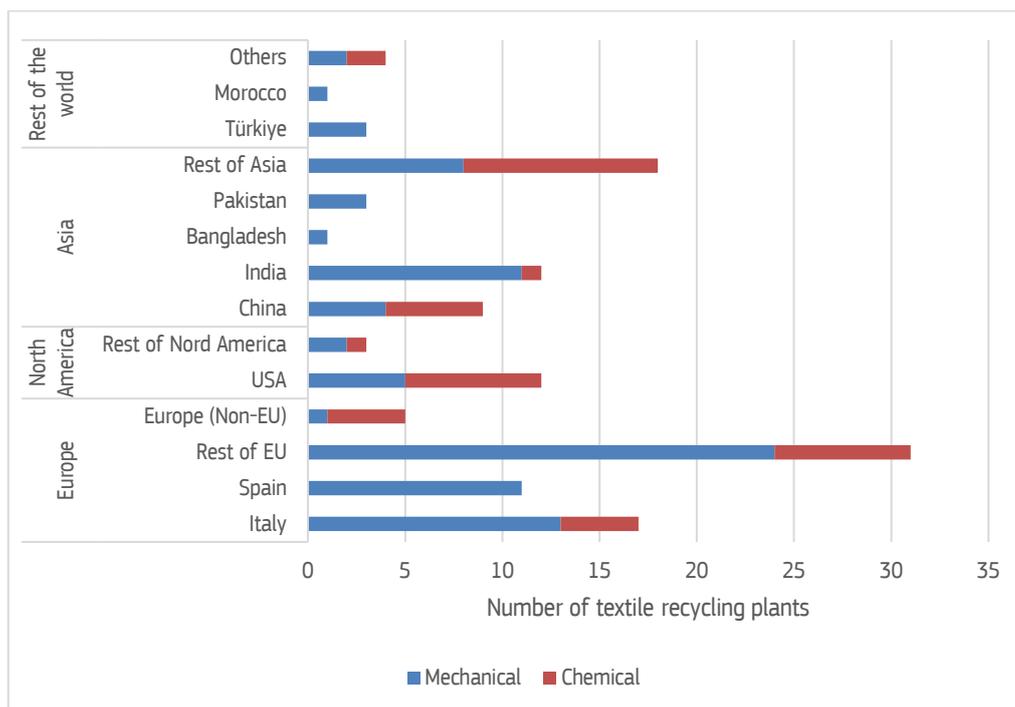
1278 N.B. Approximately 99% of the polyester recycled fibres come from plastic bottles made of polyethylene terephthalate (PET).

1279 *Source: Own elaboration based on Textile Exchange (2020), DG GROW (2021b), Textile Exchange (2021), Textile Exchange (2022), Textile  
 1280 Exchange (2023)*

1281 The current availability of textile recycling plants was investigated in terms of location, technologies, possible  
 1282 input fibres and scale of the plants (pilot or full scale). **Figure 11** shows the location of these 130 recycling  
 1283 plants, highlighting consuming and producing countries (see Sections 5.1 and 5.3). Europe and North America,  
 1284 which are the largest consumers, host about 50% and 11% of the global textile recycling plants, respectively.  
 1285 Europe hosts mainly mechanical recycling plants, whereas North America mostly has chemical recycling plants.  
 1286 Italy and Spain are the largest EU producers and the countries with the largest number of textile recycling  
 1287 plants. Asia, which is the continent producing the most global apparel, has 33% of the textile recycling plants.  
 1288 In particular, China and India, the world's largest producers, host only 7% and 9% of the global textile recycling  
 1289 plants. **Figure 11** shows that there are currently more textile recycling plants in countries that consume the  
 1290 most apparel.

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**Figure 11.** Current number of textile recycling plants classified by location



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Source: own elaboration based on Airtable - Sorting for Circularity - Recyclers Database (<sup>77</sup>), (Jørgensen et al., 2022; Textile Exchange, 2022)

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Most of the recycling plants investigated are capable of processing textile products made of many textile fibres.

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**Figure 12** shows that most of the investigated recycling plants are capable of processing polyester and cotton fibres, as well as wool fibres. Additionally, **Figure 13** shows that most of the recycling plants are full-scale facilities. This is in line with the availability of recycled fibres reported in **Table 16**.

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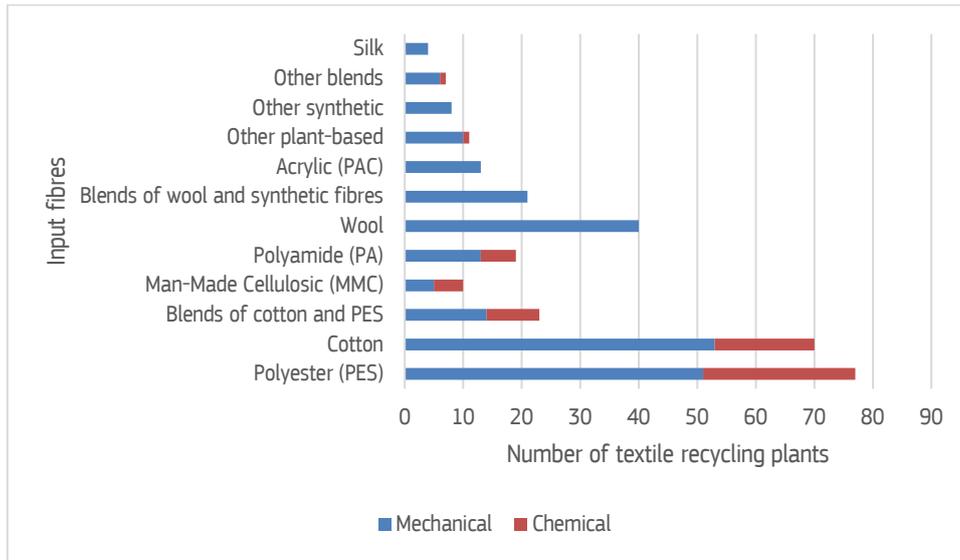
1299

More detailed data about current textile recycling plants is available in Section 9.5.1.

<sup>77</sup> Airtable - Sorting for Circularity - Recyclers Database. Available at [this link](#). Last accessed on 31 January 2024.

1300

**Figure 12.** Current number of textile recycling plants classified by input fibre



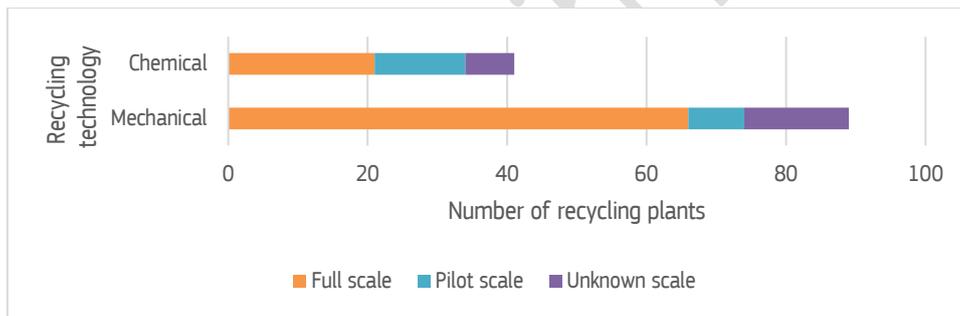
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Source: own elaboration based on Airtable - Sorting for Circularity - Recyclers Database <sup>(78)</sup>, (Jørgensen et al., 2022; Textile Exchange, 2022)

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**Figure 13.** Scale of current textile recycling plants



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Source: own elaboration based on Airtable - Sorting for Circularity - Recyclers Database <sup>(79)</sup>, (Jørgensen et al., 2022; Textile Exchange, 2022)

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A recent study of the Joint Research Centre of the European Commission estimated that in the EU approximately 30% of the used and sorted textiles (0.55-0.60 Mt yr<sup>-1</sup>) are sent for recycling. The resulting recycled fibres are mainly used for cleaning wipes, non-woven material and insulation material, due to the fact that the most abundant resulting recycled material is represented by non-spinnable fibres. In the EU, recycled material comes from post-industrial waste, which represents only 11% of all textile waste (Huygens et al., 2023).

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**Table 17** reports the current fibre composition of EU textile waste, which is mainly made up of cotton and polyester. The current EU recycling capacity is estimated to be equal to 0.7-0.85 Mt yr<sup>-1</sup>; whereas the future projection for 2030-2035 is for it to reach 1.2 - 2.7 Mt yr<sup>-1</sup>, based on the assumption that the textile industry is expected to generate more waste despite the future regulations in place. Based on the future projections for 2030-2035, a 30% increase in textile waste is expected, along with more sorting capacities, increased energy recovery and a reduction in landfilling. The majority of the future textile recycling capacity it is estimated to be based on mechanical recycling, while lower volumes are claimed by operators using chemical recycling (Huygens et al., 2023).

<sup>78</sup> Airtable - Sorting for Circularity - Recyclers Database. Available at [this link](#). Last accessed on 31 January 2024.

<sup>79</sup> Airtable - Sorting for Circularity - Recyclers Database. Available at [this link](#). Last accessed on 31 January 2024.

1320 **Table 17.** Material composition of EU post-consumer textile waste

Material	Percentage in the waste fraction (%)
Cotton	34
Polyester	29
Polyamide	7
Wool, polypropylene, acrylic	30
Non-textile	11

1321 *Source: Huygens et al. (2023)*

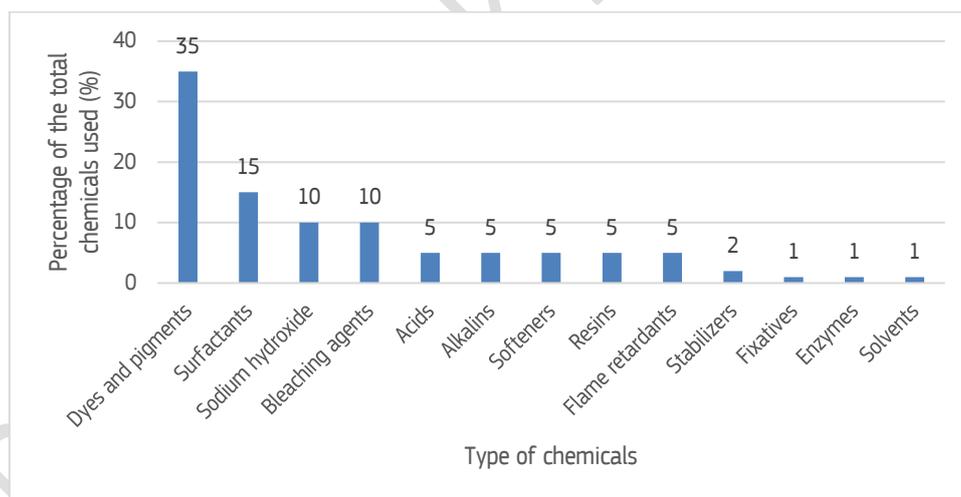
## 1322 5.4.2 Chemicals

1323 The chemical demand of the textile industry is estimated to use about 25% of the global chemical production,  
 1324 which in 2021 was equal to 9.3 million tonnes (Prasannamedha and Senthilkumar, 2021; Raj et al., 2022).

1325 The Ellen MacArthur Foundation estimated that the textile industry uses approximately 43 million tonnes of  
 1326 chemicals per year. In particular, the production of 1 kg of cotton requires 0.35–1.5 kg of chemicals, and the  
 1327 production of 1 kg of synthetic fibre requires 0.11–0.82 kg of chemicals, besides the polymers making the fibre  
 1328 itself (Ellen MacArthur Foundation, 2017). In general, the manufacturing of 1 kg of apparel usually requires 1–  
 1329 4 kg of chemicals. This range is relatively large because it depends on the type of apparel, the efficiency of the  
 1330 supply chain, and the processes used for production (Muthu, 2020).

1331 **Figure 14** shows the chemicals most commonly used by the textile industry. Dyes and pigments, surfactants,  
 1332 caustic soda, and bleaching agents represent 35%, 15%, 10% and 10% of the total consumption, respectively.  
 1333 These four types of chemicals represent about 70% of the total chemicals used (Rahman et al., 2023).

1334 **Figure 14.** Share of the most commonly used chemicals in the textile industry



1335 N.B. Sodium hydroxide is the caustic soda. Resins are formaldehyde-based.

1336 *Source: Own elaboration based on (Rahman et al., 2023)*

1338 According to the UN COMTRADE database <sup>(80)</sup> and the Observatory of Economic Complexity (OEC) database <sup>(81)</sup>,  
 1339 the largest global exporters of dyes, identified with HS 32 <sup>(82)</sup> of the Harmonized System, are Germany, China  
 1340 and the USA, representing about 15%, 10% and 9% of the global exports (**Table 18**).

<sup>80</sup> UN COMTRADE database. Available at [this link](#). Last accessed on 12 January 2024.

<sup>81</sup> Observatory of Economic Complexity (OEC) database. Available at [this link](#). Last accessed on 12 January 2024.

<sup>82</sup> HS 32: 'tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints, varnishes; putty, other mastics; inks'

1341 **Table 18.** Largest exporters of dyes in 2019

Reporter country	Trade value (m USD)	Share of the global market (%)
Germany	13 036.6	15.6
China	7 719.9	10.2
USA	7 548.3	9.22
Japan	4 624.0	5.92
Netherlands	4 474.6	4.91
India	3 504.3	4.52
United Kingdom	3 450.8	4.14
Italy	3 430.6	4.08
Spain	2 995.8	3.71
Belgium	2 631.8	3.38
Republic of Korea	2 352.4	2.88
Other Asia	1 409.9	1.72

1342 Dyes are identified with the harmonised Standard code HS 32.

1343 *Source: elaboration based on UN COMTRADE database <sup>(80)</sup> and OEC database <sup>(81)</sup>*

### 1344 **5.4.3 Energy**

1345 In 2004, the energy consumption in the global textile industry was estimated to be equal to 2% of the global  
1346 energy consumption. Additionally, the production of 1 kg of generic textile product was estimated to require  
1347 about 126 MJ (about 35 kWh) of energy (Muthu, 2015).

1348 **Table 7** in Section 3.3.1 reports that almost all the stages of the textile value chain require the use of energy.  
1349 Nevertheless, the manufacturing stages cover about 70-80% of the total life-cycle energy consumption (Sandin,  
1350 Roos, Spak, et al., 2019; Quantis, 2021).

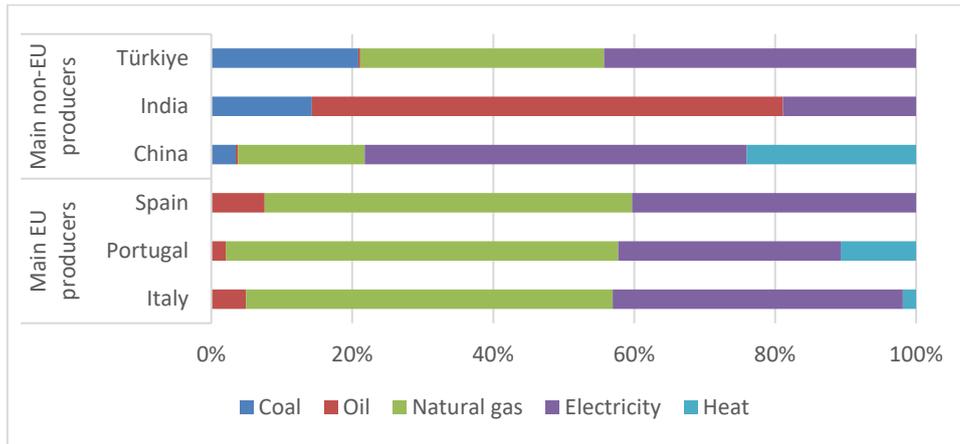
1351 The energy consumption largely varies according to the country where the textile production process occurs,  
1352 and its impacts depend on the energy source used (Hasanbeigi and Price, 2012; Muthu, 2020). Figure 15 reports  
1353 the energy balance of the textile and leather industries of the main producers inside and outside the EU.  
1354 Meanwhile, **Figure 16** shows the electricity generation by source of the same countries. Both figures show that  
1355 the energy used in the EU has a very different composition to the energy used outside the EU. The energy used  
1356 in China and India is mainly generated with coal and oil, which are known to be more polluting than natural gas  
1357 and other sources of energy.

1358 Specific stages of textile production consume different amounts of energy (Muthu, 2015; Muthu, 2020; Roth et  
1359 al., 2023). These aspects will be detailed in the following milestone, when the PS addresses tasks 4 and 5 of  
1360 the MEErP.

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**Figure 15.** Energy balance of the textile and leather industries in 2021



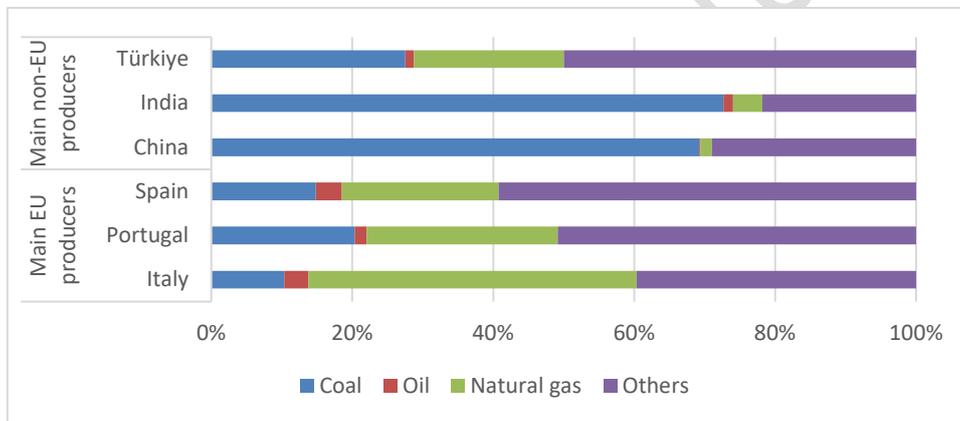
Source: own elaboration based on IEA World Energy Statistics and Balances <sup>(83)</sup>

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**Figure 16.** Electricity generation by source



N.B. The group 'Others' includes nuclear power, hydropower and renewable sources.

Source: own elaboration based on IEA (2019)

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In the manufacture of apparel, the cost of energy also plays an important role. As already mentioned in Section 5.1, the increase of the cost of energy in the EU in 2022 negatively affected the Union's textile production. **Table 19** reports the price of electricity for the countries where most of the production and consumption occurs. The data gathered report that the electricity price at industrial scale is more expensive in the EU than in China and India.

<sup>83</sup> IEA World Energy Statistics and Balances (database). Available at [this link](#). Last accessed on 10 February 2024.

1375

1376 **Table 19.** Electricity prices for selected countries for the base year 2019

Country	Residential - Electricity price (USD/MWh)		Industrial - Electricity price (USD/MWh)	
	2012	2022	2010	2022
China	NA	82.32	NA	88*
India	69.66	NA	105.51	NA
Türkiye	184.14	89.52	150.92	204.51
EU-27*	227.1	NA	160.38	NA
USA	115.77	150.89	67.89	83.69
Japan	243.76	NA	162.11	NA
Republic of Korea	101.73	106.81	75.65	104.81

1377 N.B. NA: Not available.

1378 Source: UN COMTRADE database <sup>(84)</sup> and \* Global petrol prices <sup>(85)</sup>

### 1379 5.4.4 Water

1380 **Table 7** in Section 3.3.1 reports that many stages of the textile value chain require the use of water.

1381 The water demand of the textile industry was estimated to be equal to about 79 billion m<sup>3</sup> per year. Most of  
 1382 this water is attributed to cotton production. In general, the manufacture of 1 tonne of textiles is associated  
 1383 with the consumption of 200 tonnes of fresh water (Niinimäki et al., 2020).

1384 Cotton and hemp are the most water-demanding among the textile fibres; whereas polyester and polypropylene  
 1385 need the least water for their production (**Table 20**). Among the manufacturing processes, the finishing  
 1386 processes are the most demanding, requiring between 40 l kg<sup>-1</sup> and 80 l kg<sup>-1</sup> of fabric (Roth et al., 2023). More  
 1387 details will be provided in the following milestone, when the PS addresses tasks 4 and 5 of the MEErP.

1388 **Table 20** Water consumption of fibres

Fibre	Water consumption (l/kg of fibre)
Cotton	1 559
Hemp	2 123
Wool	530
Man-made cellulosic fibres	92
Polyester	51 – 71
Nylon (known as polyamide)	185 – 633
Polyethylene and polypropylene (PP)	47 – 32
Acrylic	210
Viscose rayon	640

1389 Source: Muthu (2015), Muthu (2020), Niinimäki et al. (2020)

1390 Due to the large water demand of the finishing processes, the cost of water at industrial scale is a factor  
 1391 affecting its manufacture.

1392 **Table 21** reports the tap water price in several apparel-producing and -consuming countries. Assuming that the  
 1393 price difference between industrial and tap water has the same ratio worldwide, **Table 21** reports that the  
 1394 manufacturing of apparel in China and India can be performed with a lower water price than in Europe.

1395 **Table 21.** Tap water price for selected countries

Country (city)	Tap water price (EUR/m <sup>3</sup> )
China (Shanghai and Beijing)	0.36-0.68
India (Bangalore)	0.24
Turkey (Istanbul)	0.85
Europe (cities from 24 countries)	2.80

<sup>84</sup> UN COMTRADE database available at [this link](#). Last accessed on 15 December 2023.

<sup>85</sup> Global Petrol Prices, available at [this link](#). Last accessed on 15 December 2023.

Country (city)	Tap water price (EUR/m <sup>3</sup> )
USA (30 cities)	2.23
Japan (Tokyo)	1.58
Republic of Korea (Seoul)	0.77

1396 N.B. Reference year 2019, with the latest updates in 2021.

1397 Source: Tap water price index <sup>(86)</sup> and Eur Eau (2020)

## 1398 5.5 Market structure and business models

### 1399 Composition

1400 EU companies in the textile value chain are mostly microenterprises, covering all manufacturing stages (**Table**  
1401 **22**). However, medium and large enterprises generate most of the total turnover (**Table 23**).

1402 After the manufacturing stages, apparel textiles go through wholesalers and subsequently retailers <sup>(87)</sup>,  
1403 enabling their placing on the market. In the textile and apparel sector, wholesalers are understood as companies  
1404 that sell products to other companies in large quantities and at low prices, whereas retailers are companies  
1405 that sell in small quantities and generally with higher prices than wholesalers. In the EU, retailers in the apparel  
1406 sector are constituted by a bigger number of enterprises, generate higher turnover, higher production value,  
1407 and employ more people than wholesalers of apparel and footwear together (**Table 24**). Among the top 120  
1408 players of the EU textile ecosystem, 50 are retailers of fashion products and about 38 are wholesalers and  
1409 agents for fashion products (DG GROW, 2021a).

1410 **Table 22.** Share of the number of EU-27 enterprises per NACE group in 2021

Size of enterprises	Economic activity			
	Preparation and spinning of textile fibres [C131] (%)	Weaving of textiles [C132] & finishing of textiles [C133] (%)	Manufacture of other textiles [C139] (%)	Manufacture of wearing apparel, except fur apparel [C141] & Manufacture of knitted and crocheted apparel [C143] (%)
Microenterprises (from 0 to 9 employees)	80 (p)	85 (p)	92 (p)	95 (p)
Small enterprises (from 10 to 49 employees)	13 (ep)	9 (p)	6 (p)	3 (p)
Medium enterprises (from 50 to 249 employees)	6 (p)	6 (p)	2 (p)	2 (p)
Large enterprises (more than 250 employees)	: (c)	2 (pu)	0.3 (p)	0.2 (pu)

1411 N.B. Data from relevant countries like Italy is missing in all the indicators.

1412 p: provisional; ep: estimated, provisional; c: confidential; pu: provisional, unreliable or uncertain data with estimation error from ±1% to  
1413 ±5%; ":" not available.

1414 Source: own elaboration based on EUROSTAT SBS\_SC\_OVW <sup>(88)</sup>

<sup>86</sup> Water Price Index. Available at [this link](#). Last accessed on 11 February 2024. Water Price Index examines and interprets the prices of tap water and bottled water in 120 cities globally. It presents the actual average expenditure for usage and the percent difference of the price from the median value of the dataset in each respective location. The factor 'Tap Water Price (EUR/m<sup>3</sup>)' refers to the monthly cost for 1 cubic metre of tap water, as indicated by the most recent applicable rate from the database of the International Benchmarking Network for Water and Sanitation Utilities (IBNET), which is available at [this link](#) (last accessed on 11 February 2024).

<sup>87</sup> According to the Cambridge dictionary: (1) a wholesaler is a buyer and seller of goods in large amounts to shops and businesses; (2) retailer is a person, shop, or business that sells goods to the public.

<sup>88</sup> Enterprise statistics by size class and NACE Rev. 2 activity (from 2021 onwards). Available at [this link](#).

1415 **Table 23.** Share of the turnover of EU-27 enterprises per NACE group in 2021

Size of enterprises	Economic activity			
	Preparation and spinning of textile fibres [C131] (%)	Weaving of textiles [C132] & finishing of textiles [C133] (%)	Manufacture of other textiles [C139] (%)	Manufacture of wearing apparel, except fur apparel [C141] & Manufacture of knitted and crocheted apparel [C143] (%)
Microenterprises (from 0 to 9 employees)	10 (p)	7 (p)	13 (p)	19 (p)
Small enterprises (from 10 to 49 employees)	15 (p)	8 (p)	10 (p)	15 (p)
Medium enterprises (from 50 to 249 employees)	48 (p)	41 (p)	44 (p)	28 (p)
Large enterprises (more than 250 employees)	27 (p)	45 (p)	33 (p)	38 (p)

1416 N.B. Data from relevant countries like Italy is missing in all the indicators. Italy is the EU country with the highest turnover and employment  
1417 share compared with other MS in 2021 (EURATEX, 2022a). In this context, the data presented are indicative but not precise data.

1418 p: provisional.

1419 Source: own elaboration based on EUROSTAT SBS\_SC\_OVW <sup>(88)</sup>

1420 **Table 24.** Description of wholesalers and retailers in 2020, according to NACE classes

Economic parameter	Economic activity	
	Wholesale of clothing and footwear [G4642]	Retail sale of clothing in specialised stores [G4771]
Number of enterprises	52 212	262 403
Turnover (m EUR)	120 758.3	139 012.2
Production value (m EUR)	46 047.5	65 744.7
Number of employees	294 255	1 155 453

1421 Source: own elaboration based on data from EUROSTAT SBS\_NA\_DT\_R2 <sup>(89)</sup>.

1422 Besides numerous SMEs, the fashion industry includes large companies, which are usually active in many  
1423 subsectors of the textile ecosystem, as a consequence of acquisitions and mergers, as well as subcontracting  
1424 and outsourcing. The largest groups in the fashion industry include several brands, which supply diverse end  
1425 markets or propose different product lines that go beyond apparel and footwear. Other companies function  
1426 under a single brand, but still with a variety of products (DG GROW, 2021a).

1427 Some large companies are vertically integrated, meaning made up of large groups that design, manufacture  
1428 and sell a variety of products. Nevertheless, acquisitions, mergers, subcontracting and outsourcing strongly  
1429 define the apparel textile market in a global value chain. The majority of the most important EU companies are  
1430 also world players that manufacture, innovate and sell across the globe and acquire (and are acquired by) other  
1431 world players (DG GROW, 2021a).

1432 Drawing the boundaries of the EU apparel textile market is not possible because it fully operates in the global  
1433 market and value chains. Some important EU companies play a role in distribution, but they are not  
1434 manufacturers in the EU. Many of them own hundreds (and in a few cases thousands) of subsidiaries outside  
1435 the EU, which are responsible for production and/or retail. At the same time, subsidiaries of non-European  
1436 companies are also frequently considered important players in the EU (DG GROW, 2021a).

1437 A recent analysis of the top 120 main players in the EU textile ecosystem identified four broad classes of  
1438 companies (DG GROW, 2021a):

- 1439 — high-end luxury brands;
- 1440 — manufacturers and retailers producing mid- and low-end products;
- 1441 — manufacturers of intermediate textile products;

<sup>89</sup> Annual detailed enterprise statistics for trade (NACE Rev. 2 G). Available at [this link](#).

1442 — companies specialised in the manufacturing of specific goods.

### 1443 **General business models**

1444 Companies in the fashion industry follow different models in relation to the intangible value of the product and  
1445 the management of its supply chain. As described in Section 3.1.1, apparel textiles are products with physical  
1446 and symbolic functionalities. Besides the tangible quality of the manufacturing process, apparel textiles must  
1447 meet symbolic and aesthetic values, known as intangibles. Since these intangibles change rapidly, companies  
1448 working in the apparel textile industry try to gain value via the supply chain, reacting efficiently to the  
1449 unpredictable changes in consumer tastes and demands. Within this context, apparel textile companies  
1450 inevitably rely on outsourcing to compete in the rapidly changing market (DG GROW, 2021a).

1451 Regarding the integration of manufacturing and intangibles, two main models can be identified in the apparel  
1452 textile industry (DG GROW, 2021a):

1453 — **Consumer-led operation model**, where the requests of the consumer are the centre of the  
1454 business model. There is a huge effort to collect customer feedback, and produce what is desired  
1455 by the market. In this model, consumers dictate the terms of production and affect the whole  
1456 supply chain.

1457 — **Brand-led operation model**, where the brand dictates the design and manufacture. There is a  
1458 huge effort in strategies and programmes to promote the interest in the brand.

1459 Two other main models can be identified regarding the approaches to the supply chain (DG GROW, 2021a):

1460 — **Integrated approach**, where the production is entrusted to internal suppliers and the logistics  
1461 aims to quickly react to customer's demands.

1462 — **Centralised approach**, where the production is mostly outsourced, and supported by audit and  
1463 quality control programmes, which could eventually change contractors.

1464 Companies also apply hybrid forms of these models.

### 1465 **Distribution, retailing and e-commerce**

1466 According to McKinsey & Company <sup>(90)</sup>, the distribution and retailing channels in the fashion industry are mainly  
1467 controlled by fashion brands and retailers. **Table 25** describes the main distribution and retail models of  
1468 companies selling apparel textiles.

1469 **Table 25.** Distribution and retail models of apparel companies

Brand		Retailer	
Only direct to consumer: Fashion brands that cover various stages within the fashion value chain, beyond being solely an apparel brand. This includes managing their own retail operations and potentially establishing their own e-commerce presence, all while avoiding wholesale distribution. (Vertically integrated apparel player)	Mix wholesale/direct to consumer: Apparel brand that sells both directly to consumers (in physical stores and/or e-commerce) and to other retailers. (Hybrid apparel player)	On- and offline: multi-brand retailer with its own brands, typically with a physical store and an online store. (Multibrand retailer)	Only online: Online retailer offering a variety of brands, including its own. (Multibrand pure e-commerce retailer)

1470 *Source: Reported from McKinsey & Company <sup>(90)</sup>.*

1471 In the last few years, e-commerce has been rapidly increasing, especially for online market places and multi-  
1472 brand retailers (DG GROW, 2021a). In 2009, the percentage of textile and apparel turnover generated by e-  
1473 sales was equal to 5% of the total. In the following years, it gradually increased up to 11% in 2020 (EURATEX,  
1474 2022a).

### 1475 **Second-hand and rental markets**

1476 Second-hand and rental of apparel textiles are experiencing fast growth, but are still at the very first stages of  
1477 development. Their future success requires the adoption of business models based on collaborative

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<sup>90</sup> McKinsey & Company webpage on Retail. – Measuring the fashion world. Achim Berg, Miriam Lobis, Elizabeth Hunter, Felix Rölkens, Patrick Simon, and Hannah Yankelevich. Available at [this link](#). Last accessed on 10 December 2023.

1478 consumption practices, e.g. utility-based non-ownership, and redistributed ownership of apparel textiles. The  
1479 lack of consumer awareness is seen as a barrier to the development of these two markets. For the second-  
1480 hand market, other barriers are the limited durability of clothes and the need for traceability and guarantee of  
1481 authenticity (DG GROW, 2021a).

## 1482 **5.6 Characteristics of the value chain**

1483 The value chain of apparel textiles is defined as global, long, complex, fragmented and opaque (Cai and Choi,  
1484 2020; UNECE and UNTRADE, 2020; Brondino, 2022).

1485 The nodes of the value chain could be divided into two parts:

1486 (a) a first part including the life-cycle stages from raw material for fibre production until retailing,  
1487 when the product is placed on the market for the first time,

1488 (b) a second part including use and waste management.

1489 The first part of the value chain is composed of at least 15 nodes, i.e. the production of an apparel textile  
1490 involves at least 15 economic operators via the production of raw materials, manufacturing and retailing  
1491 operations. Companies placing products on the market do not know the full story behind their products – they  
1492 do not know which were the economic operators involved over the whole supply chain and the processes and  
1493 material/chemicals used. Most of the companies in the value chain can get information from their immediate  
1494 suppliers, but usually information is lost about suppliers further upstream (UNECE and UNTRADE, 2020). This  
1495 part of the value chain is highly interconnected with nodes spread worldwide at all stages (UNEP, 2020) <sup>(91)</sup>.  
1496 Although there are specific countries producing specific fibres, most fibres can be supplied from many parts of  
1497 the world and mixed together (Textile Exchange, 2022). Fibre processing as well as yarn spinning and fabric  
1498 manufacturing occur in several countries and use resources, e.g. chemicals, which are produced in third  
1499 countries. This was also shown in **Figure 3** and **Figure 4** in Section 5.1.

1500 This description of the first part of the value chain shows that the manufacturing origin of apparel textiles  
1501 should not refer to just one country, but it should refer to the many countries where the main production stages  
1502 occurred.

1503 Usually, the apparel textile market mainly includes multinational companies based in developed countries that  
1504 act as retailers or as producers and retailers. These multinational companies generally outsource production in  
1505 developing countries due to the lower production costs (Brondino, 2022). For the first four stages of the  
1506 product's life cycle (see **Figure 1** and **Table 7**), developing countries offer the possibility to produce apparel  
1507 textiles facing lower environmental compliance costs than in developed countries (see Section 5.7). Similar  
1508 conditions occur for the confectioning stage, which is very labour-intensive: developing countries offer cheaper  
1509 labour costs than developed countries (UNECE and UNTRADE, 2020).

1510 Some studies envisage the possibility of reshoring and/or nearshoring production to developed countries,  
1511 brought about by increased automation. However, this process is expected to happen only in the long term and  
1512 subject to the sector investing strongly in this direction (Brondino, 2022).

1513 The apparel textile industry has always operated according to seasons, which are associated with the release  
1514 of new collections. Over the last decades, the number of seasons has been drastically increasing from two per  
1515 year to almost one per week <sup>(92)</sup>. This seasonality largely affects the supply chain, from procurement to  
1516 manufacturing capacity, planning and inventory management.

1517 Within this framework, the first part of the value chain evolves among global dynamics, consumer demands  
1518 and the strategies of big retailers (Ellen MacArthur Foundation, 2017; UNECE and UNTRADE, 2020; Brondino,  
1519 2022)

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<sup>91</sup> An exchange with a large global economic actor revealed that a retailer/producer could have more than 1 700 suppliers, which may have more than 8 200 factories located in 50 supply markets.

<sup>92</sup> Numerous fashion websites report this information. Some of them are: (1) [Digitally Empowering Fashion](#), (2) [InStyle](#), and (3) [techfashionista](#). All websites were last visited on 7 December 2023. The exchange with a large global retailer revealed that this company updates their collections every week to satisfy the requests of their customers.

1520 In order to increase transparency in the apparel textiles value chain, in 2019 the United Nations Economic  
1521 Commission for Europe (UNECE) launched a project for an international framework initiative to enhance  
1522 transparency and traceability for sustainable value chains in the garment and footwear industry <sup>(93)</sup>.

1523 The second part of the value chain is mainly constituted by the post-consumer textile waste treatment market  
1524 and by the second-hand market (reuse). A study published in early 2023 by the European Environment Agency  
1525 provides figures about used textiles, mainly apparel textiles, exported outside the EU (Lingås et al., 2023). It  
1526 highlights that used apparel textiles are part of a specialised and traded global value chain. Over the last two  
1527 decades, the export of used textiles from the EU has tripled from about 550 000 tonnes in 2000 to almost  
1528 1 700 000 tonnes in 2019. These products can have several fates. Usually, what is exported to Africa is first  
1529 screened in local markets and subsequently most is dumped via informal waste streams. Used textiles reaching  
1530 Asia are usually down-cycled into industrial rags or filling, or re-exported for recycling in other Asian countries  
1531 or are further sent to Africa for reuse. Products that cannot be recycled or re-exported are likely to end up in  
1532 Asian landfills (Lingås et al., 2023).

## 1533 **5.7 Competitiveness and environmental compliance costs**

1534 The global value chain of apparel textiles produces most of its environmental impacts in the production stages  
1535 (**Table 8**). Usually, the production stages occur in Asian countries (**Figure 4**). This implies that most of the  
1536 negative emissions to the environment occur outside the EU (**Table 5**), in particular in countries that allow  
1537 production at lower costs due to poor labour conditions and less stringent measures about environmental  
1538 protection (UNECE and UN TRADE, 2020).

1539 A recent analysis performed by the OECD investigated the requirements set by several frameworks establishing  
1540 Best Available Techniques (BAT) for Preventing and Controlling Industrial Pollution (OECD, 2022). This  
1541 publication aimed to gather information on existing BAT reference documents (BREFs) that could stimulate  
1542 more countries to implement specific requirements in their territories. **Table 26** reports the comparison of  
1543 environmental aspects that are addressed by several BREFs implemented around the world. The analysis  
1544 showed the following:

- 1545 — Comparison is made difficult by the different approaches used by each BREF, in terms of key  
1546 environmental indicators and stages of production.
- 1547 — The EU has the most ambitious mandatory system, covering almost all the environmental aspects  
1548 (7 out of 8).
- 1549 — Among the largest global producers, the BREFs applied in China and India were analysed <sup>(94)</sup>. Both  
1550 China and India set limits for fewer environmental aspects than the original EU BREF. In particular,  
1551 India addresses only emissions to water, with less stringent thresholds than the EU BREF. The  
1552 Chinese BREF addresses more environmental aspects than India (4 out of 8), but it sets less  
1553 stringent values for emissions to water compared to the EU BREF (**Table 59** in Section 9.5.1).  
1554 Comparison with values related to emissions to air was not possible due to the different practices  
1555 and key environmental indicators used by the several schemes.

1556 In this context, it is evident that companies producing apparel textiles, or their intermediate products, in the EU  
1557 must face higher costs than companies producing in China and India due to prevention/reduction of emissions  
1558 into the environment set by the EU BREF, within the framework of the EU Industrial Emissions Directive <sup>(95)</sup>.

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<sup>93</sup> UNECE - Traceability for Sustainable Garment and Footwear. Available at [this link](#). Last accessed on 7 December 2023.

<sup>94</sup> Information about the Minimum National Standard (MINAS) from India was included in the analysis provided by OECD (2022). Meanwhile, the analysis of the Chinese BREF was performed thanks to a machine translation of the document found on the internet.

<sup>95</sup> Industrial Emission Directive. Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast) (Text with EEA relevance). Available at [this link](#).

1559 **Table 26.** Environmental aspects covered by the Best Available Techniques (BAT) reference documents (BREFs) for  
 1560 preventing and controlling industrial pollution around the world

Country/organisation	European Union (EU BREF)	China	India (MINAS)	South Korea	United States (US EPA)	World Bank (EHS Guideline)
Environmental aspects						
Emissions to air	Yes	Yes	No	Yes	Yes <sup>(*)</sup>	No
Emissions to water	Yes	Yes	Yes	Yes	Yes	Yes
Consumption of energy	Yes	No	No	No	No	Yes
Water usage	Yes	No	No	Yes	No	No
Waste generation	Yes	Yes	No	No	No	Yes
Usage and management of chemicals	Yes	No	No	No	No	No
Energy efficiency	Yes	No	No	Yes	No	No
Noise emission	No	Yes	No	Yes	No	No

1561 N.B. MINAS: Minimal National Standard; US EPA: United States Environmental protection Agency; EHS Guideline: World Bank Group  
 1562 Environmental, Health, and Safety Guidelines.

1563 <sup>(\*)</sup> Covered by the Clean Air Act, National Emission Standards for Hazardous Air Pollutants (NESHAP) (OECD, 2022).

1564 Source: (Ministry of Ecology and Environment, China, 2021; OECD, 2022).

1565 China implemented its scheme on available pollution prevention and control techniques for the textile  
 1566 industry<sup>(96)</sup> in 2021, but it was not included in the analysis of OECD (2022).

1567 Besides the above-mentioned aspects, the current competitiveness in the global textile value chain is also  
 1568 influenced by the cost of energy and water, as assessed in Section 5.4.3 and Section 5.4.4.

## 1569 5.8 Lifespan of apparel textiles

1570 The apparent consumption in the EU-27 of apparel textiles (**Figure 7** in Section 5.2) focuses on yearly market  
 1571 data, which provide a good understanding of the amount of apparel textiles traded over the years. Future steps  
 1572 of the PS will focus on the economic and environmental assessment of apparel textiles in the Union. This  
 1573 assessment will take into account the use phase and therefore the lifespan of the products, which affects their  
 1574 demand.

1575 The lifespan of a product can be measured according to different descriptors (Murakami et al., 2010). Table 27  
 1576 lists the different lifespan descriptors used for apparel textiles.

1577 **Table 27.** Types of lifespans

Type	Definition
Total lifespan	The period during which an apparel textile retains its original form, irrespective of its functional condition.
Service lifespan	The time an apparel textile remains functional and usable, considering its use by both the initial and subsequent owners. This timeframe initiates upon the product's acquisition by the first owner and concludes when the last owner disposes of it.
Possession span	The period of time in which an apparel textile is held by a specific owner. This timeframe does not discriminate whether the apparel textile is used subsequently by another person or it is disposed of.
Duration in use	The period of time a single owner utilises the apparel textile, considering only the use time (i.e. the time it is worn).
Physical lifespan	The period of time an apparel textile can be worn before it exhibits a level of wear beyond what is deemed acceptable.

1578 Source: adapted from Murakami et al. (2010)

1579 The lifespan of apparel textile is affected by many factors related to the specific type of apparel textiles, the  
 1580 intrinsic physical properties of the product, and the behaviour of the users. Apparel textiles are worn and cleaned  
 1581 with different frequencies according to their specific use, material composition and user choices. This is because  
 1582 specific apparel textiles have seasonal use, or are related to specific activities, like sports. Additionally, many  
 1583 apparel textiles remain stored and not in use in wardrobes. More investigation about factors related to user  
 1584 behaviour are addressed in Section 6.

<sup>96</sup> Chinese guidelines on available pollution prevention and control techniques for the textile industry. Available at [this link](#). Last accessed on 11 December 2023.

1585 The PS will focus on the service lifespan, which considers the time period from the purchase of the new item to  
1586 its disposal, disregarding the number of users. Currently, there is no established system that allows the direct  
1587 measurement of the service lifespan of apparel textiles. The information available in the literature focuses on  
1588 the possession span, which refers to the time a single user keeps the item, and the duration in use, which refers  
1589 to how much time the owner uses the item (Table 27). This information is collected via surveys where users are  
1590 asked to provide their estimates.

1591 The possession span of apparel textiles is often expressed as number of years. The duration in use is expressed  
1592 as 'days of wear'. **Table 28** and **Table 29** report data gathered from the literature, using both metrics for most  
1593 of the apparel textiles categories. **Table 61** in Section 9.5.3 reports a brief description of the investigated  
1594 studies.

1595 The figures obtained from the analysis show a relatively large range of values, a consequence of the many  
1596 factors affecting this parameter. The analysis addressed only specific products belonging to specific product  
1597 categories. Section 9.5.3 provides additional, more granular information on the collected data.

1598 Users and experts perceive that over the last 20 years the service lifespan of apparel textiles has decreased.  
1599 Some experts estimated that it decreased by 36% (Ellen MacArthur Foundation, 2017). The lack of a direct  
1600 measurement method does not allow the provision of a better understanding of this important parameter.  
1601 Nevertheless, educated assumptions will be made to be used in the stock model that will be produced in the  
1602 following milestone, when the PS addresses task 7 of the MEErP.

1603

1604

1605 **Table 28.** Possession span of apparel textiles expressed in years

Apparel textiles category	Gray et al. (2022)	Laitala and Klepp (2020)	Laitala et al. (2018)	WRAP (2017a)	Drycleaning Institute (2015)
1. T-shirts	4	4.6	3.3-6.8	4.5	NA
2. Shirts and blouses	4.1	4.8	3.3-7.2	5 (Shirts)	2-3
3. Sweaters and mid layers	4.4 (Sweatshirts and hoodies)	6	3.7-10.8	NA	3-4
4. Jackets and coats	6.2 (Non-padded) 5.4 (Padded)	7 (Coats) 6.8 (Jackets)	4-11.6 (Coats) 4-11.5 (Jackets)	NA	2-4
5. Pants and shorts	4.8 (Shorts) 4.3 (Trousers) 4.1 (Jeans)	4.7 (Pants) 3.5 (Jeans)	2.5-6.2 (Pants) 2.5-4.3 (Jeans)	4 (Jeans)	2-4
6. Dresses, skirts and jumpsuits	4.9 (Skirts) 4.6 (Dresses)	7.1 (Dresses) 6.9 (Skirts)	4.1-15.2 (Dresses and skirts)	NA	1-3 (Dresses) 2-4 (Skirts)
7. Leggings, stockings, tights and socks	3.8 (Leggings) 2.9 (Socks and hosiery)	2.6 (Socks)	1.8-3.6 (Socks)	2.5 (Socks)	1 (Socks)
8. Underwear	2.7	3.5 (Bras) 3.1 (Underpants)	2.4-4.4	NA	1-2
9. Swimwear	NA	NA	NA	NA	2
10. Accessories	NA	NA	NA	NA	1-2

1606 N.B. NA: Not available.

1607 Beton et al. (2014) reports that apparel has a lifespan between 1 and 3 years, based on expert opinions.

1608 Knitwear products were reported to have a possession span of 4.8 years (Gray et al., 2022) and 5 years (WRAP, 2017a).

1609 All investigated studies address specific products belonging to specific apparel textile categories.

1610 *Source: own production*

1611 **Table 29.** Duration in use of apparel textiles expressed in days of wear

Apparel textiles category	Roos et al. (2015)	WRAP (2017a)	Klepp et al. (2020)	PEFCR (2022)
1. T-shirts	22	112.5	90.5	45
2. Shirts and blouses	NA	80 (Shirts)	90.5	40
3. Sweaters and mid layers	NA	NA	90.5	85
4. Jackets and coats	100 (Jackets)	NA	90.5	100
5. Pants and shorts	200 (Jeans)	300 (Jeans)	90.5	70 (Jeans)
6. Dresses, skirts and jumpsuits	10 (Dresses)	NA	90.5	70
7. Leggings, stockings, tights and socks	NA	125 (Socks)	90.5	50 (Socks) 70 (Leggings/tights) 50 (Hosiery)
8. Underwear	NA	NA	90.5	60
9. Swimwear	NA	NA	NA	30
10. Accessories	NA	NA	NA	100

1612 N.B. NA: Not available.

1613 Days of wear of knitwear products were reported to be equal to 150 (WRAP, 2017a) and 90.5 Klepp et al. (2020).

1614 All investigated studies address specific products belonging to specific apparel textile categories.

1615 *Source: own production*

## 1616 **5.9 Market penetration of environmental labels**

1617 Although numerous environmental labels are used in the textile sector, currently there is no direct method to  
 1618 quantify their market penetration. Therefore, it not possible to understand the real success of these labels and  
 1619 the specific reasons behind their success.

1620 Such information could be helpful for the revision of the EU Ecolabel criteria for textile products. The following  
 1621 milestone of the PS will address the potential inclusion of information requirements for products awarded with  
 1622 one or more environmental labels. The required information could also include a description of the specific  
 1623 environmental label in the Digital Product Passport.

## 1624 **6 User behaviour**

### 1625 **6.1 Introduction**

1626 The aim of this section is to present and analyse information available in the literature regarding behavioural  
1627 trends among users with regards to apparel.

1628 The methodology used in the user behaviour analysis is twofold. First, a comprehensive screening and literature  
1629 review of scientific papers and other studies on user behaviour related to apparel was conducted. The main  
1630 goal of the systematic literature review was to identify the topics usually covered by studies on user behaviour  
1631 regarding apparel. As a second step, several questions related to the most common aspects explored by user  
1632 behaviour studies were prepared. These questions were included in the first stakeholder consultation through  
1633 an online questionnaire <sup>(97)</sup>. Stakeholder references to additional scientific papers, consumer surveys and other  
1634 relevant documents were analysed in order to complement the literature review carried out in the first step.

1635 The information was analysed considering its potential use when modelling the user phase in the environmental  
1636 and economic analysis taking place at a later stage of the preparatory study (task 5 of the MEerP), and also its  
1637 connection with potential **ecodesign requirements** to be developed within the aspects listed in Article 5(1) of  
1638 the ESPR as well as with potential **EU Ecolabel** and **GPP criteria**. Information from the user behaviour analysis  
1639 may be relevant especially with regards to the potential inclusion of EU Ecolabel criteria addressing product  
1640 recyclability.

1641 The user behaviour chapter covers aspects such as the way users choose to buy apparel, their habits during the  
1642 use phase, and why they decide to dispose of. It distinguishes user behaviour aspects at pre-purchase (section  
1643 6.2.), post-purchase (section 6.3.) and disposal stages (section 6.4.).

1644 The table below indicates the main aspects related to user behaviour that will inform the modelling phase and  
1645 the development of potential ecodesign requirements. Knowledge of user behaviour can help to identify barriers  
1646 and restrictions to possible ecodesign measures resulting from social or cultural factors. Having information  
1647 about how frequently consumers buy apparel, the temperature of washing or whether softeners are used or  
1648 not, is important for the modelling. Equally, knowing whether consumers can assess the quality of apparel, what  
1649 are their priorities when purchasing, whether users follow care labels, reasons for disposal and if consumers  
1650 are willing to repair the apparel or not, are relevant considerations for the development of ecodesign  
1651 requirements. The table below indicates the main user behaviour aspects that will serve as relevant input in the  
1652 modelling of the environmental impacts and the life cycle costs of apparel, and for the development of potential  
1653 ecodesign requirements.

1654

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<sup>97</sup> Initial questionnaire. Preparatory Study on textiles for product policy instruments – the initial questionnaire. Available at [this link](#).

**Table 30.** Potential application of user behaviour aspects in the next steps of the preparatory study

ID	Aspect	Information used for	Comments
1	Reasons for purchasing	Potential ecodesign requirements	Reasons for purchasing showcase the triggers for new apparel purchases and can shape the development of ecodesign requirements.
2	Criteria used when purchasing	Potential ecodesign requirements	The criteria used when purchasing could give an indication of which aspects of the apparel are more relevant to users, e.g. durability.
3	Quality assessment of apparel	Potential ecodesign requirements	Quality and longer apparel lifespans are important to consumers. This supports the focus on durability ecodesign requirements.
4	Attitude towards second-hand purchases	Potential ecodesign requirements	Supports the development of potential durability requirements.
5	Attitudes towards chemicals in apparel	Potential ecodesign requirements	Supports the development of requirements on substances of concern.  Provides relevant input for the EU Ecolabel potential criteria on chemicals.
6	Attitudes towards the purchase of apparel made with recycled materials	Potential ecodesign requirements	Supports the development of requirements on recycled content. Provides relevant input for the EU Ecolabel and/or EU GPP potential criteria on recycled content.
7	Laundrying practices <sup>(a)</sup>	Modelling and potential ecodesign requirements	Different washing temperatures, washing frequencies and sorting practices among users can be modelled to show the way they affect the durability and quality of apparel. Potentially relevant input for the assessment of the environmental impact and the life cycle costs.
8	Care labels	Potential ecodesign requirements	The user behaviour informs how care labels are used by users and what aspects may be missing from them <sup>(98)</sup> , supporting the drafting of information requirements and the development of the Digital Product Passport.
9	Reparability	Potential ecodesign requirements	Potential reparability and durability ecodesign requirements can be shaped by user behaviour data on reparability e.g. the link between the apparel item and accessories such as buttons that tend to fail sooner.
10	Long-term apparel storage	Potential ecodesign requirements	The user storage of apparel could affect its lifespan, thus it may be considered in the LCA modelling phase.
11	Reasons for disposal <sup>(99)</sup> and product-person attachment	Potential ecodesign requirements	The early disposal of apparel by users could trigger the need for the development of durability ecodesign requirements. Reasons for apparel disposal include loss of functionality and quality. These are aspects that create product-person attachment which translates into apparel being kept in the system for longer. This supports the focus on design for durability requirements.
12	Reasons for returning apparel	Potential ecodesign requirements	The lack of quality of ordered apparel is among the main reasons for returning products ordered online. This supports potential inclusion of durability ecodesign requirements.

1656

1657

1658

<sup>(a)</sup> It includes sorting before washing, washing temperature and frequency, choice of detergent and softener, drying, ironing, and storing after washing and drying

Source: own production

<sup>98</sup> The ongoing review of the Textile Labelling Regulation is also assessing this same issue.

<sup>99</sup> In this study the term 'disposal' used to refer to the generic action of getting rid of a product, regardless of whether the product becomes waste or it simply changes ownership as a product. The general use of the term 'disposal' in this Preparatory Study should not be understood to imply 'disposal operations' described in Annex I of the Directive 2008/98/EC on waste and repealing certain Directives Available at [this link](#).

1659 **Note:** The following sections provide a summary of the main learnings and observations derived from an  
1660 extensive literature search carried out on user behaviour with regards to apparel. **A more detailed review of**  
1661 **literature corresponding to pre-purchase, post-purchase and disposal aspects is provided in the**  
1662 **annex, Section 9.6.**

## 1663 **6.2 Pre-purchase aspects**

### 1664 **6.2.1 Reasons for purchasing apparel**

1665 Consumer behaviour in the apparel industry is influenced by various factors, including individual perspectives  
1666 on purchasing and the prevalence of spontaneous buying behaviour. Understanding the motivations behind  
1667 consumer purchases, whether driven by functionality or self-representation, shows what qualities in apparel  
1668 users consider to be important for them.

1669 — **Diverse consumer perspectives and reasons for purchasing:** There are two primary consumer  
1670 approaches towards apparel - those viewing it as purely functional and those seeing it as self-  
1671 representational. These perspectives significantly influence consumer priorities during the purchase process  
1672 (McNeill and Moore 2015). Research suggests that the primary purchase motivations include looking good,  
1673 replacing old items, buying essential wear, staying on-trend, acquiring new apparel, and preparing for  
1674 special occasions (D&B, 2020).

1675 — **Spontaneous buying behaviour:** Apparel purchases often occur spontaneously, with a considerable  
1676 proportion in the 40-70 age group engaging in frequent spontaneous buying. This trend indicates that a  
1677 majority of consumers may not thoroughly inform themselves before making apparel purchases and act  
1678 on impulse (Kleinhüeckelkotten et al., 2018). Discount offers, including global phenomena like New Year  
1679 sales, influence impulsive purchases, leading to more frequent buying and increased monthly spending on  
1680 apparel (D&B, 2020; Djafarova and Bowes, 2021; Heiny and Schneide, 2021; Amasawa and Kimita, 2023).

1681 — **Digital vs. physical shopping dynamics:** While visual aids on social media attempt to replicate physical  
1682 store experiences (Djafarova and Bowes, 2021), impulse purchases are more closely associated with  
1683 physical stores, particularly affecting the younger population (Cook and Yurchisin, 2017).

1684 The level of information provided by surveys on reasons for purchasing apparel is sufficient to get an idea of  
1685 the different consumer preferences. It should be noted that the literature does not provide an order of  
1686 importance or a priority list for the reasons for purchase mentioned by consumers.

1687 The reasons users have for purchasing apparel are diverse and highly dependent on personal preferences.  
1688 However, some seem to be linked to the need to replace apparel that is old, worn out or broken to a certain  
1689 extent. In these cases, information requirements on reparability and disposal could guide the user concerning  
1690 ways to repair the product to ensure optimum durability.

1691 In the cases in which impulse purchases are involved, information requirements on the product itself regarding  
1692 the life-cycle environmental impacts of the apparel item in question, would allow consumers to be more aware  
1693 of the impact of their purchase and make evidence-based decisions.

### 1694 **6.2.2 Criteria used when buying apparel**

1695 When it comes to purchasing apparel, consumers navigate a complex landscape of decision-making criteria that  
1696 encompass various factors influencing their choices. These criteria often include considerations such as product  
1697 quality, price affordability, brand significance, durability, ease of care, and alignment with personal values and  
1698 preferences. Additionally, age-related preferences and sustainability concerns further shape the decision-  
1699 making process, highlighting the diverse range of factors at play in the apparel market.

1700 — **Main apparel purchase decision attributes:**

1701 • Quality and price are paramount factors influencing consumers' apparel purchasing decisions, with  
1702 97% emphasising the importance of product quality and 94% expressing a similar sentiment  
1703 towards price in a survey run among 26 635 European citizens (European Commission. Directorate  
1704 General for Environment, 2023). The brand's significance is lower, as only 61% consider it 'very'  
1705 or 'rather important' in their purchase decision-making process (European Commission. Directorate  
1706 General for Environment, 2023).

1709 • Other studies indicate that the perceived value of an apparel item by a specific user is also a  
1710 significant driver of purchasing behaviour, with quality and functionality following closely behind  
1711 (AK Wienn and Greenpeace, 2023; Mishra et al., 2023; Thredup, 2023).  
1712 • Durability and ease of care are not explicitly considered by users during apparel purchases but are  
1713 associated with perceived quality according to De Klerk and Lubbe (2008) and Wakes et al. (2020).  
1714 However, other studies highlight durability in the top three main aspects to influence the decision  
1715 to purchase apparel items such as coats or jackets (Consumers, Health, Agriculture and Food  
1716 Executive Agency et al., 2018)

1717 — **Age-related purchase preferences:**

1718 • Fashion trends hold greater significance for younger consumers, as they see them as a sign of  
1719 success (AK Wienn and Greenpeace, 2023; Spaepen et al., 2021).  
1720 • Older generations prioritize new items, comfort, country of origin, textile material, and brand  
1721 knowledge (Spaepen et al., 2021).

1722 — **Sustainability considerations:**

1723 • Approximately 82% of 27 498 survey respondents believe that there is insufficient information  
1724 available regarding environmental aspects and working conditions associated with apparel  
1725 (European Commission, 2019).  
1726 • Some sources highlight that across all Member States, a majority of respondents reply that the  
1727 environmental impact of a product is 'very' or 'rather important' in their purchasing decisions  
1728 (European Commission. Directorate General for Environment, 2023). In fact, in an EU-wide survey  
1729 involving 27 498 respondents, three-quarters express the view that apparel should be crafted  
1730 from materials that are recyclable (European Commission, 2019).  
1731 • Other sources indicate that sustainability and social standards rank lower in importance compared  
1732 to price or quality considerations when purchasing (Consumers, Health, Agriculture and Food  
1733 Executive Agency. et al., 2018; AK Wienn and Greenpeace, 2023). In fact, approximately 32% of  
1734 the 27 498 EU survey respondents express agreement with the notion that they are not concerned  
1735 about the environmentally-friendliness of their apparel (European Commission, 2019). Moreover,  
1736 approximately half of the 27 498 respondents indicate that apparel should be offered at the  
1737 lowest possible price, irrespective of the environmental impact or working conditions during its  
1738 production, with a similar proportion of respondents in disagreement with this statement  
1739 (European Commission, 2019).  
1740 • The willingness of having more information on the sustainability of products in the category of  
1741 'textiles, clothing/footwear' seems relatively high. In particular, 71% out of 26 635 survey  
1742 respondents in the EU-27 Member States express a desire to find more of the above-mentioned  
1743 products carrying the EU Ecolabel. This sentiment is prevalent in all countries, to varying degrees  
1744 (from 54% in Czechia to 83% in Portugal and Romania) (European Commission. Directorate  
1745 General for Environment, 2023).  
1746 • Individuals with a higher level of education are generally more inclined to seek products with the  
1747 EU Ecolabel. For the category of 'textiles, clothing/footwear', 74% of those who completed  
1748 education aged 20 or older express this preference, compared to 71% aged 16-19 and 61% who  
1749 stopped education before the age of 16 (European Commission. Directorate General for  
1750 Environment, 2023).

1751 In summary, purchase decisions are very much influenced by the perception of quality and price, but there are  
1752 other factors (trends, sustainability, comfort, perceived value), which are of varying importance to different  
1753 population segments (based on their age, education level). Given the analysed information provided by surveys,  
1754 there is no doubt that quality in apparel is very important for consumers. As apparel quality is closely linked to  
1755 its durability, developing ecodesign requirements for this product aspect deserves further consideration.

1756 Moreover, the fact that a high number of consumers believes that environmental information about apparel is  
1757 not sufficient is relevant for consideration of possible information requirements on environmental impacts of  
1758 apparel.

1759 Equally important is the certainty that consumers would like to find more apparel holding the EU Ecolabel, which  
1760 supports the revision of requirements set by this label.

1761 Criteria applied by consumers when buying apparel can support the inclusion and prioritization of ecodesign  
1762 requirements on certain product sustainability aspects (e.g. durability) and the setting of classes of  
1763 performance, as appropriate.

### 1764 **6.2.3 User quality assessment of apparel: key insights**

1765 Understanding how users assess the quality of apparel involves examining various phases and factors that  
1766 influence their perceptions. This assessment is influenced by intrinsic attributes like material and fit, as well as  
1767 extrinsic factors such as brand reputation and manufacturing location. Additionally, experienced features and  
1768 personal values play a significant role in shaping perceptions of quality. Consumers also tend to associate  
1769 durability and ease of care with higher quality apparel, with a strong expectation for long-lasting products.  
1770 Despite the role of price in influencing perceptions of quality and longevity expectations, studies suggest that  
1771 cheaper apparel is not necessarily synonymous with lower quality, indicating a complex relationship between  
1772 price and perceived value.

#### 1773 — **Phases of quality assessment by users:**

- 1774 • Consumer evaluates the quality in apparel in three phases: at the point of purchase, during use,  
1775 and upon disposal (Piippo et al., 2022).

#### 1776 — **Factors influencing the perception of quality:**

- 1777 • Intrinsic attributes (material, fit), extrinsic factors (brand, manufacturing location), experienced  
1778 features, and values influence the perception of quality in apparel (Niinimäki, 2011; Koszewska,  
1779 2016; Henninger et al., 2017).

#### 1780 — **Interlinkages between durability and quality in apparel:**

- 1781 • Durability and ease of care are associated with perceived quality (De Klerk and Lubbe, 2008;  
1782 Wakes et al., 2020).
- 1783 • Consumers expect high-quality apparel to be durable (Yuille, 2015). In fact, 43% of survey  
1784 respondents declared that long-lasting products are generally better quality (Consumers, Health,  
1785 Agriculture and Food Executive Agency et al., 2018).
- 1786 • In 2019, nine in ten respondents (88 % out of 27 498 EU-27 citizens) indicated that apparel should  
1787 be made to last longer (European Commission, 2019). Among the reasons, over 45% of  
1788 respondents of another survey indicated that they will save money if apparel items such as coats  
1789 or jackets last longer (Consumers, Health, Agriculture and Food Executive Agency et al., 2018).

#### 1790 — **Role of price in apparel quality perception and longevity expectations:**

- 1791 • Consumer expectations of apparel longevity are linked to the price, particularly for younger  
1792 generations (Monitor, Cotton Incorporated Lifestyle, 2018; Wakes et al., 2020).
- 1793 • Price may not always accurately reflect quality and durability (Ghaani Farashahi et al., 2018a;  
1794 Wakes et al., 2020). In fact, some studies indicate that cheaper apparel is not always synonymous  
1795 with lower quality (Wakes et al., 2020; Badgett, 2017).
- 1796 • 43% of Austrian survey participants express a willingness to buy long-lasting apparel despite the  
1797 price, with 30% already practising this behaviour (AK Wienn and Greenpeace, 2023).
- 1798 • For coats or jackets, over 60% of 1 001 respondents' observations indicated that it is hard to tell  
1799 how long a product will last (Consumers, Health, Agriculture and Food Executive Agency et al.,  
1800 2018).

1801 Overall, the references analysed provide consistent views on the fact that the assessment of quality by users  
1802 is multifactorial and somewhat subjective because, inter alia, it is largely based on tactile experience with the  
1803 apparel.

1804 In the previous section, apparel quality has been highlighted as a key aspect users deem to be important in the  
1805 apparel they purchase. However, how consumers assess quality is not always clear as this can be very  
1806 subjective. For this reason, information on the performance of the product could provide consumers with  
1807 additional, objective quality parameters for the apparel. Information requirements on product aspects linked to  
1808 durability, and even reliability, could enable consumers to better understand and assess the quality of apparel.

1809 In order to facilitate the user's assessment of the quality of apparel, performance requirements based on  
1810 product durability, reliability and reusability aspects could, as appropriate, include minimum levels. Another  
1811 possibility could be to define requirements connected to the functional performance of apparel. Information  
1812 requirements related to the above-mentioned product parameters could serve as metrics to guide users'  
1813 assessment of quality in apparel.

1814

## 1815 **6.2.4 Consumer behaviour towards labels on apparel**

1816 Consumer behaviour towards labels on apparel plays a pivotal role in shaping purchasing decisions and  
1817 influencing perceptions of product quality and sustainability. Expectations regarding label information vary, with  
1818 consumers expressing preferences for receiving details about durability and/or reparability either via official EU  
1819 labels, product descriptions, or retailers. Offering such information on labels has the potential to impact the  
1820 relative importance of price in purchasing decisions, highlighting the growing interest in transparency and  
1821 sustainability among consumers. This interest extends to EU Ecolabel products, with a substantial proportion of  
1822 survey respondents expressing a desire for more environmentally friendly options in apparel.

### 1823 — **Consumer attention to labels in general:**

- 1824 • There is limited information regarding the level of consumer attention to apparel labels generally  
1825 speaking, except for care labels (Section 6.3.2).

### 1826 — **Expectations regarding label information:**

- 1827 • Around 18% of over 4 880 user responses indicate that consumers expect to receive information  
1828 regarding the durability of coats or jackets via an EU official label while the majority prefers to receive  
1829 such information via product descriptions (39.9%) or via the retailer (36%) (Consumers, Health,  
1830 Agriculture and Food Executive Agency. et al., 2018).
- 1831 • In the case of reparability information, 14% of survey respondents expect to have such information  
1832 via an EU official label while the majority would opt to have it via the retailer (35.6%) and via product  
1833 descriptions (33.6%) (Consumers, Health, Agriculture and Food Executive Agency. et al., 2018).
- 1834 • Offering details about durability on labels could alter the relative importance of price when making  
1835 purchasing decisions (Consumers, Health, Agriculture and Food Executive Agency. et al., 2018).

### 1836 — **Growing interest in EU Ecolabel products:**

- 1837 • There is increasing interest in EU Ecolabel textile products. A total of 71% of 26 635 EU survey  
1838 respondents express a desire for more EU Ecolabel textile products. There is a consistent level of  
1839 interest across countries, ranging from 54% in Czechia to 83% in Portugal and Romania (European  
1840 Commission. Directorate General for Environment, 2023).

1841 Understanding the way and extent to which consumers respond to information contained on labels can support  
1842 the development of information requirements, for instance related to the environmental impacts of a product  
1843 and its performance on specific product sustainability aspects.

## 1844 **6.2.5 Attitudes towards second-hand apparel purchase**

1845 There is a growing interest in second-hand apparel reflected in consumer attitudes. Evidence suggests a  
1846 significant portion of consumers are open to purchasing second-hand items. While concerns about hygiene and  
1847 a preference for new items persist among some, the appeal of financial savings and eco-friendly practices  
1848 drives many to incorporate second-hand pieces into their wardrobe. Additionally, emotional attachment to  
1849 clothing items further boosts positive attitudes towards second-hand shopping, highlighting a nuanced  
1850 approach to fashion consumption.

### 1851 — **Consumer inclination towards second-hand apparel:**

- 1852 • There is a certain interest among consumers towards second-hand apparel, as indicated by 34%  
1853 of the 26,595 respondents showing a readiness to buy second-hand apparel (European  
1854 Commission. Directorate General for Environment, 2014).
- 1855 • Over 70% of 27 498 respondents in the EU agree that the promotion of second-hand apparel  
1856 should be increased (European Commission, 2019).
- 1857 • About 37.4% of the population actively engages in buying second-hand apparel, while concerns  
1858 about hygiene and a preference for new items are primary reasons for non-participation (D&B,  
1859 2020).
- 1860 • Those incorporating second-hand apparel tend to purchase fewer new items, with financial  
1861 savings, sustainability, and a preference for unique pieces being primary drivers (D&B, 2020).
- 1862 • The emotional value users have for apparel items significantly boosts positive attitudes towards  
1863 second-hand clothing (Rulikova, 2020; Amini et al., 2021; Koay et al., 2022).

### 1864 — **Gender and age dynamics:**

- 1865 • Women show a higher inclination to purchase second-hand apparel, with approximately 40%  
1866 embracing this trend compared to just over 25% of men (European Commission. Directorate  
1867 General for Environment, 2014; D&B, 2020).

- 1868                   • The younger population, especially those aged 18-25, lead in the adoption of second-hand apparel,  
1869                   while participation decreases in the 26-40 age group (D&B, 2020).

1870 The willingness of users to purchase previously used apparel (second-hand) can be relevant in view of the  
1871 potential definition of ecodesign requirements on reusability.

### 1872 **6.2.6 Attitudes towards chemicals in apparel**

1873 Consumer attitudes towards chemicals in apparel encompass a spectrum of perceptions shaped by factors such  
1874 as fabric type, geographical location and evolving consumer preferences. Insights from surveys and analyses  
1875 offer valuable perspectives on the perceived risks associated with chemicals in apparel fabrics, highlighting  
1876 varying degrees of concern and priorities among consumers.

#### 1877 — **Chemical perception in apparel:**

- 1878                   • In a survey spanning 27 EU Member States, 60% of 26 718 respondents perceive chemicals in  
1879 apparel fabrics as minimally risky, with most not seeing them as a threat to people (European  
1880 Commission, 2009).

#### 1881 — **Fabric-specific risk assessment:**

- 1882                   • Synthetics are perceived as posing the highest risk among fabric types, with only 22% categorising  
1883 them as significantly risky (European Commission, 2009).

#### 1884 — **Country-level variances in risk considerations:**

- 1885                   • A country-level analysis reveals that environmental and health risks are deemed very important  
1886 by about two-thirds of respondents in Germany and Slovakia. In contrast, more than six in ten  
1887 respondents in Denmark and the United Kingdom consider this aspect unimportant (European  
1888 Commission, 2009).
- 1889                   • Data from the Fashion Revolution (2020) survey, covering 5 000 consumers across the United  
1890 Kingdom, France, Germany, Italy, and Spain, indicates that an average of 37% considers it  
1891 important to buy apparel produced without harmful chemicals. The survey does not provide  
1892 detailed information about the types of chemicals, and responses show no significant differences  
1893 across age groups, genders, and income levels.

1894 The user perception towards chemicals in apparel, especially as regards substances that pose a risk to human  
1895 health or to the environment, could support the establishment of information requirements on the presence of  
1896 substances, in particular of substances of concern. This in turn can inform possible actions that could be  
1897 addressed in specific legislation on the safe use of chemicals such as REACH (e.g. via prioritisation in the REACH  
1898 restrictions “roadmap” which is subject to periodic review by the Commission).

### 1899 **6.2.7 Attitudes towards the purchase of apparel made with recycled materials**

1900 Knowledge of consumer attitudes towards apparel containing recycled material (recycled content) is relevant  
1901 for end-of-life modelling. Consumers’ preferences for apparel containing recycled materials can support and  
1902 provide reassurance in the modelling for different materials, for instance as regards the use of several  
1903 assumptions about different percentages of recycled content present in apparel.

#### 1904 — **Consumer preference for recycled materials:**

- 1905                   • According to the Fashion Revolution (2020) survey of 5 000 consumers in the United Kingdom,  
1906 France, Germany, Italy, and Spain, an average of 11% emphasize the importance of their apparel  
1907 containing recycled materials.

#### 1908 — **Age group differences:**

- 1909                   • Younger respondents (12-24 years old) give it greater importance, with 14% indicating a  
1910 preference for apparel containing recycled materials, compared to only 7% in the 55-75 age group  
1911 (Fashion Revolution, 2020).

#### 1912 — **Demographic consistency:**

- 1913                   • No significant variations exist in the analysed survey responses across different income and  
1914 gender groups.

## 1915 **6.3 Post-purchase aspects**

### 1916 **6.3.1 User behaviour during use: laundering practices**

1917 User laundering practices include sorting before washing, use of a certain washing temperature, washing  
1918 frequency, choice of softeners and detergents, drying methods, ironing, and storage. Consumer behaviour  
1919 related to apparel laundering practices influences the environmental impact during the life of the product and  
1920 constitutes relevant input for the assessment of the environmental impact and the life cycle costs of an apparel  
1921 product.

1922 Moreover, research indicates that consumer behaviour during the use and care of apparel may significantly  
1923 impact the lifespan of apparel too. It could therefore be a good idea for apparel items to be accompanied by  
1924 information for consumers and other end users on how to maintain the product to ensure a longer lifespan.  
1925

#### 1926 — **Sorting before washing:**

- 1927 ● Sorting practices vary based on factors like washing temperature, colour, fibre type, and care  
1928 labelling (Laitala et al., 2012).
- 1929 ● Sorting based on washing temperature is more common among consumers compared to washing  
1930 everything together (Laitala et al., 2012).

#### 1931 — **Washing temperature and washing frequency:**

- 1932 ● The average European washing temperature is 42.4 °C (A.I.S.E, 2020).
- 1933 ● Differences in washing habits (i.e. washing temperature used, choice of detergent and softeners,  
1934 etc.) are observed across countries. Factors like age, location and societal norms contribute.
- 1935 ● User beliefs about hygiene and convenience may impact washing frequency (D&B, 2020).

#### 1936 — **Choice of softeners and detergents:**

- 1937 ● Users often dose detergent arbitrarily; overdosing is common (A.I.S.E, 2020).
- 1938 ● Fabric softeners are used in approximately 55% of washing cycles in Europe (Stamminger, 2016  
1939 as cited in Klepp and Laitala, 2023a).
- 1940 ● Economic factors play a substantial role in users' choices of laundry products.

#### 1941 — **Drying:**

- 1942 ● Diverse drying methods include air-drying, electric dryers and dedicated drying spaces. Survey data  
1943 provide insights into specific drying methods where line-dried outdoors (natural drying) is one of  
1944 the most commonly used drying methods for apparel (Laitala et al., 2020; GINETEX, 2017).

#### 1945 — **Ironing:**

- 1946 ● Ironing practices have decreased over the years; habits vary across countries and demographics.
- 1947 ● The frequency of ironing is influenced by gender and age; men and younger respondents tend to  
1948 iron less (Klepp and Laitala, 2023b).

#### 1949 — **Storage after washing and drying**

- 1950 ● The folding and storage of apparel after washing and drying may influence the lifespan of apparel.  
1951 However, no studies have been found on post-washing, drying and storage behaviours.  
1952

1953 Sufficient information is available on commonly used washing temperatures among users as well as washing  
1954 frequency. When it comes to sorting, drying and ironing practices, the literature is more limited. Additionally, the  
1955 surveys analysed on choice of softeners and detergents provide valuable information for the LCA modelling  
1956 phase given as softeners could be a source of substances of concern to be taken into consideration.

1957 Finally, evidence on links between concrete laundering practices and environmental impacts has not been found.

### 1958 **6.3.2 Following apparel care label instructions**

1959 Apparel care labels provide instructions on washing temperature, cycles, detergents, etc. Surveys and studies  
1960 shed light on consumer attitudes and behaviours regarding care label instructions, revealing insights into  
1961 adherence rates, preferences for accessing instructions, and associations with care label symbols.

#### 1962 — **Attitudes towards care label instructions:**

- 1963 ● Surveys indicate that a significant percentage of users follow care instructions on apparel labels  
1964 (GINETEX, 2017; GINETEX, 2019).
- 1965 ● Users' adherence to care labels diminishes after the initial wash (McLaren et al., 2015).
- 1966 ● Some users cut out care labels, affecting the resale potential of apparel GINETEX (2017).

- 1967 • Some users prefer new ways to access the apparel care instructions, such as QR codes on smartphones (COFREET, 2023).
- 1968

1969 — **Association with care label symbols:**

- 1970 • Surveys show consistent understanding of symbols like ironing and washing (AB-REOC and BV-OECO, 2019; GINETEX, 2017).
- 1971
- 1972 • Users' poorer understanding of symbols for bleaching, drying, and professional cleaning may be due to them being less intuitive (AB-REOC and BV-OECO, 2019; GINETEX, 2017).
- 1973
- 1974

1975 Relevant information can be extracted from the available surveys on user interaction with care labels, especially when it comes to the extent to which users follow care labels in Europe. For other user behaviour patterns in relation to care labels, information is available only from one survey, and so not allowing the comparison of information from different sources. Nonetheless, all the surveys related to user behaviour and apparel care labels have an ample respondent base, making the results valuable for the preparatory study at hand.

1981 Additionally, the user behaviour analysis provides insights on apparel maintenance aspects that may either be missing or need further clarification on care labels. This is valuable data for the development of information requirements for consumers on how to use and maintain the product in order to minimise its impact on the environment and to allow for optimal duration.

1985 Finally, consumer opinions about care label instructions and their level of adherence to them can guide the manner in which the information could be provided (e.g. in the Digital Product Passport or directly on a label as referred to in Article 14 of the ESPR final compromise text).

1988 **6.3.3 Reparability**

1989 The consumer relationship with apparel often exhibits a transient nature, characterised by the disposal of items before they reach the end of their lifecycle. This disposability stems from factors such as overconsumption and the convenience of replacing rather than repairing apparel. Moreover, diminishing sewing skills and limited access to repair services further impact consumers' decisions regarding garment maintenance and repair.

1993 — **Transitory relationship with apparel:**

- 1994 • Consumers have a transient relationship with apparel, often disposing of items before they are worn out or broken (Harris et al., 2016).
- 1995
- 1996 • Reasons for this behaviour include overconsumption and the convenience of replacing unwanted items rather than repairing them. A lack of emotional attachment to the product is observed (EEA, 2022a).
- 1997
- 1998
- 1999 • Most survey respondents rated reparability as unimportant when purchasing apparel items such as coats or jackets while only about 11% considered reparability to be important (Consumers, Health, Agriculture and Food Executive Agency. et al., 2018).
- 2000
- 2001

2002 — **User decisions and repair capabilities:**

- 2003 • Sewing skills for apparel repair are diminishing, attributed to a lack of dedicated teaching in schools and at home and a scarcity of time and repair equipment (Finnish Ministry of the Environment, 2023).
- 2004
- 2005
- 2006 • Trust in one's own skills is a significant motivator for engaging in sewing and repairs (Finnish Ministry of the Environment, 2023).
- 2007
- 2008 • Users decide to mend apparel based on sewing skills; some can sew a button, but fewer can replace zippers (Laitala and Boks, 2012).
- 2009

2010 — **The apparel repair sector in the EU:**

- 2011 • Repair in Europe is common, but the total cost is influenced by high labour costs, equipment, and materials (EEA, 2022a).
- 2012
- 2013 • On average, the share of survey respondents rating the availability of repair services as having a lot of influence on their purchasing decision was relatively low (Consumers, Health, Agriculture and Food Executive Agency et al., 2018).
- 2014
- 2015
- 2016 • Difficulties accessing repair services notably diminished the appeal of repair (Consumers, Health, Agriculture and Food Executive Agency et al., 2018).
- 2017
- 2018 • Lack of information about, trust in, and satisfaction with repair services hinder consumer engagement (EEA, 2022a).
- 2019

2020 The user behaviour analysis identifies a series of common apparel repairs that users generally carry out. These apparel repairs are generally limited to simple ones, such as substituting a button, and only a limited fraction

2022 of the population is skilled enough to engage in more demanding repairs such as changing a zipper.  
2023 Performance requirements for reparability could be considered to ensure the availability of replacement  
2024 components that, according to users, tend to break or wear out most frequently. Moreover, information on the  
2025 period of availability of spare parts (e.g. buttons and other accessories) and the possibilities of repairing may  
2026 also contribute to further user engagement in repair activities whether privately or by visiting repair shops.

2027 It could also be envisaged that information requirements would provide instructions or 'use cues' in the product  
2028 to guide the correct repair or replacement of the above-mentioned apparel components. This could facilitate  
2029 the ease of self-repair by the user but also guide tailors when repairing apparel, guaranteeing that a certain  
2030 level of quality in the apparel repair is achieved. Some of this information could be included in the Digital  
2031 Product Passport.

### 2032 **6.3.4 Storage of apparel**

2033 User behaviour regarding storage of apparel is linked to aspects described in Section 6.2 and Section 6.4.3. The  
2034 storage of apparel items, whether temporary or permanent, appears to be strongly connected to the emotional  
2035 attachment individuals have to their apparel. Increasing the emotional durability could potentially make users  
2036 keep their items for longer, avoiding disposal and potentially increasing the number of uses. However, such  
2037 storage does not prevent users from continuing to buy more apparel.

#### 2038 — **Types of apparel storage:**

2039 • Apparel storage can be classified into two categories: active and inactive. Active apparel storage  
2040 involves placing regularly worn items inside wardrobes or easily accessible spaces. Inactive apparel  
2041 storage refers to keeping items at home without use for an extended period. Inactive storage  
2042 constitutes over 30% of apparel in European closets (European Parliamentary Research Service,  
2043 2019).

#### 2044 — **Reasons for inactive apparel storage:**

2045 • Inactive apparel may include items that no longer fit, stored with the hope they will fit again, and  
2046 as a means of monitoring weight (Bye and McKinney, 2007).

#### 2047 — **Temporary storage practices:**

2048 • Temporary storage occurs when users are contemplating disposal methods, waiting for apparel to  
2049 come back into fashion, repairing, or determining if there are still ways to utilise the apparel  
2050 (Cluver, 2008).

#### 2051 — **Storage of basic apparel:**

2052 • Essential but outdated or worn-out basic apparel is stored until substitutes are purchased (Cluver,  
2053 2008).

2054 Information requirements related to the end-of-use options (e.g. reusability) for apparel that is no longer wanted  
2055 could encourage users to opt to give a second life to their apparel, for instance via donation. This would avoid  
2056 the storage of apparel users no longer wish to wear or to keep in their closets.

## 2057 **6.4 User behaviour related to the disposal of apparel**

### 2058 **6.4.1 Reasons for the disposal of apparel**

2059 Disposal<sup>(99)</sup> of apparel happens when a user transfers its ownership to another person or entity (Cluver, 2008).

2060 The main reasons for apparel disposal seem to be due to certain product characteristics changing over time,  
2061 damage or simply for reasons related to consumer preferences.

#### 2062 — **Factors influencing disposal decisions:**

2063 • Individual characteristics, habits, demographics, product traits, and quality influence the decision  
2064 to dispose of an apparel products (Cluver, 2008; Goworek et al., 2012, as cited in Harris et al.,  
2065 2016; Sandin et al., 2019).

2066 • Perceived quality is crucial; low quality may lead to early disposal, and owning new apparel  
2067 frequently shortens usage time (Aakko and Niinimäki, 2022).

2068 • Loss of symbolic perceived value also contributes to early disposal (Gwozdz et al., 2017).

#### 2069 — **Reasons for apparel disposal:**

2070 • Common reasons for disposal of apparel include material defects due to wear and tear,  
2071 inappropriate size, loss of shape, and no longer liking the item (Kleinhüchelkotten et al., 2018).

- 2072 • In Norway, reasons include wear or damage and a desire for something new due to changing  
 2073 consumer needs (Klepp and Grimstad, 2001).  
 2074 • Price influences disposal frequency, with consumers valuing higher-priced items and disposing of  
 2075 cheaper apparel more frequently (Morgan and Birtwistle, 2009; Joy et al., 2012).  
 2076 — **Intrinsic durability and user perceptions:**  
 2077 • Intrinsic durability, defined during product design, influences the ability of apparel to withstand  
 2078 wear without compromising functionality and aesthetics (Alliance of Commerce and Deloitte,  
 2079 2022).  
 2080 • Physical issues like abrasion, colour changes, and broken zippers contribute to the perceived loss  
 2081 of intrinsic durability (Laitala and Boks, 2012).  
 2082 — **Disposed apparel problems:**  
 2083 • Predominant problems of disposed apparel: colour fading and fabric-related issues.  
 2084 • Other issues: pilling, fabric breakdown, accidental damage, loss of dimensional stability, logo  
 2085 failure, discoloration, holes in seams, and trim failure (Cooper and Claxton, 2022b).

2086 The combined dataset in **Table 31** from various studies (detailed in Section **9.6.3.1**) provides a comprehensive  
 2087 view of global apparel disposal trends. Survey participants across countries commonly cite intrinsic quality and  
 2088 fit as reasons for disposal of apparel.

2089 Perceived value, taste-related factors, situational reasons, and fashion trends also play a role in apparel  
 2090 disposal. Overall, there is a complex interplay of individual factors contributing to disposal decisions.

2091 **Table 31.** Main reasons for apparel disposal

Publication	Country	Main reasons for the disposal (expressed in % of respondents)				
		Intrinsic quality	Fit issues	Perceived value (e.g. taste-related unsuitability)	Fashion changes	Other (e.g. Situational reasons, functional shortcomings)
Greenpeace (2015)	Germany	92	72	64	40	NA
Ungerth and Carlsson (2011)	Sweden	60	8	21	NA	9
Laitala and Boks (2012)	Norway	49	19	11	NA	19
YouGov (2019)	Italy	31	24	20	NA	25
Laitala and Klepp (2020)	China, Germany, Japan, United Kingdom, and USA	44	13	35	NA	9

2092 N.B. NA: Not Available

2093 *Source: Own elaboration based on data provided in the indicated publications.*

2094 Changes in the product's characteristics may relate to apparel quality issues that can shed light on which types  
 2095 of performance and information requirements could be prioritised extend the duration of use of apparel  
 2096 products. For instance, in order to enhance technical durability for an extended usage period, it is crucial to  
 2097 understand the reasons behind consumer apparel disposal. Gaining such insights should aid in assessing  
 2098 possible ecodesign requirements that foster the durability of the apparel, while also addressing practices  
 2099 associated with premature disposal of apparel which have an overall negative impact on the environment.

2100 Moreover, the reasons for disposal can focus on certain aspects of the product's performance.

2101

## 2102 **6.4.2 Disposal channels**

2103 Users may dispose of apparel directly in the residual waste, donate it for reuse or pass on to family and friends.

### 2104 — **Disposal trends:**

- 2105 ● The person-product type of attachment plays a key role in how apparel may be disposed of.  
2106 Sharing within social circles is consistent behaviour when there are positive associations with the  
2107 user's apparel. Negative associations with the apparel may result in donation, swapping, or  
2108 disposal in the waste bin (Joung and Park-Poaps, 2013; Lewis, 2015). At the same time, throwing  
2109 away usable apparel is generally perceived negatively and as socially reproachable behaviour.
- 2110 ● The overarching observation made by the European Commission. Directorate General Joint  
2111 Research Centre (2021) study regarding the quality of apparel found in residual waste is that there  
2112 exists a correlation between the proportion of apparel collected separately and the average quality  
2113 and value of apparel discarded in residual waste. According to the above-mentioned study, this  
2114 relationship is partly attributable to households' discerning decisions regarding the perceived  
2115 monetary value of apparel, determining which items merit donation or resale for reuse, and which  
2116 have minimal reuse potential. Supporting this notion, a 2018 study conducted in Denmark (Watson  
2117 et al., 2018) lends credence to this theory. It suggests that the 42 000 tonnes of apparel disposed  
2118 of in Danish residual waste for incineration in 2017 held an estimated value of 12-15 million  
2119 euros prior to disposal. In contrast, the 36 000 tonnes of apparel separately collected were sold  
2120 on reuse markets for an estimated 65 million euros, signifying a value per tonne that is four to  
2121 five times higher.

2122 The way users dispose of their apparel provides valuable data that can help shape information requirements  
2123 related to end-of-life behaviour. For instance, information requirements may guide consumers and public  
2124 authorities towards more sustainable choices when disposing of apparel, which could also contribute to  
2125 enhanced separate apparel collection rates as prescribed by the Waste Framework Directive by Member States  
2126 given the significant reuse potential of apparel.

## 2127 **6.4.3 Person-product attachment**

2128 The emotional attachment formed between the apparel and the consumer is generally referred to as 'person-  
2129 product attachment'. This type of connection between a user and an apparel item has an influence on how long  
2130 consumers own certain apparel and how often they make use of it. This person-product attachment is usually  
2131 embedded in the term 'emotional durability', which goes beyond just functionality. The Ellen MacArthur  
2132 Foundation report (Ellen MacArthur Foundation, 2021) defines emotional durability as: 'the product's relevance  
2133 and desirability to a user, or multiple users, over time'.

### 2134 — **Ownership categories:**

- 2135 ● Ownership categories include 'active' (daily use), 'seldom' (several times a year), and 'inactive/in  
2136 storage' (rarely or never used) (Niinimäki and Armstrong, 2013).
- 2137 ● A survey by Niinimäki and Armstrong (2013) identified elements fostering person-product  
2138 attachment:  
2139 ○ Functionality: Comfort, good fit, multi-function, ease of matching, easy to put on.  
2140 ○ Memory: Memories, received from a special person, family ties.  
2141 ○ Emotional satisfaction: Looking/feeling good, receiving compliments, love for the brand.  
2142 ○ Design and style: Good design, in style.  
2143 ○ Fabric and material: Nice colour, pleasant touch, aesthetic, flexible.  
2144 ○ Personal values, quality, effort invested, and financial value: Uniqueness, feeling relaxed,  
2145 durability, high quality, hand-made, reward for self, price (Niinimäki and Armstrong, 2013).

### 2146 — **Value of new apparel and barriers to reuse:**

- 2147 ● Newly purchased apparel holds the highest emotional attachment due to its perceived intrinsic  
2148 value (Forbrugerrådet Tænk, 2022).
- 2149 ● New apparel is used more frequently than older apparel; second-hand apparel is used 30% less  
2150 (Forbrugerrådet Tænk, 2022).
- 2151 ● Reuse may extend the possession span but does not necessarily increase apparel usage (Laitala  
2152 and Klepp, 2021).

### 2153 — **Emotional durability as a forward-looking issue:**

2154

- 2155 • Emotional durability, linked to consumer perceptions, is challenging to measure, relying on social
- 2156 science concepts (Alliance of Commerce and Deloitte, 2022).
- 2157 — **Quality as a key factor in prolonged use:**
- 2158 • Quality is a significant factor in incentivising prolonged apparel use. In fact, consumers express
- 2159 willingness to wear apparel longer if it is of better quality, maintains shape and colour, and has a
- 2160 bonding effect (Kleinhüchelkotten et al., 2019; Laitala et al., 2021).
- 2161 — **Role of designers in increasing emotional attachment:**
- 2162 • Strategies to promote the product-person attachment include designing for long-term needs,
- 2163 incorporating added value, and creating adaptable, modular, or timeless products (Niinimäki and
- 2164 Armstrong, 2013; Alliance of Commerce and Deloitte, 2022).

#### 2165 **6.4.4 Returns of apparel**

2166 The dynamics of online shopping and returns encompass various facets that influence consumer behaviour and  
 2167 preferences. Convenience emerges as a primary driver for the proliferation of online purchases, while return  
 2168 policies and processes significantly shape the shopping experience. This overview delves into return rates,  
 2169 underlying reasons for returns, and the factors influencing return behaviour, shedding light on the complexities  
 2170 of the retail returns landscape.

##### 2171 — **Online shopping and returns:**

- 2172 • Convenience is a key reason for online shopping (AK Wienn and Greenpeace, 2023).
- 2173 • Long return periods encourage more apparel orders, while inconvenient return processes lead to
- 2174 items being stored rather than returned (Forbrugerrådet Tænk, 2022).

##### 2175 — **Return rates and demographics:**

- 2176 • Casual dresses, jackets and jeans have high return rates, with expensive products more likely to
- 2177 be returned (On-going European Environment Agency study).
- 2178 • Women tend to return more online purchases than men (AK Wienn and Greenpeace, 2023; British
- 2179 Fashion Council's Institute of Positive and Roland Berger, 2023).
- 2180 • Young consumers, more active in online shopping, tend to return apparel more frequently, ordering
- 2181 multiple sizes (AK Wienn and Greenpeace, 2023).

##### 2182 — **Reasons for returns:**

- 2183 • **Fit issues:** Fit issues is the main reason for returns, followed by taste-related unsuitability
- 2184 (including shape, material, colour, or pattern dislike), quality and faulty items (Foresight Factory,
- 2185 2021; Zimmermann et al., 2021).
- 2186 • **Mis-buying:** Common issue with online shopping, driven by fitting problems and consumer dislikes
- 2187 (Forbrugerrådet Tænk, 2022).
- 2188 • **Quality concerns:** Low quality, lack of durability, and buyer's remorse also contribute to returns
- 2189 (Bernon et al., 2011).

##### 2190 — **Factors influencing returns:**

- 2191 • **Sizing issues:** Difficulty interpreting sizing scales and inconsistent sizing contribute to fitting
- 2192 problems (Vladimirova et al., 2022).
- 2193 • **Return policies:** Consumers often check return policies before purchasing, and their return
- 2194 experience influences repeat purchases (Asdecker and Sucky, 2019).
- 2195 • **Assumptions about returns:** Many consumers assume returned items are always resold,
- 2196 impacting their return behaviour (Makov, 2023).

2197 Similarly to the reasons for apparel disposal, the causes for apparel returns may shed light on the product  
 2198 aspects that are important for users, e.g. quality. This could support the potential inclusion of durability  
 2199 ecodesign requirements.

2200 **7 Current EU Ecolabel criteria for textile products**

2201 This section analyses the current EU Ecolabel criteria for textile products <sup>(100)</sup> in light of their revision. Section  
 2202 7.1 reports the facts and figures of the criteria, whereas Section 7.2 provides the main suggestions for the  
 2203 criteria revision received via the initial questionnaire (see Table 1 in Section 1). Section 7.3 describes the  
 2204 relationship between the new mandatory ecodesign framework (ESPR) and the revision of the EU Ecolabel  
 2205 criteria for textile products. Finally, Section 7.4 provides a detailed comparison of the criteria for textile products  
 2206 set by the EU Ecolabel, Blue Angel and Nordic Swan. This analysis set the bases to address Article 6(f) of the  
 2207 EU Ecolabel Regulation which promotes synergy with other officially recognised ISO Type I environmental labels  
 2208 (Ecolabels).

2209 **7.1 Facts and figures**

2210 In recent years, the number of licences and products awarded the EU Ecolabel for textile products has  
 2211 continuously increased (**Figure 47** in Section 9.7.1). In September 2023, the EU Ecolabel for textile products  
 2212 counted 86 licences and 9 250 products. The most licences were awarded by Denmark, Italy and Norway,  
 2213 representing 28%, 21% and 13% of the total, respectively. The most products were awarded by Portugal, Italy  
 2214 and Denmark, representing 42%, 36% and 14% of the total, respectively. More details are available in **Table**  
 2215 **80** in Section 9.7.1.

2216 Table 32 reports the figures published in September 2023 according to the type of products. Most licences and  
 2217 products awarded were apparel textiles: 76% and 32% of the total products and licences, respectively.  
 2218 Home/interior textiles were 8% and 18% of the total products and licences, respectively. Cleaning products were  
 2219 11% and 16% of the total products and licences, respectively. Intermediate products represent a significant  
 2220 percentage in terms of licences but less in products.

2221 **Table 32.** Figures of types of products awarded the EU Ecolabel for textile products in September 2023

Type of product	Licences		Products	
	Number	Percentage of the total (%)	Number	Percentage of the total (%)
Apparel textiles	27	32	6 947	76
Home/interior textiles	15	18	688	8
Textile cleaning products	14	16	1 012	11
Intermediate products, such as textile fibres, yarns, fabrics and knitted panels	27	32	512	6
Intermediate products, such as non-fibre elements	2	2	4	<1

2222 N.B. The number of licences and products is affected by the reporting methods used by competent bodies. This results in small discrepancies  
 2223 compared to the total statistics.

2224 *Source: own elaboration based on data provided by EU Ecolabel Helpdesk*

2225 **7.2 Suggestions for the revision of EU Ecolabel criteria**

2226 When voting on the final draft of the current EU Ecolabel criteria, in November 2013, the Commission and the  
 2227 Member States identified some aspects to potentially be assessed during the subsequent revision process of  
 2228 the EU Ecolabel criteria. The proposal suggested investigating the extension of the scope to silk, bamboo fibres,  
 2229 man-made fibres, as well as the use of additional recycled materials and potential alternatives to the use of  
 2230 fluorinated membranes.

2231 The initial questionnaire (see **Table 1** in Section 1) allowed the collection of respondents' opinions on the current  
 2232 EU Ecolabel criteria and on the potential topics to investigate during the revision process. Out of 34 respondents,  
 2233 10 belonged to the manufacturing industry and 6 to governmental institutions (4 competent bodies of the EU  
 2234 Ecolabel), 29% and 18% of the total, respectively. More details about the types of respondents are provided in  
 2235 **Table 81** in Section 9.7.2.

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<sup>100</sup> EU Ecolabel criteria for textile products. Commission Decision of 5 June 2014 establishing the ecological criteria for the award of the EU Ecolabel for textile products. Commission Decision (2014/350/EU). Available at [this link](#).

2236 In general, current EU Ecolabel criteria are perceived to be too complex, and the application process cumbersome  
2237 and bureaucratic, with most of the costs and difficulties being related to the involvement of suppliers, tests and  
2238 certifications.

2239 In particular, two competent bodies declared that applicants usually need clarifications/guidance on which  
2240 products are included in the scope, and which are the corresponding criteria that these specific products must  
2241 meet. A couple of competent bodies reported that some applicants gave up with the application, because they  
2242 lacked data and information on their supply chain. This is further confirmation of the features of the supply  
2243 chain discussed in Section 5.6.

2244 Respondents had different general perceptions about the interest in the EU Ecolabel criteria: 32% think that  
2245 consumers look for textile products with the EU Ecolabel, 52% think that consumers do not look for products  
2246 with the EU Ecolabel, and 16% have no opinion.

2247 Respondents to the initial questionnaire gave specific suggestions on the requirements of the current EU  
2248 Ecolabel criteria for textile products, reported in Section 9.7.2, **Table 82** to **Table 86**.

2249 General suggestions on how to improve the EU Ecolabel criteria included:

- 2250 • simplification of the application process;
- 2251 • harmonisation of the requirements with the ones of other Type I ecolabels;
- 2252 • use of more third-party certifications to prove compliance with the criteria (e.g. on chemicals)  
2253 to streamline the verification process;
- 2254 • facilitating the retrieval of information from the supply chain actors outside the EU;
- 2255 • inclusion of criteria addressing product recyclability and packaging;
- 2256 • alignment with ecodesign requirements developed in the framework of the ESPR.

### 2257 **7.3 Revision of EU Ecolabel criteria within the ESPR framework**

2258 The establishment of the ESPR brings a change in the revision of the EU Ecolabel criteria for products addressed  
2259 by a delegated act of the ESPR. This is the case of the EU Ecolabel criteria for textile products. As mentioned in  
2260 Section 1, Article 34(3) of the ESPR establishes synergies between the mandatory ecodesign legislative  
2261 framework and the EU Ecolabel, as the EU Ecolabel could be used as proof of compliance to Ecodesign  
2262 requirements when ESPR and EU Ecolabel cover the same product groups. The ESPR and EU Ecolabel  
2263 requirements must therefore be coherent and synergic to guarantee that products awarded the EU Ecolabel  
2264 comply with the ESPR requirements set in the relevant delegated act. Therefore, the revision of the EU Ecolabel  
2265 criteria for textile products remains regulated by the EU Ecolabel Regulation, but it should also follow the  
2266 framework of the ESPR.

2267 In particular, this means that the EU Ecolabel criteria should complement ecodesign requirements, increasing  
2268 the ambition level set by the ESPR, complying with the specificities of the EU Ecolabel Regulation. For instance,  
2269 the EU Ecolabel criteria could restrict hazardous chemicals and consider ethical and social aspects where  
2270 appropriate, as well as they could forbid or restrict the use of specific chemicals and substances.

2271 The EU Ecolabel criteria for textile products set the product environmental performance at fibre, fabric and  
2272 product level:

- 2273 • specific fibres must meet requirements on sourcing and emissions at their production stage;
- 2274 • fabrics must demonstrate that they satisfy specific physical durability parameters;
- 2275 • the product, as well as its components, must meet specific requirements regarding chemical  
2276 content.

2277 These EU Ecolabel criteria disregard the final function of the product, e.g. there is no distinction as to whether  
2278 a fabric is used as component of a T-shirt, a winter jacket, or a sofa. As explained in Section 3.2, the same  
2279 approach cannot be used in the PS because ecodesign requirements must include aspects like durability and  
2280 recycled content, which are closely related to the function and use of the textile product. A preliminary exchange  
2281 with the textile industry and associations provided important information on this subject. First, a fabric must be  
2282 designed considering its final use because it undergoes different wear and tear according to the function and  
2283 use of the textile product. Second, the fact that recycled natural fibres are shorter than virgin natural fibres

2284 significantly affects the physical characteristics of the yarn and consequently of the fabric. The longer the fibre,  
2285 the thinner the manufactured yarn can be. Specific yarns are used to produce specific fabrics. In general, a T-  
2286 shirt, which requires thin yarns, can contain less recycled natural fibre than a coat, which can be manufactured  
2287 with thicker yarns. This means that the possibility to use a specific quantity of recycled natural fibres in a textile  
2288 product depends on the function performed by the textile product.

#### 2289 **7.4 Looking for synergies with other Ecolabels used in the EU**

2290 Article 6(f) of the EU Ecolabel Regulation promotes synergy with other officially recognised ISO Type I  
2291 environmental labels (**Ecolabels**). In the EU, besides the EU Ecolabel for textile products, there are the following:

- 2292 • Blue Angel – The German Ecolabel: criteria are set by DE-UZ 154 Basic Award Criteria. Edition  
2293 January 2023, version 2 <sup>(101)</sup>.
- 2294 • Nordic Swan Ecolabel: criteria are set by 'Textiles, hides/skins, and leather'. Version 5.4 <sup>(102)</sup>.

2295 **Table 33** reports the scope of these Ecolabels according to the classification adopted in this PS. Besides some  
2296 differences, the three Ecolabels include in their scope apparel, home/interior textiles, technical textiles like  
2297 cleaning textiles (with the exception of Nordic Swan), and intermediate textile products. Nordic Swan is the only  
2298 Ecolabel addressing hide and leather products.

2299 Section 9.7.3 (from **Table 87** to **Table 93**) describes in parallel the topics addressed by the criteria of the three  
2300 Ecolabels, which all have the same approach. They set the product environmental performance at fibre, fabric  
2301 and product level, as described for the EU Ecolabel criteria in Section 7.3.

2302 The three Ecolabels address the same main topics, even if there are differences in terms of ambition level,  
2303 specific substances and test methods used as verification.

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<sup>101</sup> Blue Angel – The German Ecolabel: DE-UZ 154 Basic Award Criteria. Edition January 2023, version 2. Available at [this link](#). Last accessed on 12 January 2024.

<sup>102</sup> Nordic Swan Ecolabel: Textiles, hides/skins, and leather. Version 5.4. Available at [this link](#). Last accessed on 12 January 2024.

2305 **Table 33.** Scope of the textile Ecolabels used the most in the EU

Type of product	EU Ecolabel <sup>(a)</sup>	Blue Angel <sup>(b)</sup>	Nordic Swan <sup>(c)</sup>
Apparel	Textile clothing and accessories: clothing and accessories consisting of at least 80% by weight of textile fibres in a woven, non-woven or knitted form.	<ul style="list-style-type: none"> <li>- Textile clothing and textile accessories consisting of at least 90% textile fibres by mass.</li> <li>- Functional clothing in which more than 90% by mass of the material is textile fibres or textile substances that have undergone finishing processes (impregnation, sealing, etc.).</li> </ul>	Apparel and accessories, for example trousers, shirts, jackets, workwear, uniforms, underwear, handkerchiefs, scarves.
Home/interior textiles	Interior textiles: textile products for interior use consisting of at least 80% by weight of textile fibres in a woven, non-woven or knitted form.	<ul style="list-style-type: none"> <li>- Textile products for use inside buildings (house and home textiles incl. uncoated carpets) consisting of at least 90% textile fibres by mass.</li> <li>- Bedding consisting of at least 90% textile fibres by mass.</li> </ul>	Furnishing fabrics (for both private and professional use), such as towels, bedding, curtains, tablecloths, pillows, duvets, plus textiles for use in the furnishing of cars/trains/aircraft/boats.
Technical textiles	Cleaning products: woven or non-woven products made from textile fibres and intended for the wet or dry cleaning of surfaces and the drying of kitchenware	<ul style="list-style-type: none"> <li>- Cleaning textiles: woven or non-woven textiles consisting of at least 90% textile fibres by mass that are designed for the wet or dry cleaning of surfaces or for drying household articles.</li> <li>- Textile products designed for food contact (e.g. waxed cloths).</li> </ul>	NA
Intermediate products	<p>Textile fibres, yarn, fabric and knitted panels: intermediate products intended for use in textile clothing and accessories and interior textiles, including upholstery fabric and mattress ticking prior to the application of backings and treatments associated with the final product.</p> <p>Non-fibre elements: intermediate products that are incorporated into textile clothing and accessories and interior textiles, including zips, buttons and other accessories, as well as membranes, coatings and laminates.</p>	<ul style="list-style-type: none"> <li>- Fibres, yarn, fabric, knitted and crocheted items, non-wovens (including textile composites).</li> <li>- Fibres made of stainless steel and mineral fibres are limited to a maximum of 10% by mass.</li> </ul>	<ul style="list-style-type: none"> <li>- Fibres*, yarn, fabric.</li> <li>* Only the following fibre types can be certified with the Nordic Swan Ecolabel as a certified fibre and only if the relevant fibre requirements of the criteria are met: Organic cotton fibres, wool, and other creatine fibres (either sheep, camel, alpaca, or goat), regenerated cellulose produced by closed loop process, flax (linen), silk, bamboo, sisal and other bast fibres.</li> <li>- Durable non-woven textiles that are to be used for apparel and accessories or in interior furnishings.</li> </ul>
Other products	NA	Handbags, bicycle bags, backpacks and school bags consisting of at least 70% textile fibres by mass.	<ul style="list-style-type: none"> <li>- Purses, wallets, and bags.</li> <li>- Hide and leather products, such as jackets, trousers or bags, and hides/skins and leather as raw materials for clothing or home furnishings (including for cars/trains/aircraft/boats), from the following species of animal: sheep, goat, cow, horse, pig, elk, deer, and reindeer.</li> </ul>

2306 <sup>(a)</sup> EU Ecolabel criteria for textile products. Commission Decision (2014/350/EU).

2307 <sup>(b)</sup> Blue Angel – The German Ecolabel: DE-UZ 154 Basic Award Criteria. Edition January 2023, version 2.

2308 <sup>(c)</sup> Nordic Swan Ecolabel: Textiles, hides/skins, and leather. Version 5.4.

2309 N.B. The classification of the type of products follows the classification adopted in this PS, which does not necessarily correspond to the classification given by the specific Ecolabel. NA: Not available.

2311 Source: own production

## 2312 **8 Public procurement and current EU voluntary Green Public Procurement** 2313 **criteria**

2314 As mentioned in Section 1, the PS will provide the scientific and technical basis for the future development of  
2315 the possible mandatory EU GPP requirements for textile products within the framework of the ESPR. To this  
2316 aim, it is important to assess the current public procurement of apparel in the EU (Section 8.1), and the current  
2317 status of the voluntary EU GPP criteria, which could provide important learnings for the development of future  
2318 mandatory criteria (Section 8.2).

### 2319 **8.1 Public procurement in the EU**

2320 Public procurement in the EU is regulated by Directive 2014/24/EU<sup>(103)</sup>, Directive 2014/23/EU<sup>(104)</sup> and Directive  
2321 2014/25/EU<sup>(105)</sup>. Monitoring public procurement is currently a challenging task. The first reporting and  
2322 monitoring exercise (COM(2021) 245 final)<sup>(106)</sup> submitted by Member States showed that all reports contained  
2323 more qualitative information than quantitative data. Additionally, the incomplete available data limited the  
2324 analysis at EU level (COM(2021) 245 final). The monitoring exercise showed that Member States follow  
2325 different methodologies for data collection, and that in several cases there were discrepancies between figures  
2326 collected at country level and figures reported on Tenders Electronic Daily (TED)<sup>(107)</sup>.

2327 TED is the online version of the 'Supplement to the Official Journal' of the EU, which is dedicated to European  
2328 public procurement. TED gathers information covering public procurement for the European Economic Area,  
2329 Switzerland, and the Republic of North Macedonia from 1 January 2006 to 31 December 2021. These data  
2330 include the most important information of the contract notice and contract award notice standard forms, such  
2331 as who bought what from whom, for how much, and which procedure and award criteria were used. Therefore,  
2332 TED is the only platform that can currently be used to analyse public procurement in the EU.

2333 Generally, the data reported in TED consist of tenders above the procurement threshold of EUR 139 000.  
2334 Nevertheless, many public authorities register on TED data of their tenders below this mandatory threshold.

2335 Goods, works, and services that are being procured are classified with Common Procurement Vocabulary (CPV)  
2336 codes. CPV codes help procurement personnel to classify their contract notices and to help suppliers find the  
2337 notices which are of interest.

2338 Each CPV code nine digits: the first two digits identify the divisions (XX000000-Y); the first three digits identify  
2339 the groups (XXX00000-Y); the first four digits identify the classes (XXXX0000-Y); the first five digits identify the  
2340 categories (XXXXX000-Y). Each of the last three digits gives a greater degree of precision within each category.  
2341 A ninth digit serves to verify the previous digits.

2342 **Table 94** in Section 9.8.1 reports the CPV codes for products in the scope of the PS.

2343 CPV codes related to apparel were investigated in the TED dataset<sup>(108)</sup> for 5 years before the pandemic (2015-  
2344 2019). This time interval was chosen to investigate the latest evolution of public procurements without  
2345 considering the market disruption caused by the COVID-19 pandemic in 2020.

2346 The description of CPV codes reported in the Contract Award allowed the analysis of apparel public procurement  
2347 as reported in **Table 34**. The number of Contract Awards procuring apparel in the EU gradually increased from  
2348 556 in 2015 to 1 261 in 2019. Products included in the CPV group of 'Occupational clothing, special workwear  
2349 and accessories' were the most purchased by public authorities in the investigated years, representing between  
2350 42% and 46% of the total procured apparel reported in TED.

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<sup>103</sup> Public Procurement Directive. Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC (Text with EEA relevance)Text with EEA relevance. Available at [this link](#).

<sup>104</sup> Award of Concession Contracts Directive. Directive 2014/23/EU of the European Parliament and of the Council of 26 February 2014 on the award of concession contracts (Text with EEA relevance) Text with EEA relevance. Available at [this link](#).

<sup>105</sup> Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC (Text with EEA relevance)Text with EEA relevance. Available at [this link](#).

<sup>106</sup> Report from the Commission - Implementation and best practices of national procurement policies in the Internal Market. COM/2021/245 final. Available at [this link](#).

<sup>107</sup> Tenders Electronic Daily (TED). The online version of the 'Supplement to the Official Journal' of the EU, dedicated to European public procurement. Available at [this link](#). Last visited on 12 January 2024.

<sup>108</sup> Tenders Electronic Daily (TED) (csv subset) – public procurement notices. Available at [this link](#). Last accessed on 12 January 2024.

2351 The analysis showed that the Member States with the highest number of Contract Awards reported in TED were  
 2352 France, Germany, Poland and Czechia. More details about the analysis are available in Section 9.8.2.

2353 **Table 34.** Number of Contract Awards procuring apparel in the EU

CPV code	2015		2016		2017		2018		2019	
	N	%	N	%	N	%	N	%	N	%
181XXXX-X Occupational clothing, special workwear and accessories	241	43	285	46	360	43	431	44	533	42
182XXXX-X Outerwear	61	11	68	11	93	11	93	10	124	10
183XXXX-X Garments	57	10	60	10	88	11	99	10	138	11
184XXXX-X Special clothing and accessories	110	20	47	8	97	12	111	11	142	11
351134XX-X Protective and safety clothing	14	3	37	6	50	6	69	7	103	8
3741XXXX-X Sport goods and equipment	7	1	11	2	8	1	10	1	15	1
3581XXXX-X Individual and support equipment	66	12	108	18	133	16	158	16	206	16
Total	556	100	616	100	829	100	971	100	1 261	100

2354 N.B. N: number of Contract Awards. %: Percentage of Contract Awards compared to the total number of contracts related to textile products.

2355 Source: own elaboration based on Tenders Electronic Daily (TED) (csv subset) – public procurement notices<sup>(108)</sup>.

## 2356 8.2 Current voluntary EU Green Public Procurement criteria

2357 As mentioned in Section 1, the PS will provide the scientific and technical basis for the future development of  
 2358 the mandatory EU GPP requirements for textile products within the framework of the ESPR. To this aim, the  
 2359 analysis of current voluntary EU GPP criteria<sup>(109)</sup> could provide some important learnings.

2360 The current voluntary EU GPP criteria are based on the current EU Ecolabel criteria for textile products. In  
 2361 addition to EU Ecolabel criteria, the voluntary EU GPP criteria suggest some requirements about textile services  
 2362 related to laundry operations and take-back systems.

2363 The initial questionnaire (see **Table 1** in Section 1) allowed the collection of respondents' opinions on the status  
 2364 of the current voluntary EU GPP criteria and on the lessons learnt so far. Out of 34 respondents, 12 belonged  
 2365 to the governmental institutions and 6 to the manufacturing industry, 35% and 18% of the total, respectively.  
 2366 More details about the types of respondents are provided in **Table 100** in Section 9.8.3.

2367 The questionnaire showed that although many European countries<sup>(110)</sup> have GPP schemes on textile products,  
 2368 it is not possible to understand the uptake of the EU GPP criteria. This is mainly due to their voluntary nature,  
 2369 and the lack of a framework to collect this kind of data.

2370 In light of possible future mandatory EU GPP criteria, respondents provided the following suggestions:

- 2371 — Provide a clear and fixed set of requirements, which will allow manufacturers to produce goods  
 2372 that meet the demand.
- 2373 — Assess administrative obstacles related to the premature disposal of textile products caused by  
 2374 contracting or budget period reasons.
- 2375 — Facilitate the verification of product characteristics to procurers, who are usually not sustainability  
 2376 experts.
- 2377 — Establish a framework based on Life Cycle Costing of durable textile products.

<sup>109</sup> EU GPP criteria for textile products and services. Commission Staff Working Document on EU green public procurement criteria for textiles products and services. SWD(2017) 231 final. Available at [this link](#).

<sup>110</sup> These countries are: Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Malta, the Netherlands, Portugal, Sweden and Norway.

2378 — Establish a framework which considers environmental and social aspects in the whole value chain,  
2379 possibly promoting the purchase of second-hand products.

2380 — Support public authorities to develop a common strategy in purchasing and disposing of textile  
2381 products.

2382 The positions expressed by the respondents to the initial questionnaire are complemented by COM(2021) 245  
2383 final <sup>(106)</sup>. This Communication lists the main aspects hindering the adoption of current voluntary EU GPP criteria:

2384 • the lack of legal obligation;

2385 • the lack of legal certainty on the correct interpretation of the requirement for a 'link to the  
2386 subject matter of the contract' and the general fear of litigation;

2387 • the lack of data proving the economic benefits of applying GPP criteria;

2388 • the difficulty to monitor their application;

2389 • the lack of specific knowledge and skills of the public servants engaged in tendering  
2390 procedures;

2391 • the fact that GPP may be perceived as an obstacle to competition, specifically restricting SME  
2392 participation in public tendering.

2393

DRAFT - work in progress

2394 **References**

- 2395 Aakko M, Niinimäki K. 2022. Quality matters: reviewing the connections between perceived quality and clothing  
2396 use time. *J Fash Mark Manag Int J* **26**(1): 107–125. doi: 10.1108/JFMM-09-2020-0192
- 2397 AB-REOC and BV-OECO. 2019. De Belgische consument en kleding.
- 2398 Adam Barone. 2022 Nov 28. Quota. Investopedia. Available at <https://www.investopedia.com/terms/q/quota.asp>.  
2399 Accessed 2023 Aug 17.
- 2400 Adigüzel F, Linkowski C, Olson E. 2020. Do Sustainability Labels Make Us More Negligent? Rebound and Moral  
2401 Licensing Effects in the Clothing Industry. In: Muthu SS, Gardetti MA, editors. *Sustainability in the Textile  
2402 and Apparel Industries*. Cham: Springer International Publishing. p. 1–18. doi: 10.1007/978-3-030-  
2403 38532-3\_1
- 2404 A.I.S.E. 2017a. Low temperature washing. Available at  
2405 [https://www.aise.eu/documents/document/20171215161844-aise\\_expo17\\_laundry-b2-  
2406 low\\_temp\\_def.pdf](https://www.aise.eu/documents/document/20171215161844-aise_expo17_laundry-b2-low_temp_def.pdf).
- 2407 A.I.S.E. 2017b. Pan-European consumer habits survey 2017. Perceptions of cleanliness and hygiene. Available  
2408 at [https://www.aise.eu/documents/document/20180528165059-  
2409 aise\\_consumershabitssurvey2017\\_summary\\_final.pdf](https://www.aise.eu/documents/document/20180528165059-aise_consumershabitssurvey2017_summary_final.pdf).
- 2410 A.I.S.E. 2020. Pan-European consumer habits survey 2020. Available at [https://www.aise.eu/our-  
2411 activities/information-to-end-users/consumer-research.aspx](https://www.aise.eu/our-activities/information-to-end-users/consumer-research.aspx).
- 2412 AK Wienn, Greenpeace. 2023. FASHION CONSUMPTION IN AUSTRIA: a high level of awareness, but potential to  
2413 do more. Available at [https://www.akeuropa.eu/en/sustainable-fashion-consumption-austria-high-  
2414 level-awareness-potential-do-more](https://www.akeuropa.eu/en/sustainable-fashion-consumption-austria-high-level-awareness-potential-do-more).
- 2415 Aldalbahi A, El-Naggar M, El-Newehy M, Rahaman M, Hatshan M, Khattab T. 2021. Effects of Technical Textiles  
2416 and Synthetic Nanofibers on Environmental Pollution. *Polymers* **13**(1): 155. doi:  
2417 10.3390/polym13010155
- 2418 Alliance of Commerce, Deloitte. 2022. Les Cahiers de la mode durable. Available at  
2419 [https://www.alliancecommerce.org/cahier-de-la-mode-durable-n3-prolonger-la-vie-des-produits-un-  
2420 defi-pour-les-marques/](https://www.alliancecommerce.org/cahier-de-la-mode-durable-n3-prolonger-la-vie-des-produits-un-defi-pour-les-marques/).
- 2421 Alyssa Hardy. 2020 Jan 9. Let's Stop Pretending We Need New Clothes Every Season. InStyle. Available at  
2422 <https://www.instyle.com/fashion/future-of-fashion-is-seasonless>. Accessed 2023 Sep 15.
- 2423 Amasawa E, Kimita K. 2023. Deducing environmental implication of clothing rental from consumer voices and  
2424 behaviors: a social experiment in Japan. 5th PLATE Conference. Available at  
2425 <https://aaltodoc.aalto.fi/handle/123456789/122687>.
- 2426 Amicarelli V, Bux C, Spinelli MP, Lagioia G. 2022. Life cycle assessment to tackle the take-make-waste paradigm  
2427 in the textiles production. *Waste Manag* **151**: 10–27. doi: 10.1016/j.wasman.2022.07.032
- 2428 Amini R, Ghaffarianhoseini Amirhosein, Ghaffarianhoseini Ali, Berardi U. 2021. Numerical investigation of indoor  
2429 thermal comfort and air quality for a multi-purpose hall with various shading and glazing ratios. *Therm  
2430 Sci Eng Prog* **22**: 100812. doi: 10.1016/j.tsep.2020.100812
- 2431 Amobonye A, Bhagwat P, Raveendran S, Singh S, Pillai S. 2021. Environmental Impacts of Microplastics and  
2432 Nanoplastics: A Current Overview. *Front Microbiol* **12**: 768297. doi: 10.3389/fmicb.2021.768297
- 2433 Anisha, Kalaivani. 2016. Factors influencing buyers behaviour while purchasing. *Shanlax International Journal  
2434 of Commerce* **4**(3). Available at [https://www.shanlaxjournals.in/pdf/COM/V4N3/COM\\_V4\\_N3\\_020.pdf](https://www.shanlaxjournals.in/pdf/COM/V4N3/COM_V4_N3_020.pdf).

- 2435 Anthesis. 2015. Clothing Durability Report. Banbury: WRAP. Available at [https://www.teraz-](https://www.teraz-srodowisko.pl/media/pdf/aktualnosci/1694-Clothing-Durability.pdf)  
2436 [srodowisko.pl/media/pdf/aktualnosci/1694-Clothing-Durability.pdf](https://www.teraz-srodowisko.pl/media/pdf/aktualnosci/1694-Clothing-Durability.pdf). Accessed 2023 Dec 16.
- 2437 Asdecker B, Sucky E. 2019. Der Weg aus der Retourenfalle. *Best in procurement : BIP ; das Magazin für Manager*  
2438 *in Einkauf und Logistik* **10**(6): 46–48.
- 2439 Aslan B, Stevenson M, Hendry LC. 2015. The applicability and impact of Enterprise Resource Planning (ERP)  
2440 systems: Results from a mixed method study on Make-To-Order (MTO) companies. *Comput Ind* **70**:  
2441 127–143. doi: 10.1016/j.compind.2014.10.003
- 2442 Badgett JO. 2017. An Evaluation of the Quality of Mens 100% Cotton Jersey Knit T-Shirts Representing Three  
2443 Retail Categories. , in press. University of Kentucky Libraries. doi: 10.13023/ETD.2017.289
- 2444 Batra SK, Pourdeyhimi B. 2012. *Introduction to Nonwovens Technology*. DEStech Publications, Inc.
- 2445 Bauer B, Watson D, Gylling A, Remmen A, Lysemose MH, Hohenthal C, Jönbrink A-K. 2018. Potential Ecodesign  
2446 Requirements for Textiles and Furniture. Nordic Council of Ministers. Report No.: TemaNord 2018:535.  
2447 Available at <http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A1221509&dswid=6042>.
- 2448 Bernon M, Rossi S, Cullen J. 2011. Retail reverse logistics: a call and grounding framework for research. *Int J*  
2449 *Phys Distrib Logist Manag* **41**(5): 484–510. doi: 10.1108/09600031111138835
- 2450 Beton A, Dias D, Farrant L, Gibon T, Le GY, Desaxce M, Perwultz A, Boufateh I. 2014 Jan 28. Environmental  
2451 Improvement Potential of textiles (IMPRO Textiles). *JRC Publ Repos*, in press. doi: 10.2791/52624
- 2452 Botta V. 2021. Durable, repairable and mainstream: How ecodesign can make our textiles circular. ECOS.  
2453 Available at [https://ecostandard.org/section\\_documents/report-durable-repairable-and-mainstream-](https://ecostandard.org/section_documents/report-durable-repairable-and-mainstream-how-ecodesign-can-make-our-textiles-circular/)  
2454 [how-ecodesign-can-make-our-textiles-circular/](https://ecostandard.org/section_documents/report-durable-repairable-and-mainstream-how-ecodesign-can-make-our-textiles-circular/).
- 2455 Botta V, Magnusson E. 2022. Deep dive: Standards to measure textile durability. Brussels: ECOS - Environmental  
2456 Coalition on Standards. Available at [https://euagenda.eu/upload/publications/ecos-report-standards-to-](https://euagenda.eu/upload/publications/ecos-report-standards-to-measure-textile-durability-december-2023.pdf)  
2457 [measure-textile-durability-december-2023.pdf](https://euagenda.eu/upload/publications/ecos-report-standards-to-measure-textile-durability-december-2023.pdf). Accessed 2023 Dec 2.
- 2458 Boucher J, Friot D. 2017. *Primary Microplastics in the Oceans: A Global Evaluation of Sources*. IUCN International  
2459 Union for Conservation of Nature. doi: 10.2305/IUCN.CH.2017.01.en
- 2460 Britannica. 2019. Spinning | Synthetic Fibers, Textile Machinery & Spinning Processes |. Britannica. Available at  
2461 <https://www.britannica.com/technology/spinning-yarn-manufacturing>. Accessed 2023 Jul 31.
- 2462 British Fashion Council's Institute of Positive, Roland Berger. 2023. Solving fashion's product returns-How to  
2463 keep value in a closed-loop system.
- 2464 Brondino G. 2022. Global value chain analysis of the automotive and garment sectors: a study of Germany,  
2465 Spain, Romania, Indonesia and Mexico for 2000 2014. , in press. doi: doi:10.2760/966324
- 2466 Bye E, McKinney E. 2007. Sizing up the Wardrobe—Why We Keep Clothes That Do Not Fit. *Fash Theory* **11**(4):  
2467 483–498. doi: 10.2752/175174107X250262
- 2468 Cai Y-J, Choi T-M. 2020. A United Nations' Sustainable Development Goals perspective for sustainable textile  
2469 and apparel supply chain management. *Transp Res Part E Logist Transp Rev* **141**: 102010. doi:  
2470 10.1016/j.tre.2020.102010
- 2471 CECU, Amigos de la Tierra. 2022. INFORME SOBRE CONDUCTAS DE CONSUMO Y REPARABILIDAD. Universidad  
2472 de Salamanca.
- 2473 Clark M. 2011. *Handbook of Textile and Industrial Dyeing: Principles, Processes and Types of Dyes*. Elsevier.

- 2474 Claxton S, Kent A. 2020. The management of sustainable fashion design strategies: An analysis of the designer's  
2475 role. *J Clean Prod* **268**: 122112. doi: 10.1016/j.jclepro.2020.122112
- 2476 Cluver BG. 2008. Consumer Clothing Inventory Management. Oregon State University.
- 2477 COFREET. 2023. Baromètre COFREET 2022 : Les Français et l'étiquette d'entretien textile. Available at  
2478 [https://www.lavermonlinge.com/article/FR/cofreet/quelques\\_chiffres/resultats-du-5eme-barometre-](https://www.lavermonlinge.com/article/FR/cofreet/quelques_chiffres/resultats-du-5eme-barometre-cofreet-ipsos)  
2479 [cofreet-ipsos](https://www.lavermonlinge.com/article/FR/cofreet/quelques_chiffres/resultats-du-5eme-barometre-cofreet-ipsos).
- 2480 Conrady T, Kruschwitz A, Stamminger R. 2014. Influencing the sustainability of washing behavior by using  
2481 motivational interviewing. *Energy Effic* **7**(2): 163–178. doi: 10.1007/s12053-013-9215-9
- 2482 Consumers, Health, Agriculture and Food Executive Agency., LE Europe., VVA Europe., IPSOS., ConPolicy.,  
2483 Trinomics. 2018. *Behavioural Study on Consumers' Engagement in the Circular Economy: Final Report*.  
2484 LU: Publications Office. Available at <https://data.europa.eu/doi/10.2818/956512>. Accessed 2024 Feb 8.
- 2485 Cook SC, Yurchisin J. 2017. Fast fashion environments: consumer's heaven or retailer's nightmare? *Int J Retail*  
2486 *Distrib Manag* **45**(2): 143–157. doi: 10.1108/IJRDM-03-2016-0027
- 2487 Cooper T, Claxton S. 2022a. Garment failure causes and solutions: Slowing the cycles for circular fashion. *J*  
2488 *Clean Prod* **351**: 131394. doi: 10.1016/j.jclepro.2022.131394
- 2489 Cooper T, Claxton S. 2022b. Garment failure causes and solutions: Slowing the cycles for circular fashion. *J*  
2490 *Clean Prod* **351**: 131394. doi: 10.1016/j.jclepro.2022.131394
- 2491 Cura K, Rintala N, Kamppuri T, Saarimäki E, Heikkilä P. 2021. Textile Recognition and Sorting for Recycling at an  
2492 Automated Line Using Near Infrared Spectroscopy. *Recycling* **6**(1): 11. doi: 10.3390/recycling6010011
- 2493 D&B. 2020. Gedragsonderzoek kleding. Available at [https://open.overheid.nl/documenten/ronl-6e59a9f4-1e95-](https://open.overheid.nl/documenten/ronl-6e59a9f4-1e95-4ffd-9316-a49affe5b271/pdf)  
2494 [4ffd-9316-a49affe5b271/pdf](https://open.overheid.nl/documenten/ronl-6e59a9f4-1e95-4ffd-9316-a49affe5b271/pdf).
- 2495 De Almeida A, Fonseca P, Schломann B, Feilberg N. 2011. Characterization of the household electricity  
2496 consumption in the EU, potential energy savings and specific policy recommendations. *Energy Build*  
2497 **43**(8): 1884–1894. doi: 10.1016/j.enbuild.2011.03.027
- 2498 De Klerk HM, Lubbe S. 2008. Female consumers' evaluation of apparel quality: exploring the importance of  
2499 aesthetics. *J Fashion Mark Manag Int J* **12**(1): 36–50. doi: 10.1108/13612020810857934
- 2500 DG ENV. 2023. Combatting microplastic pollution in the European Union (Part 3/3). European Commission,  
2501 Directorate-General for Environment. SWD(2023)332 Report No.: part 3/3. Available at  
2502 [https://ec.europa.eu/transparency/documents-](https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2023)332&lang=en&lang=en)  
2503 [register/detail?ref=SWD\(2023\)332&lang=en&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2023)332&lang=en&lang=en).
- 2504 DG GROW. 2021a. Data on the EU textile ecosystem and its competitiveness - Final report. Luxembourg: European  
2505 Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. Available  
2506 at [https://op.europa.eu/en/publication-detail/-/publication/574c0bfe-6142-11ec-9c6c-](https://op.europa.eu/en/publication-detail/-/publication/574c0bfe-6142-11ec-9c6c-01aa75ed71a1/language-en/format-PDF/source-298907666)  
2507 [01aa75ed71a1/language-en/format-PDF/source-298907666](https://op.europa.eu/en/publication-detail/-/publication/574c0bfe-6142-11ec-9c6c-01aa75ed71a1/language-en/format-PDF/source-298907666). Accessed 2023 Apr 12.
- 2508 DG GROW. 2021b. Study on the technical, regulatory, economic and environmental effectiveness of textile fibres  
2509 recycling: final report. Luxembourg: European Commission, Directorate-General for Internal Market,  
2510 Industry, Entrepreneurship and SMEs. Available at <https://data.europa.eu/doi/10.2873/828412>.  
2511 Accessed 2023 Jul 4.
- 2512 Djafarova E, Bowes T. 2021. 'Instagram made Me buy it': Generation Z impulse purchases in fashion industry. *J*  
2513 *Retail Consum Serv* **59**: 102345. doi: 10.1016/j.jretconser.2020.102345
- 2514 Dodd N, Gama CM. 2017 Jun. Revision of the EU Green Public Procurement (GPP) Criteria for Textile Products  
2515 and Services: Technical Report with final criteria. *Jt Res Cent JRC*: 80. doi: 10.2760/906174

- 2516 Drycleaning Institute. 2015. International Fair claims guide for consumer textiles products. Alexandria - New  
2517 South Wales: Drycleaning Institute of Australia Ltd. Available at [https://irp-](https://irp-cdn.multiscreensite.com/670b4da8678441db9ca09d24ced7de7c/files/uploaded/Fair%20Claims%20Guide.pdf)  
2518 [cdn.multiscreensite.com/670b4da8678441db9ca09d24ced7de7c/files/uploaded/Fair%20Claims%20](https://irp-cdn.multiscreensite.com/670b4da8678441db9ca09d24ced7de7c/files/uploaded/Fair%20Claims%20Guide.pdf)  
2519 [Guide.pdf](https://irp-cdn.multiscreensite.com/670b4da8678441db9ca09d24ced7de7c/files/uploaded/Fair%20Claims%20Guide.pdf). Accessed 2024 Feb 5.
- 2520 ECOS, Botta V, Cabral I. 2021. Durable, repairable and mainstream - How ecodesign can make our textiles  
2521 circular. ECOS - Environmental Coalition on Standards. Available at [https://ecostandard.org/wp-](https://ecostandard.org/wp-content/uploads/2021/04/ECOS-REPORT-HOW-ECODESIGN-CAN-MAKE-OUR-TEXTILES-CIRCULAR.pdf)  
2522 [content/uploads/2021/04/ECOS-REPORT-HOW-ECODESIGN-CAN-MAKE-OUR-TEXTILES-CIRCULAR.pdf](https://ecostandard.org/wp-content/uploads/2021/04/ECOS-REPORT-HOW-ECODESIGN-CAN-MAKE-OUR-TEXTILES-CIRCULAR.pdf).  
2523 Accessed 2023 Feb 11.
- 2524 EEA. 2022a. An overview of Europe's repair sector. Available at  
2525 <https://circulareconomy.europa.eu/platform/sites/default/files/2022-12/Repair%20sector.pdf>.
- 2526 EEA. 2022b. Textiles and the Environment - The role of design in Europe's circular economy. European  
2527 Environment Agency. Report No.: ETC/CE 2022/2. Available at [https://www.eionet.europa.eu/etcs/etc-](https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-products/etc-ce-report-2-2022-textiles-and-the-environment-the-role-of-design-in-europes-circular-economy)  
2528 [ce/products/etc-ce-products/etc-ce-report-2-2022-textiles-and-the-environment-the-role-of-design-](https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-products/etc-ce-report-2-2022-textiles-and-the-environment-the-role-of-design-in-europes-circular-economy)  
2529 [in-europes-circular-economy](https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-products/etc-ce-report-2-2022-textiles-and-the-environment-the-role-of-design-in-europes-circular-economy). Accessed 2024 Feb 5.
- 2530 Ellen MacArthur Foundation. 2017. A new textiles economy: Redesigning fashion's future. Ellen MacArthur  
2531 Foundation. Available at <http://www.ellenmacarthurfoundation.org/publications>.
- 2532 Ellen MacArthur Foundation. 2021. Circular business models: redefining growth for a thriving fashion industry.
- 2533 Engelberg J, Brassell E. 2019. Differences in Fuel Usage in the United States Housing Stock. U.S. Department of  
2534 Housing and Urban Development and U.S. Census Bureau. Report No.: H150-19. Available at  
2535 <https://www.census.gov/programs-surveys/ahs/research/publications/h150-19.html>.
- 2536 EPA Circular Economy Programme, B&A. 2021. TEXTILES: ATTITUDES & BEHAVIOURS NATIONAL SURVEY 2021.  
2537 Available at [https://www.epa.ie/our-services/monitoring--assessment/circular-](https://www.epa.ie/our-services/monitoring--assessment/circular-economy/textiles/national-attitudes-and-behaviours-survey-2021/)  
2538 [economy/textiles/national-attitudes-and-behaviours-survey-2021/](https://www.epa.ie/our-services/monitoring--assessment/circular-economy/textiles/national-attitudes-and-behaviours-survey-2021/).
- 2539 Eur Eau. 2020. The governance of water services in Europe. Belgium: The European Federation of National  
2540 Associations of Water Services. Available at [https://www.eureau.org/resources/publications/eureau-](https://www.eureau.org/resources/publications/eureau-publications/5219-the-governance-of-water-services-in-europe-2020-edition/file)  
2541 [publications/5219-the-governance-of-water-services-in-europe-2020-edition/file](https://www.eureau.org/resources/publications/eureau-publications/5219-the-governance-of-water-services-in-europe-2020-edition/file). Accessed 2023  
2542 May 8.
- 2543 EURATEX. 2020. Facts & Key Figures 2020 of the European Textile and Clothing Industry. EURATEX, Economic  
2544 and Statistics. Available at [https://euratex.eu/wp-content/uploads/EURATEX-Facts-Key-Figures-2020-](https://euratex.eu/wp-content/uploads/EURATEX-Facts-Key-Figures-2020-LQ.pdf)  
2545 [LQ.pdf](https://euratex.eu/wp-content/uploads/EURATEX-Facts-Key-Figures-2020-LQ.pdf).
- 2546 EURATEX. 2022a. Facts & Key Figures 2022 of the European Textile and Clothing Industry. EURATEX, Economic  
2547 and Statistics. Available at <https://euratex.eu/facts-and-key-figures/>.
- 2548 EURATEX. 2022b Dec 16. The EU Textiles industry is highly concerned about the potential loss of  
2549 competitiveness, caused by the EU's inaction of the energy crisis, and Chinese and US subsidies to  
2550 domestic industry. EURATEX. Available at [https://euratex.eu/news/the-eu-textiles-industry-is-highly-](https://euratex.eu/news/the-eu-textiles-industry-is-highly-concerned-about-the-potential-loss-of-competitiveness-caused-by-the-eus-inaction-of-the-energy-crisis-and-chinese-and-us-subsidies-to-domestic-industry/)  
2551 [concerned-about-the-potential-loss-of-competitiveness-caused-by-the-eus-inaction-of-the-energy-](https://euratex.eu/news/the-eu-textiles-industry-is-highly-concerned-about-the-potential-loss-of-competitiveness-caused-by-the-eus-inaction-of-the-energy-crisis-and-chinese-and-us-subsidies-to-domestic-industry/)  
2552 [crisis-and-chinese-and-us-subsidies-to-domestic-industry/](https://euratex.eu/news/the-eu-textiles-industry-is-highly-concerned-about-the-potential-loss-of-competitiveness-caused-by-the-eus-inaction-of-the-energy-crisis-and-chinese-and-us-subsidies-to-domestic-industry/). Accessed 2023 Aug 15.
- 2553 European Commission. 2009. Special Eurobarometer 314 - Europeans' attitudes toward chemicals in consumer  
2554 products: Risk perception of potential health hazards. Chemicals - Chemical Safety. Available at  
2555 <https://europa.eu/eurobarometer/surveys/detail/752>.
- 2556 European Commission. 2019. Special Eurobarometer 501 - Attitudes of European citizens towards the  
2557 environment. Environment. doi: 10.2779/902489
- 2558 European Commission. 2023. Retail. Internal Market, Industry, Entrepreneurship and SMEs. Available at  
2559 [https://single-market-economy.ec.europa.eu/single-market/services/retail\\_en](https://single-market-economy.ec.europa.eu/single-market/services/retail_en). Accessed 2023 Sep 19.

- 2560 European Commission. Directorate General for Environment. 2014. Flash Eurobarometer 388 - Attitudes of  
2561 Europeans towards waste management and resource efficiency. Publications Office. Available at  
2562 <https://data.europa.eu/doi/10.2779/14825>.
- 2563 European Commission. Directorate General for Environment. 2023. Flash Eurobarometer 535 - The EU ecolabel:  
2564 report. LU: Publications Office. Available at <https://data.europa.eu/doi/10.2779/463334>. Accessed 2024  
2565 Jan 26.
- 2566 European Commission. Directorate General for Internal Market, Industry, Entrepreneurship and SMEs. 2021.  
2567 *Study on the Technical, Regulatory, Economic and Environmental Effectiveness of Textile Fibres*  
2568 *Recycling: Final Report*. LU: Publications Office. Available at  
2569 <https://data.europa.eu/doi/10.2873/828412>. Accessed 2023 Sep 19.
- 2570 European Commission. Directorate General Joint Research Centre, Donatello S, Danneck J, Löw C, Watson D,  
2571 Konstantas A, Trzepacz S, Liu R, Köhler A, Faraca G. 2021. *Circular Economy Perspectives in the EU*  
2572 *Textile Sector: Final Report*. LU: Publications Office of the European Union. Available at  
2573 <https://data.europa.eu/doi/10.2760/858144>. Accessed 2023 Apr 17.
- 2574 European Parliamentary Research Service. 2019. Environmental impact of the textile and clothing industry -  
2575 What consumers need to know. European Parliament. Available at  
2576 [https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/633143/EPRS\\_BRI\(2019\)633143\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/633143/EPRS_BRI(2019)633143_EN.pdf).
- 2577 Eurostat. 2023. European business statistics user's manual for PRODCOM: 2023 edition. Publications Office.  
2578 Available at <https://data.europa.eu/doi/10.2785/39767>. Accessed 2023 Dec 1.
- 2579 Fashion Revolution. 2020. A survey of EU consumer attitudes to sustainability and supply chain transparency in  
2580 the fashion industry. Available at  
2581 [https://issuu.com/fashionrevolution/docs/fashrev\\_consumersurvey\\_2020\\_full](https://issuu.com/fashionrevolution/docs/fashrev_consumersurvey_2020_full).
- 2582 Finnish Ministry of the Environment. 2023. Konsumenterna i den cirkulära ekonomien MOT ett ett Samhälle som  
2583 främjar cirkulär ekonomier och reparation. Helsinki. Available at [https://urn.fi/URN:ISBN:978-952-361-  
2584 231-0](https://urn.fi/URN:ISBN:978-952-361-231-0).
- 2585 Forbrugerrådet Tænk. 2022. Vejen til et tøjforbrug med mindre miljø-og klimaaftryk. Danish Consumer Council.  
2586 Available at <https://taenk.dk/det-kaemper-vi-for-sammen-mod-toejspild>.
- 2587 Foresight Factory. 2021. Future of Shopping - Global Report. Available at [http://www.foresightfactory.co/wp-  
2588 content/uploads/2021/07/Snap-Final-Global-Report-.pdf](http://www.foresightfactory.co/wp-content/uploads/2021/07/Snap-Final-Global-Report-.pdf).
- 2589 Frydendal J, Hansen LE, Bonou A. 2018. Environmental Labels and Declarations. In: Hauschild MZ, Rosenbaum  
2590 RK, Olsen SI, editors. *Life Cycle Assessment*. Cham: Springer International Publishing. p. 577–604. doi:  
2591 10.1007/978-3-319-56475-3\_24
- 2592 Ghaani Farashahi B, Easter E, Annett-Hitchcock K. 2018a. Price and perceived product quality: a comparison of  
2593 denim jeans in three price categories. *J Fashion Mark Manag Int J* **22**(3): 369–386. doi: 10.1108/JFMM-  
2594 10-2017-0104
- 2595 Ghaani Farashahi B, Easter E, Annett-Hitchcock K. 2018b. Price and perceived product quality: a comparison of  
2596 denim jeans in three price categories. *J Fashion Mark Manag Int J* **22**(3): 369–386. doi: 10.1108/JFMM-  
2597 10-2017-0104
- 2598 GINETEX. 2017. TEXTILE CARE SYMBOLS. Available at <https://www.ginetex.net/thematique/GB/textile/a-2>.
- 2599 GINETEX. 2019 Nov 7. DURABILITY OF CLOTHES: A MAJOR CONCERN FOR EUROPEANS. Available at  
2600 [https://www.ginetex.net/thematique/GB/textile/a-barometer-for-textile-care-labelling-in-  
2601 europe](https://www.ginetex.net/thematique/GB/textile/a-barometer-for-textile-care-labelling-in-europe)[https://www.ginetex.net/userfiles/files/Maarc%20pour%20COFREET\\_Barometre%20IPSOS\\_GIN  
2602 ETEX.pdf](https://www.ginetex.net/userfiles/files/Maarc%20pour%20COFREET_Barometre%20IPSOS_GINETEX.pdf).

- 2603 Gita Gopinath. 2020 Apr 14. The Great Lockdown: Worst Economic Downturn Since the Great Depression. IMF.  
2604 Available at <https://www.imf.org/en/Blogs/Articles/2020/04/14/blog-weo-the-great-lockdown-worst-economic-downturn-since-the-great-depression>. Accessed 2023 Aug 15.  
2605
- 2606 Gottfridsson M, Zhang Y. 2015. Environmental impacts of shoe consumption - Combining product flow analysis  
2607 with an LCA model for Sweden [Master Thesis]. [Gothenburg]: Chalmers University of Technology.  
2608 Available at <https://publications.lib.chalmers.se/records/fulltext/218968/218968.pdf>. Accessed 2023  
2609 Feb 17.
- 2610 Goworek H, Oxborrow L, Claxton S, McLaren A, Cooper T, Hill H. 2020. Managing sustainability in the fashion  
2611 business: Challenges in product development for clothing longevity in the UK. *J Bus Res* **117**: 629–  
2612 641. doi: 10.1016/j.jbusres.2018.07.021
- 2613 Gray R, Sabaiduc C, Salvidge C, Doriza A. 2022. Clothing longevity and circular business models receptivity in  
2614 the UK. UK: WRAP. Available at <https://wrap.org.uk/resources/report/citizen-insights-clothing-longevity-and-circular-business-models-receptivity-uk>.  
2615
- 2616 Greenpeace. 2015. Wegwerfware Kleidung Repräsentative Greenpeace-Umfrage zu Kaufverhalten, Tragedauer  
2617 und der Entsorgung von Mode. Available at  
2618 [https://www.greenpeace.de/sites/default/files/publications/20151123\\_greenpeace\\_modekonsum\\_flyer.pdf](https://www.greenpeace.de/sites/default/files/publications/20151123_greenpeace_modekonsum_flyer.pdf).  
2619
- 2620 Gupta R, Kushwaha A, Dave D, Mahanta NR. 2022. Waste management in fashion and textile industry: Recent  
2621 advances and trends, life-cycle assessment, and circular economy. In: *Emerging Trends to Approaching  
2622 Zero Waste*. Elsevier. p. 215–242. doi: 10.1016/B978-0-323-85403-0.00004-9
- 2623 Guy A, Green E, Banim M, editors. 2001. *Through the Wardrobe: Women's Relationships with Their Clothes*. 1st  
2624 ed. Oxford International Publishers Ltd. doi: 10.2752/9781847888921
- 2625 Gwozdz W, Steensen Nielsen K, Müller T. 2017. An Environmental Perspective on Clothing Consumption:  
2626 Consumer Segments and Their Behavioral Patterns. *Sustainability* **9**(5): 762. doi: 10.3390/su9050762
- 2627 Harris F, Roby H, Dibb S. 2016. Sustainable clothing: challenges, barriers and interventions for encouraging more  
2628 sustainable consumer behaviour: Sustainable clothing. *Int J Consum Stud* **40**(3): 309–318. doi:  
2629 10.1111/ijcs.12257
- 2630 Hasanbeigi A, Price L. 2012. A review of energy use and energy efficiency technologies for the textile industry.  
2631 *Renew Sustain Energy Rev* **16**(6): 3648–3665. doi: 10.1016/j.rser.2012.03.029
- 2632 Heiny K, Schneide D. 2021. Attitude-Behavior Gap Report: How the industry and consumers can close the  
2633 sustainability Attitude-Behavior Gap in fashion. Zalando. Available at  
2634 <https://corporate.zalando.com/en/our-impact/sustainability/sustainability-reports/attitude-behavior-gap-report>.  
2635
- 2636 Henninger CE, Alevizou PJ, Goworek H, Ryding D, editors. 2017. *Sustainability in Fashion: A Cradle to Upcycle  
2637 Approach*. Cham: Springer International Publishing. doi: 10.1007/978-3-319-51253-2
- 2638 Henninger CE, Brydges T, Iran S, Vladimirova K. 2021. Collaborative fashion consumption – A synthesis and  
2639 future research agenda. *J Clean Prod* **319**: 128648. doi: 10.1016/j.jclepro.2021.128648
- 2640 Henry B, Laitala K, Klepp IG. 2019. Microfibres from apparel and home textiles: Prospects for including  
2641 microplastics in environmental sustainability assessment. *Sci Total Environ* **652**: 483–494. doi:  
2642 10.1016/j.scitotenv.2018.10.166
- 2643 Hildegunn Kyvik Nordås. 2004. *The Global Textile and Clothing Industry Post the Agreement on Textiles and  
2644 Clothing*. Geneva: World Trade Organization. (WTO discussion papers / World Trade Organization; Vol.  
2645 5).

- 2646 Hultén P, Vanyushyn V. 2014. Promotion and shoppers' impulse purchases: the example of clothes. *J Consum*  
2647 *Mark* **31**(2): 94–102. doi: 10.1108/JCM-06-2013-0603
- 2648 Huygens D, Foschi J, Caro D, Caldeira C, Faraca G, Foster G, Solis M, Marschinski R, Napolano L, Astrup Fruergaard  
2649 T, et al. 2023. Techno-scientific assessment of the management options for used and waste textiles  
2650 in the European Union. *JRC134586*, in press. doi: doi:10.2760/6292
- 2651 IEA. 2019. World Energy Balances 2019. Paris: International Energy Agency. Available at  
2652 <https://doi.org/10.1787/3a876031-en>.
- 2653 ILO News. 1996 Oct 28. Globalization Changes the Face of Textile, Clothing and Footwear Industries. Available  
2654 at [http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS\\_008075/lang--en/index.htm](http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_008075/lang--en/index.htm).  
2655 Accessed 2023 Aug 15.
- 2656 INDA. 2023. What are nonwovens. Association of the Nonwoven Fabrics Industry. Available at  
2657 <https://www.inda.org/about-nonwovens/>. Accessed 2023 Sep 20.
- 2658 Jadhav NC, Jadhav AC. 2020. Waste and 3R's in Footwear and Leather Sectors. In: Muthu SS, editor. *Leather*  
2659 *and Footwear Sustainability*. Singapore: Springer Singapore. p. 261–293. doi: 10.1007/978-981-15-  
2660 6296-9\_10
- 2661 Jaffe M, Menczel JD. 2020. Thermal Analysis of Textiles and Fibers, Chapter 1 - Introduction. In: Jaffe M, Menczel  
2662 JD, editors. *Thermal Analysis of Textiles and Fibers*. Woodhead Publishing. p. 1–6. doi: 10.1016/B978-  
2663 0-08-100572-9.00001-X
- 2664 Jana D, Saskia M, Lars FM. 2023. The role of bio-based textile fibres in a circular and sustainable textiles system.  
2665 European Environment Agency. Report No.: ETC-CE Report 2023/5. Available at  
2666 [file:///C:/Users/smoldovan/Downloads/ETC-EEA%20-%20Bio-based%20Textile%20Fibres\\_FINAL.pdf](file:///C:/Users/smoldovan/Downloads/ETC-EEA%20-%20Bio-based%20Textile%20Fibres_FINAL.pdf).
- 2667 Jankoska M, Demboski G. 2017. The influence of the sewing speed and fabric thickness on sewing machine  
2668 stitch formation parameters. *Adv Technol* **6**(2): 72–77. doi: 10.5937/savteh1702072J
- 2669 Jørgensen P-E, Werner A, Constantinou G. 2022. Research and identification of textile plants globally - focusing  
2670 on fiber-to-fiber recycling for the fashion & textile industry. Lifestyle & Design Cluster. Available at  
2671 [https://ldcluster.com/wp-content/uploads/sites/4/2022/08/FINAL-Interactive-mapping-of-global-  
2672 recycling-textile-plants-august-2022-LDC.pdf](https://ldcluster.com/wp-content/uploads/sites/4/2022/08/FINAL-Interactive-mapping-of-global-recycling-textile-plants-august-2022-LDC.pdf).
- 2673 Joung H-M, Park-Poaps H. 2013. Factors motivating and influencing clothing disposal behaviours: Clothing  
2674 disposal behaviours. *Int J Consum Stud* **37**(1): 105–111. doi: 10.1111/j.1470-6431.2011.01048.x
- 2675 Joy A, Sherry JF, Venkatesh A, Wang J, Chan R. 2012. Fast Fashion, Sustainability, and the Ethical Appeal of  
2676 Luxury Brands. *Fash Theory* **16**(3): 273–295. doi: 10.2752/175174112X13340749707123
- 2677 Kalliala EM, Nousiainen P. 1999. Life Cycle Assessment, environmental profile of cotton and polyester-cotton  
2678 fabrics. *Tamp Univ Technol* **1**(1). Available at  
2679 [https://proyectaryproducir.com.ar/public\\_html/Seminarios\\_Posgrado/Material\\_de\\_referencia/LCA%20f  
2680 or%20Cotton%20and%20Polyester-cotton%20fabrics.pdf](https://proyectaryproducir.com.ar/public_html/Seminarios_Posgrado/Material_de_referencia/LCA%20f or%20Cotton%20and%20Polyester-cotton%20fabrics.pdf).
- 2681 Khanna A. 2021. Factors affecting consumer-buying motivations: An empirical study in the behavioral  
2682 economics perspective. *International Journal of Research in Marketing Management and Sales* **3**(2):  
2683 19–23.
- 2684 Kleinhüchelkotten S, Freudenreich B, Glomb M, Hübner G, Landsbek B, Nebel K, Neitzke H-P, Schaltegger S,  
2685 Woznica A. 2019. Slow Fashion: Gestalterische, technische und ökonomische Innovationen für  
2686 massenmarkttaugliche nachhaltige Angebote im Bedarfsfeld "Bekleidung." Hannover, Hamburg.
- 2687 Kleinhüchelkotten S, Neitzke H-P, Schmidt N. 2018. Mode, Kleidung und Nachhaltigkeit: Einstellungen und  
2688 Verhalten - Ergebnisse der Repräsentativbefragung 2017. Hannover: Innabe. Available at

- 2689 [https://www.ecolog-institut.de/wp-content/uploads/2021/04/InNaBe\\_Bericht\\_5-](https://www.ecolog-institut.de/wp-content/uploads/2021/04/InNaBe_Bericht_5-5_Repr%C3%A4sentativbefragung_2.pdf)  
2690 [5\\_Repr%C3%A4sentativbefragung\\_2.pdf](https://www.ecolog-institut.de/wp-content/uploads/2021/04/InNaBe_Bericht_5-5_Repr%C3%A4sentativbefragung_2.pdf).
- 2691 Klepp, Grimstad I. 2001. Hvorfor går klær ut av bruk? Available at <https://hdl.handle.net/20.500.12199/5390>.
- 2692 Klepp IG, Laitala K. 2023a. Washing Clothes. In: *The Routledge History of Fashion and Dress, 1800 to the Present* 1st ed. London: Routledge. p. 491–506. doi: 10.4324/9780429295607-31  
2693
- 2694 Klepp IG, Laitala K. 2023b. Washing Clothes. In: *The Routledge History of Fashion and Dress, 1800 to the Present* 1st ed. London: Routledge. p. 491–506. doi: 10.4324/9780429295607-31  
2695
- 2696 Klepp IG, Laitala K, Wiedemann S. 2020. Clothing Lifespans: What Should Be Measured and How. *Sustainability*  
2697 **12**(15): 6219. doi: 10.3390/su12156219
- 2698 Koay KY, Cheah CW, Lom HS. 2022. An integrated model of consumers' intention to buy second-hand clothing.  
2699 *Int J Retail Distrib Manag* **50**(11): 1358–1377. doi: 10.1108/IJRDM-10-2021-0470
- 2700 Koszewska M. 2016. Understanding Consumer Behavior in the Sustainable Clothing Market: Model Development  
2701 and Verification. In: Muthu SS, Gardetti MA, editors. *Green Fashion*. Singapore: Springer Singapore. p.  
2702 43–94. doi: 10.1007/978-981-10-0111-6\_3
- 2703 Koukouvinos D. 2012. Psychosocial Factors Influencing Young Consumers' Clothing Disposal Behaviour in  
2704 Greece. , in press.
- 2705 Laitala K, Boks C. 2012. Sustainable clothing design: use matters. *J Des Res* **10**(1/2): 121. doi:  
2706 10.1504/JDR.2012.046142
- 2707 Laitala K, Klepp I, Henry B. 2018. Does Use Matter? Comparison of Environmental Impacts of Clothing Based on  
2708 Fiber Type. *Sustainability* **10**(7): 2524. doi: 10.3390/su10072524
- 2709 Laitala K, Klepp IG. 2018. Care and Production of Clothing in Norwegian Homes: Environmental Implications of  
2710 Mending and Making Practices. *Sustainability* **10**(8): 2899. doi: 10.3390/su10082899
- 2711 Laitala K, Klepp IG. 2020a. What Affects Garment Lifespans? International Clothing Practices Based on a  
2712 Wardrobe Survey in China, Germany, Japan, the UK, and the USA. *Sustainability* **12**(21): 9151.  
2713 Multidisciplinary Digital Publishing Institute. doi: 10.3390/su12219151
- 2714 Laitala K, Klepp IG. 2020b. What Affects Garment Lifespans? International Clothing Practices Based on a  
2715 Wardrobe Survey in China, Germany, Japan, the UK, and the USA. *Sustainability* **12**(21): 9151. doi:  
2716 10.3390/su12219151
- 2717 Laitala K, Klepp IG. 2021. Clothing Longevity: The Relationship Between The Number of Users, How Long and  
2718 How Many Times Garments are Used. 2021. 4th PLATE 2021 Virtual Conference 26-28 May 2021;  
2719 Limerick, Ireland. Available at  
2720 [https://www.researchgate.net/publication/352993692\\_Clothing\\_Longevity\\_The\\_Relationship\\_Between\\_The\\_Number\\_of\\_Users\\_How\\_Long\\_and\\_How\\_Many\\_Times\\_Garments\\_are\\_Used](https://www.researchgate.net/publication/352993692_Clothing_Longevity_The_Relationship_Between_The_Number_of_Users_How_Long_and_How_Many_Times_Garments_are_Used).  
2721
- 2722 Laitala K, Klepp IG, Boks C. 2012. Changing laundry habits in Norway: Changing laundry habits in Norway. *Int J*  
2723 *Consum Stud* **36**(2): 228–237. doi: 10.1111/j.1470-6431.2011.01081.x
- 2724 Laitala K, Klepp IG, Haugrønning V, Throne-Holst H, Strandbakken P. 2021. Increasing repair of household  
2725 appliances, mobile phones and clothing: Experiences from consumers and the repair industry. *J Clean*  
2726 *Prod* **282**: 125349. doi: 10.1016/j.jclepro.2020.125349
- 2727 Laitala K, Klepp IG, Henry B. 2018a. Does Use Matter? Comparison of Environmental Impacts of Clothing Based  
2728 on Fiber Type. *Sustainability* **10**(7): 2524. Multidisciplinary Digital Publishing Institute. doi:  
2729 10.3390/su10072524

- 2730 Laitala K, Klepp IG, Henry B. 2018b. Use phase of apparel: A literature review for Life Cycle Assessment with  
2731 focus on wool. , in press. Unpublished. doi: 10.13140/RG.2.2.25769.90729
- 2732 Laitala K, Klepp IG, Kettlewell R, Wiedemann S. 2020. Laundry Care Regimes: Do the Practices of Keeping Clothes  
2733 Clean Have Different Environmental Impacts Based on the Fibre Content? *Sustainability* **12**(18): 7537.  
2734 doi: 10.3390/su12187537
- 2735 Lang C, Armstrong CM, Brannon LA. 2013. Drivers of clothing disposal in the US: An exploration of the role of  
2736 personal attributes and behaviours in frequent disposal: Drivers of frequent clothing disposal. *Int J*  
2737 *Consum Stud* **37**(6): 706–714. doi: 10.1111/ijcs.12060
- 2738 LEITAT. 2017. Implementation of Article 11 under the EU Ecolabel Regulation. Spain: LEITAT-Technological  
2739 Center. Report No.: Deliverable 4. FINAL REPORT. Available at  
2740 [https://ec.europa.eu/environment/ecolabel/documents/180504%20FINAL\\_REPORT\\_ARTICLE11\\_V3%20with%20disclaimer.pdf](https://ec.europa.eu/environment/ecolabel/documents/180504%20FINAL_REPORT_ARTICLE11_V3%20with%20disclaimer.pdf). Accessed 2024 Jan 19.
- 2742 Leslie HA, van Velzen MJM, Brandsma SH, Vethaak AD, Garcia-Vallejo JJ, Lamoree MH. 2022. Discovery and  
2743 quantification of plastic particle pollution in human blood. *Environ Int* **163**: 107199. doi:  
2744 10.1016/j.envint.2022.107199
- 2745 Lewis T. 2015. Apparel disposal and reuse. In: *Sustainable Apparel*. Elsevier. p. 233–250. doi: 10.1016/B978-1-  
2746 78242-339-3.00010-8
- 2747 Lingås D, Manshoven S, Mortensen LF, Paulsen F. 2023. EU exports of used textiles in Europe’s circular economy.  
2748 EEA. Report No.: ETC CE Report 2023/4. Available at <https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-report-2023-4-eu-exports-of-used-textiles-in-europe2019s-circular-economy#:~:text=2023>.
- 2751 Luo Y, Wu X, Ding X. 2023a. Environmental impacts of textiles in the use stage: A systematic review. *Sustain*  
2752 *Prod Consum* **36**: 233–245. doi: 10.1016/j.spc.2023.01.006
- 2753 Luo Y, Wu X, Ding X. 2023b. Environmental impacts of textiles in the use stage: A systematic review. *Sustain*  
2754 *Prod Consum* **36**: 233–245. doi: 10.1016/j.spc.2023.01.006
- 2755 Makov T. 2023. The hidden environmental costs of consumer product returns. 5th PLATE Conference. Available  
2756 at <https://aaltoodoc.aalto.fi/handle/123456789/122687>.
- 2757 Mao N. 2016. Methods for characterisation of nonwoven structure, property, and performance. In: Kellie G,  
2758 editor. *Advances in Technical Nonwovens*. Woodhead Publishing. p. 155–211. doi: 10.1016/B978-0-08-  
2759 100575-0.00006-1
- 2760 de Mattos FB, Esquivel V, Kucera D, Tejani S. 2022. The state of the apparel and footwear industry: Employment,  
2761 automation and their gender dimensions. *Backgr Pap N3 GLO/20/82/EUR[ILO\_REF]*. Available at  
2762 [https://www.ilo.org/employment/Whatwedo/Projects/building-partnerships-on-the-future-of-work/WCMS\\_835423/lang--en/index.htmç](https://www.ilo.org/employment/Whatwedo/Projects/building-partnerships-on-the-future-of-work/WCMS_835423/lang--en/index.htmç).
- 2764 Maya Forstater. 2010 Jan 6. Sectoral coverage of the global economic crisis. Implications of the global financial  
2765 and economic crisis on the textile and clothing sector. *Int Labour Organ*: 32.
- 2766 McKinsey & Company. 2022. Scaling textile recycling in europe turning waste into value. McKinsey Apparel,  
2767 Fashion & Luxury Group. Available at <https://www.mckinsey.com/industries/retail/our-insights/scaling-textile-recycling-in-europe-turning-waste-into-value>.
- 2769 McKinsey & Company, BOF. 2016. The State of Fashion 2017. The Business of Fashion and McKinsey &  
2770 Company. Available at  
2771 <https://www.mckinsey.com/~media/McKinsey/Industries/Retail/Our%20Insights/The%20state%20of%20fashion/The-state-of-fashion-2017-McK-BoF-report.pdf>. Accessed 2023 Dec 8.

- 2773 McLaren A, Goworek H, Cooper T, Oxborrow L, Hill H. 2015. Clothing longevity perspectives: exploring consumer  
2774 expectations, consumption and use. 2015. PLATE conference - Nottingham Trent University, 17/19 June  
2775 2015. Available at [http://irep.ntu.ac.uk/id/eprint/17978/1/220768\\_PubSub2644\\_McLaren.pdf](http://irep.ntu.ac.uk/id/eprint/17978/1/220768_PubSub2644_McLaren.pdf).  
2776 Accessed 2023 Oct 30.
- 2777 McLaren A, Goworek H, Cooper T, Oxborrow L, Hill H. 2016. The effect of consumer attitudes on design for  
2778 product longevity: The case of the fashion industry. 2016 Jun 25. Design Research Society Conference  
2779 2016. doi: 10.21606/drs.2016.456
- 2780 McNeill L, Moore R. 2015. Sustainable fashion consumption and the fast fashion conundrum: fashionable  
2781 consumers and attitudes to sustainability in clothing choice: Sustainable fashion consumption and the  
2782 fast fashion conundrum. *Int J Consum Stud* **39**(3): 212–222. doi: 10.1111/ijcs.12169
- 2783 MEErP. 2011. MEErP: Methodology for Ecodesign of Energy-related Products. European Commission, DG  
2784 Enterprise and Industry Unit B1 Sustainable Industrial Policy under. Report No.: Final report. Available  
2785 at [https://op.europa.eu/en/publication-detail/-/publication/b7650397-32f1-436c-82c4-](https://op.europa.eu/en/publication-detail/-/publication/b7650397-32f1-436c-82c4-df39aef297a3/language-en/format-PDF/source-295028560)  
2786 [df39aef297a3/language-en/format-PDF/source-295028560](https://op.europa.eu/en/publication-detail/-/publication/b7650397-32f1-436c-82c4-df39aef297a3/language-en/format-PDF/source-295028560).
- 2787 Ministry of Ecology and Environment, China. 2021. Guideline on available techniques of pollution prevention  
2788 and control for textile industry. Available at  
2789 <https://www.mee.gov.cn/ywgz/fgbz/bz/bzwb/kxxjszn/202106/W020210809521494726861.pdf>.
- 2790 Mishra M, Kushwaha R, Gupta N, Sinha A, Dwivedi H. 2023. Survey data to evaluate consumer behaviour and  
2791 consumption pattern of sustainable apparel: A study on consumer awareness level. *Data Brief* **49**:  
2792 109350. doi: 10.1016/j.dib.2023.109350
- 2793 Mohapatra P, Gaonkar O. 2021. An overview of toxic chemicals in textiles. New Delhi: Toxics Links. Available at  
2794 <https://toxicslink.org/Publication/ToxicsChemicalinTextileReport>.
- 2795 Monitor, Cotton Incorporated Lifestyle. 2018. Price, Quality and Style: Consumers Seek Shopping Symmetry.  
2796 Available at <https://lifestylemonitor.cottoninc.com/price-quality-and-style/>. Accessed 2023 Nov 15.
- 2797 Morgan L R, Birtwistle G. 2009. An investigation of young fashion consumers' disposal habits. **33**: 190–198. doi:  
2798 <https://doi.org/10.1111/j.1470-6431.2009.00756.x>
- 2799 Munasinghe P, Druckman A, Dissanayake DGK. 2021. A systematic review of the life cycle inventory of clothing.  
2800 *J Clean Prod* **320**: 128852. doi: 10.1016/j.jclepro.2021.128852
- 2801 Murakami S, Oguchi M, Tasaki T, Daigo I, Hashimoto S. 2010. Lifespan of Commodities, Part I - The Creation of  
2802 a Database and Its Review. *Journal of Industrial Ecology* **14**(4): 529–684, i–xi. doi: 0.1111/j.1530-  
2803 9290.2010.00250.x
- 2804 Mustia DI, Edy S, Nurul A. 2021. Analysis of waste composition as a source of refuse-derived fuel in Cilacap.  
2805 *IOP Conf Ser Earth Environ Sci* **896**(1): 012063. doi: 10.1088/1755-1315/896/1/012063
- 2806 Muthu SS. 2015. *Handbook of Life Cycle Assessment (LCA) of Textiles and Clothing*. Elsevier. (Woodhead  
2807 Publishing Series in Textiles; Vol. 172). doi: 10.1016/C2014-0-00761-7
- 2808 Muthu SS. 2020. *Assessing the Environmental Impact of Textiles and the Clothing Supply Chain*. Second edition.  
2809 Elsevier. doi: 10.1016/B978-0-12-819783-7.00001-6
- 2810 Nayak R, Padhye R. 2018. Introduction to automation in garment manufacturing. In: Nayak R, Padhye R, editors.  
2811 *Automation in Garment Manufacturing*. Woodhead Publishing. p. 1–27. doi: 10.1016/B978-0-08-  
2812 101211-6.00001-X
- 2813 Niinimäki K. 2011. *From Disposable to Sustainable: The Complex Interplay between Design and Consumption of*  
2814 *Textiles and Clothing*. Helsinki: Aalto University School of Art and Design. Available at  
2815 <https://aaltodoc.aalto.fi/handle/123456789/13770>.

- 2816 Niinimäki K, Armstrong C. 2013. From pleasure in use to preservation of meaningful memories: a closer look at  
2817 the sustainability of clothing via longevity and attachment. *Int J Fashion Design Technol Educ* **6**(3): 190–  
2818 199. doi: 10.1080/17543266.2013.825737
- 2819 Niinimäki K, Peters G, Dahlbo H, Perry P, Rissanen T, Gwilt A. 2020. The environmental price of fast fashion. *Nat*  
2820 *Rev Earth Environ* **1**(4): 189–200. doi: 10.1038/s43017-020-0039-9
- 2821 OCU. 2018. Otro consumo para un futuro mejor - Nuevas economías al servicio de las personas y el planeta.  
2822 Available at [https://www.ocu.org/consumo-familia/consumo-colaborativo/noticias/otro-consumo-es-](https://www.ocu.org/consumo-familia/consumo-colaborativo/noticias/otro-consumo-es-posible)  
2823 [posible](https://www.ocu.org/consumo-familia/consumo-colaborativo/noticias/otro-consumo-es-posible).
- 2824 OECD. 2022. Best Available Techniques (BAT) for Preventing and Controlling Industrial Pollution. Activity 6: Cross  
2825 Country analysis of BAT and BAT-associated emission and environmental performance levels in the  
2826 Thermal Power Plants, Cement and Textile industries. *Ser Risk Manag*(71).
- 2827 OVAM. 2022. Ecodesign criteria for consumer textiles. Available at [https://ovam-](https://ovam-english.vlaanderen.be/documents/177280/797580/2021+-+Ecodesign+criteria+for+consumer+textiles.pdf/ed47b6c4-a625-300d-64af-8ef88b44cab2?version=2.1&t=1662551112862&download=true)  
2828 [english.vlaanderen.be/documents/177280/797580/2021+-](https://ovam-english.vlaanderen.be/documents/177280/797580/2021+-+Ecodesign+criteria+for+consumer+textiles.pdf/ed47b6c4-a625-300d-64af-8ef88b44cab2?version=2.1&t=1662551112862&download=true)  
2829 [+Ecodesign+criteria+for+consumer+textiles.pdf/ed47b6c4-a625-300d-64af-](https://ovam-english.vlaanderen.be/documents/177280/797580/2021+-+Ecodesign+criteria+for+consumer+textiles.pdf/ed47b6c4-a625-300d-64af-8ef88b44cab2?version=2.1&t=1662551112862&download=true)  
2830 [8ef88b44cab2?version=2.1&t=1662551112862&download=true](https://ovam-english.vlaanderen.be/documents/177280/797580/2021+-+Ecodesign+criteria+for+consumer+textiles.pdf/ed47b6c4-a625-300d-64af-8ef88b44cab2?version=2.1&t=1662551112862&download=true). Accessed 2023 Dec 2.
- 2831 Oxford dictionary. 2023 Sep 13. retail. Oxford dictionary. Available at  
2832 <https://dictionary.cambridge.org/dictionary/english/retail>. Accessed 2023 Sep 19.
- 2833 Piippo R, Niinimäki K, Aakko M. 2022. Fit for the Future: Garment Quality and Product Lifetimes in a CE Context.  
2834 *Sustainability* **14**(2): 726. doi: 10.3390/su14020726
- 2835 Prasannamedha G, Senthilkumar P. 2021. Chemical compliance and regulations in textiles and fashion. In:  
2836 *Chemical Management in Textiles and Fashion*. Elsevier. p. 135–154. doi: 10.1016/B978-0-12-  
2837 820494-8.00007-1
- 2838 Quantis. 2018. Measuring Fashion, 2018. Environmental impact of the global apparel and footwear industries  
2839 study. Full report and methodological considerations. Available at  
2840 <https://quantis.com/report/measuring-fashion-report/>.
- 2841 Quantis. 2021. Measuring fashion: Environmental Impact of the Global Apparel and Footwear Industries Study.  
2842 Quantis. Available at [https://quantis.com/wp-](https://quantis.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf)  
2843 [content/uploads/2018/03/measuringfashion\\_globalimpactstudy\\_full-report\\_quantis\\_cwf\\_2018a.pdf](https://quantis.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf).  
2844 Accessed 2023 Sep 12.
- 2845 Quantis Q. 2022. Draft Product Environmental footprint category 2 rules . Apparel and footwear (PEFCR).  
2846 Switzerland. Report No.: Version 1.3. Available at [https://green-business.ec.europa.eu/environmental-](https://green-business.ec.europa.eu/environmental-footprint-methods_en)  
2847 [footprint-methods\\_en](https://green-business.ec.europa.eu/environmental-footprint-methods_en).
- 2848 Rahman Md. Mizanur, Mashud M, Rahman Md. Mostafizur, editors. 2023. *Advanced Technology in Textiles: Fibre*  
2849 *to Apparel*. Singapore: Springer Nature Singapore. (Textile Science and Clothing Technology). doi:  
2850 10.1007/978-981-99-2142-3
- 2851 Raj A, Chowdhury A, Ali SW. 2022. Green chemistry: its opportunities and challenges in colouration and chemical  
2852 finishing of textiles. *Sustain Chem Pharm* **27**: 100689. doi: 10.1016/j.scp.2022.100689
- 2853 Ranasinghe L, Jayasooriya VM. 2021. Ecolabelling in textile industry: A review. *Resour Environ Sustain* **6**:  
2854 100037. doi: 10.1016/j.resenv.2021.100037
- 2855 Ray S. 2012. Warp knitting machines and knitting elements. p. 144–150. doi: 10.1533/9780857095558.144
- 2856 Roos S, Sandin G, Zamani B, Peters G. 2015. Environmental assessment of Swedish fashion consumption. *Mistra*  
2857 *Future Fashion*. Available at [http://mistrafuturefashion.com/life-cycle-assessment-gives-new-](http://mistrafuturefashion.com/life-cycle-assessment-gives-new-understanding-of-fashions-environmental-impact/)  
2858 [understanding-of-fashions-environmental-impact/](http://mistrafuturefashion.com/life-cycle-assessment-gives-new-understanding-of-fashions-environmental-impact/).

- 2859 Roth J, Zerger B, De GD, Gómez BJ, Roudier S. 2023 Jan 16. Best available techniques (BAT) reference document  
2860 for the Textiles Industry. *JRC Publ Repos*, in press. doi: 10.2760/355887
- 2861 Rulikova M. 2020. "I would never wear those old clodhoppers!": Age differences and used clothing consumption  
2862 in the Czech Republic. *J Consum Cult* **20**(2): 175–193. doi: 10.1177/1469540519891274
- 2863 Sandin G, Roos S, Spak B, Zamani B, Peters G. 2019. Environmental assessment of Swedish clothing consumption  
2864 - six garments, sustainable futures. Mistra Future Fashion. Available at  
2865 <http://mistrafuturefashion.com/impact-of-swedish-clothing-consumption/>.
- 2866 Sandin G, Roos S, Spak, Björn, Zamani B, Peters GM. 2019. Environmental assessment of Swedish clothing  
2867 consumption - six garments, sustainable futures. Mistra Future Fashion Consortium. Available at  
2868 [http://mistrafuturefashion.com/wp-content/uploads/2019/08/G.Sandin-Environmental-assessment-of-](http://mistrafuturefashion.com/wp-content/uploads/2019/08/G.Sandin-Environmental-assessment-of-Swedish-clothing-consumption.MistraFutureFashionReport-2019.05.pdf)  
2869 [Swedish-clothing-consumption.MistraFutureFashionReport-2019.05.pdf](http://mistrafuturefashion.com/wp-content/uploads/2019/08/G.Sandin-Environmental-assessment-of-Swedish-clothing-consumption.MistraFutureFashionReport-2019.05.pdf).
- 2870 Schmitz A, Stamminger R. 2014. Usage behaviour and related energy consumption of European consumers for  
2871 washing and drying. *Energy Effic* **7**(6): 937–954. doi: 10.1007/s12053-014-9268-4
- 2872 Shishoo RL. 1994. Environmental Issues Facing the Technical Textile Industry in Europe. *J Coat Fabr* **24**(2): 117–  
2873 128. doi: 10.1177/152808379402400204
- 2874 Singh HB, Bharati KA. 2014 Jan 1. Handbook of Natural Dyes and Pigments. : 1–299.
- 2875 Sohail Y, Sun D. 2019. Life Cycle Assessment of Technical Textile Waste: Pilot Evaluation of Environmental  
2876 Impacts. 2019. 2nd International Forum on Textiles for Graduate Students 2018; Tianjin Polytechnic  
2877 University, Tianjin, China. Tianjin Polytechnic University. Available at <https://hal.science/hal-02133644>.  
2878 Accessed 2023 Feb 17.
- 2879 Spaepen V, J. Van Camp M, Lenaerts. 2021. One Size Does Not Fit All: Consumer Attitudes towards Circular  
2880 Business Models in Fashion. , in press. Available at <https://orcid.org/0000-0002-8603-7028>.
- 2881 Stephen MacDonald. 2006 Jan 2. The World Bids Farewell to the Multifiber Arrangement - USDA ERS. Economic  
2882 Research Service U.S. Department of Agriculture. Available at [https://www.ers.usda.gov/amber-](https://www.ers.usda.gov/amber-waves/2006/february/the-world-bids-farewell-to-the-multifiber-arrangement/)  
2883 [waves/2006/february/the-world-bids-farewell-to-the-multifiber-arrangement/](https://www.ers.usda.gov/amber-waves/2006/february/the-world-bids-farewell-to-the-multifiber-arrangement/). Accessed 2023 Aug  
2884 17.
- 2885 Szczepanski M. 2019. A decade on from the crisis: Main responses and remaining challenges. EPRS | European  
2886 Parliamentary Research Service. Report No.: PE 642.253. Available at  
2887 [https://www.europarl.europa.eu/thinktank/en/document/EPRS\\_BRI\(2019\)642253](https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2019)642253).
- 2888 TAUW. 2023. Performance requirements for textiles Input on EU sustainable design criteria for textiles. Utrecht.  
2889 Report No.: R001- 1288851BUM-V03- los- NL. Available at  
2890 [https://www.rijksoverheid.nl/documenten/rapporten/2023/09/26/bijlage-eindrapport-onderzoek-](https://www.rijksoverheid.nl/documenten/rapporten/2023/09/26/bijlage-eindrapport-onderzoek-designeisen-textiel)  
2891 [designeisen-textiel](https://www.rijksoverheid.nl/documenten/rapporten/2023/09/26/bijlage-eindrapport-onderzoek-designeisen-textiel). Accessed 2024 Feb 20.
- 2892 Textile Exchange. 2020. Preferred fiber & Materials Market Report 2020. Textile Exchange.
- 2893 Textile Exchange. 2021. Preferred Fiber and Materials Market Report 2021. Textile Exchange.
- 2894 Textile Exchange. 2022. Preferred Fiber & Materials Market Report 2022. Textile Exchange.
- 2895 Textile Exchange. 2023. Materials Market Report. Textile Exchange. Available at  
2896 <https://textileexchange.org/knowledge-center/documents/materials-market-report-2023/>. Accessed  
2897 2023 Dec 19.
- 2898 Thredup. 2023. thredUP's annual Resale Report. Available at [https://cf-assets-](https://cf-assets-tup.thredup.com/resale_report/2023/thredUP_2023_Resale_Report_FINAL.pdf)  
2899 [tup.thredup.com/resale\\_report/2023/thredUP\\_2023\\_Resale\\_Report\\_FINAL.pdf](https://cf-assets-tup.thredup.com/resale_report/2023/thredUP_2023_Resale_Report_FINAL.pdf).

- 2900 UNECE, UNTRADE. 2020. Accelerating action for a sustainable and circular garment and footwear industry:  
2901 which role for transparency and traceability of value chains? Geneva: United Nations Economic  
2902 Commission for Europe. Report No.: ECE/TRADE/449. Available at  
2903 [https://unece.org/DAM/trade/Publications/ECE\\_TRADE\\_449-AcceleratingTanspRraceabilityTextile.pdf](https://unece.org/DAM/trade/Publications/ECE_TRADE_449-AcceleratingTranspRraceabilityTextile.pdf).  
2904 Accessed 2023 Dec 7.
- 2905 UNEP. 2020. Sustainability and Circularity in the Textile Value Chain - Global Stocktaking. Nairobi, Kenya.: United  
2906 Nation Environment Programme. Available at  
2907 [https://www.unep.org/resources/publication/sustainability-and-circularity-textile-value-chain-global-](https://www.unep.org/resources/publication/sustainability-and-circularity-textile-value-chain-global-stocktaking)  
2908 [stocktaking](https://www.unep.org/resources/publication/sustainability-and-circularity-textile-value-chain-global-stocktaking). Accessed 2023 Jun 12.
- 2909 UNEP. 2023a. Sustainability and Circularity in the Textile Value Chain - A Global Roadmap. Paris: United Nations  
2910 Environment Programme (UNEP). Available at  
2911 [https://www.unep.org/resources/publication/sustainability-and-circularity-textile-value-chain-global-](https://www.unep.org/resources/publication/sustainability-and-circularity-textile-value-chain-global-roadmap)  
2912 [roadmap](https://www.unep.org/resources/publication/sustainability-and-circularity-textile-value-chain-global-roadmap).
- 2913 UNEP. 2023b. Environmental labels in Ukraine. Information for Producers in the EU's Eastern Neighbourhood.  
2914 UNEP, OECD, UNECE, UN, UNIDO, The World Bank. Available at  
2915 [https://www.eu4environment.org/app/uploads/2023/06/Ecolabelling-PPT\\_Ukraine\\_EN.pdf](https://www.eu4environment.org/app/uploads/2023/06/Ecolabelling-PPT_Ukraine_EN.pdf). Accessed  
2916 2024 Jan 22.
- 2917 Van Rensburg ML, Nkomo SL, Mkhize NM. 2020. Life cycle and End-of-Life management options in the footwear  
2918 industry: A review. *Waste Manag Res* **38**(6): 599–613. doi: 10.1177/0734242X20908938
- 2919 Vargas F, Yuleimy Ramírez YR. 2014. Potential of Municipal Solid Waste Calorific Energy as Coal Replacement.  
2920 *Tek Rev Científica* **14**(2): 23. doi: 10.25044/25392190.467
- 2921 Vet JMD, Nigohosyan D, Ferrer JN, Gross A-K, Kuehl S, Flickenschild M. 2021 Mar. Impacts of the COVID-19  
2922 pandemic on EU industries. , in press.
- 2923 Vinted. 2021. Climate Change Impact Report - Understanding the avoided emissions of second-hand shopping  
2924 on Vinted. Available at [https://press-center-](https://press-center-static.vinted.com/Vaayu_x_Vinted_Full_Climate_Impact_Report_2021_045f9e5c4b.pdf)  
2925 [static.vinted.com/Vaayu\\_x\\_Vinted\\_Full\\_Climate\\_Impact\\_Report\\_2021\\_045f9e5c4b.pdf](https://press-center-static.vinted.com/Vaayu_x_Vinted_Full_Climate_Impact_Report_2021_045f9e5c4b.pdf).
- 2926 Vladimirova K, Henninger CE, Joyner-Martinez C, Iran S, Diddi S, Durrani M, Iyer K, Jestratijevic I, McCormick H,  
2927 Niinimäki K, et al. 2022. Fashion consumption during COVID-19: Comparative analysis of changing  
2928 acquisition practices across nine countries and implications for sustainability. *Clean Responsible*  
2929 *Consum* **5**: 100056. doi: 10.1016/j.clrc.2022.100056
- 2930 Wakes S, Dunn L, Penty D, Kitson K, Jowett T. 2020. Is Price an Indicator of Garment Durability and Longevity?  
2931 *Sustainability* **12**(21): 8906. doi: 10.3390/su12218906
- 2932 Watson D, Trzepacz S, Gravgård Pedersen O. 2018. Mapping of textile flows in Denmark. The Danish  
2933 Environmental Protection Agency. Available at [https://www2.mst.dk/Udgiv/publications/2018/08/978-](https://www2.mst.dk/Udgiv/publications/2018/08/978-87-93710-48-1.pdf)  
2934 [87-93710-48-1.pdf](https://www2.mst.dk/Udgiv/publications/2018/08/978-87-93710-48-1.pdf).
- 2935 Williams L, Ackerman J. 2011. Please touch the merchandise. Harvard Business Review. Available at  
2936 <https://hbr.org/2011/12/please-touch-the-merchandise>.
- 2937 WRAP. 2017a. Sustainable clothing: A practical guide to enhancing clothing durability and quality. UK. Available  
2938 at <https://wrap.org.uk/resources/guide/sustainable-clothing-guide>.
- 2939 WRAP. 2017b. An Economic and Financial Sustainability Assessment of F2F Recycling.
- 2940 WRAP. 2017c. Valuing Our Clothes: the cost of UK fashion. Available at WRAP. (2017). Valuing Our Clothes: the  
2941 cost of UK fashion. [http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-](http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-fashion_WRAP.pdf)  
2942 [fashion\\_WRAP.pdf](http://www.wrap.org.uk/sites/files/wrap/valuing-our-clothes-the-cost-of-uk-fashion_WRAP.pdf).

- 2943 WRAP. 2019. Consumer Research for ECAP 2016-2019. Available at [http://www.ecap.eu.com/wp-](http://www.ecap.eu.com/wp-content/uploads/2019/12/Consumer-Research-for-ECAP.pdf)  
2944 [content/uploads/2019/12/Consumer-Research-for-ECAP.pdf](http://www.ecap.eu.com/wp-content/uploads/2019/12/Consumer-Research-for-ECAP.pdf).
- 2945 WTO. 2020. World Trade Statistical Review 2020. Geneva: World Trade Organization. Available at  
2946 [https://www.wto.org/english/res\\_e/statis\\_e/wts2020\\_e/wts2020\\_e.pdf](https://www.wto.org/english/res_e/statis_e/wts2020_e/wts2020_e.pdf).
- 2947 Xiang Y, Jiang L, Zhou Y, Luo Z, Zhi D, Yang J, Lam SS. 2022. Microplastics and environmental pollutants: Key  
2948 interaction and toxicology in aquatic and soil environments. *J Hazard Mater* **422**: 126843. doi:  
2949 10.1016/j.jhazmat.2021.126843
- 2950 Yassen HA. 2017. Study of the Relationship between Sewing and Fabric Parameters and Seam Strength. *Int Des*  
2951 *J* **7**(2): 125–129. doi: 10.12816/0046559
- 2952 Yates L, Evans D. 2016. Dirtying Linen: Re-evaluating the sustainability of domestic laundry: Dirtying Linen: Re-  
2953 Evaluating the Sustainability of Domestic Laundry. *Environ Policy Gov* **26**(2): 101–115. doi:  
2954 10.1002/eet.1704
- 2955 YouGov. 2019. Fast fashion: il continuo rinnovo del guardaroba. Available at  
2956 [https://it.yougov.com/society/articles/23537-fast-fashion-il-rinnovo-del-](https://it.yougov.com/society/articles/23537-fast-fashion-il-rinnovo-del-guardaroba?redirect_from=%2Fnews%2F2019%2F05%2F27%2Ffast-fashion-il-rinnovo-del-guardaroba%2F)  
2957 [guardaroba?redirect\\_from=%2Fnews%2F2019%2F05%2F27%2Ffast-fashion-il-rinnovo-del-](https://it.yougov.com/society/articles/23537-fast-fashion-il-rinnovo-del-guardaroba?redirect_from=%2Fnews%2F2019%2F05%2F27%2Ffast-fashion-il-rinnovo-del-guardaroba%2F)  
2958 [guardaroba%2F](https://it.yougov.com/society/articles/23537-fast-fashion-il-rinnovo-del-guardaroba?redirect_from=%2Fnews%2F2019%2F05%2F27%2Ffast-fashion-il-rinnovo-del-guardaroba%2F).
- 2959 Yuille P. 2015. Exploring the Relationship between the Presumed Quality and Durability of Fast-Fashion  
2960 Garments by the Generation-Y Consumer. 2015. PLATE Conference, Nottingham, UK, 17–19 June 2015;  
2961 Nottingham, UK,. Available at [https://www.plateconference.org/pdf/plate\\_2015\\_proceedings.pdf](https://www.plateconference.org/pdf/plate_2015_proceedings.pdf).
- 2962 Zhang L, Leung MY, Boriskina S, Tao X. 2022. Advancing life cycle sustainability of textiles through technological  
2963 innovations. *Nat Sustain* **6**(3): 243–253. doi: 10.1038/s41893-022-01004-5
- 2964 Zimmermann T, Hauschke F, Memelink R, Reitz A, Pelke N, John R, Eberle U, Ninnemann J. 2021. Die  
2965 Ökologisierung des Onlinehandels. Neue Herausforderungen für die umweltpolitische Förderung eines  
2966 nachhaltigen Konsums Report No.: 142/2021. Available at  
2967 [https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/texte\\_142-](https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/texte_142-2021_die_oekologisierung_des_onlinehandels.pdf)  
2968 [2021\\_die\\_oekologisierung\\_des\\_onlinehandels.pdf](https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/texte_142-2021_die_oekologisierung_des_onlinehandels.pdf).
- 2969 Ziyeh P, Cinelli M. 2023. A Framework to Navigate Eco-Labels in the Textile and Clothing Industry. *Sustainability*  
2970 **15**(19): 14170. doi: 10.3390/su151914170
- 2971

2972 **List of abbreviations**

2973	DPP	Digital Product Passport
2974	EC	European Commission
2975	ESPR	Ecodesign for Sustainable Product Regulation
2976	EU	European Union
2977	GPP	Green Public Procurement
2978	MEErP	Methodology for Ecodesign of Energy-related Products
2979	PEFCR A&F	Product Environmental Footprint Category Rules for Apparel and Footwear
2980	PS	Preparatory Study on textile products
2981	REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
2982	SVHC	Substance(s) of Very High Concern
2983	TLR	Textile Labelling Regulation (Regulation (EU) No 1007/2011)

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3101 **9 Annexes**

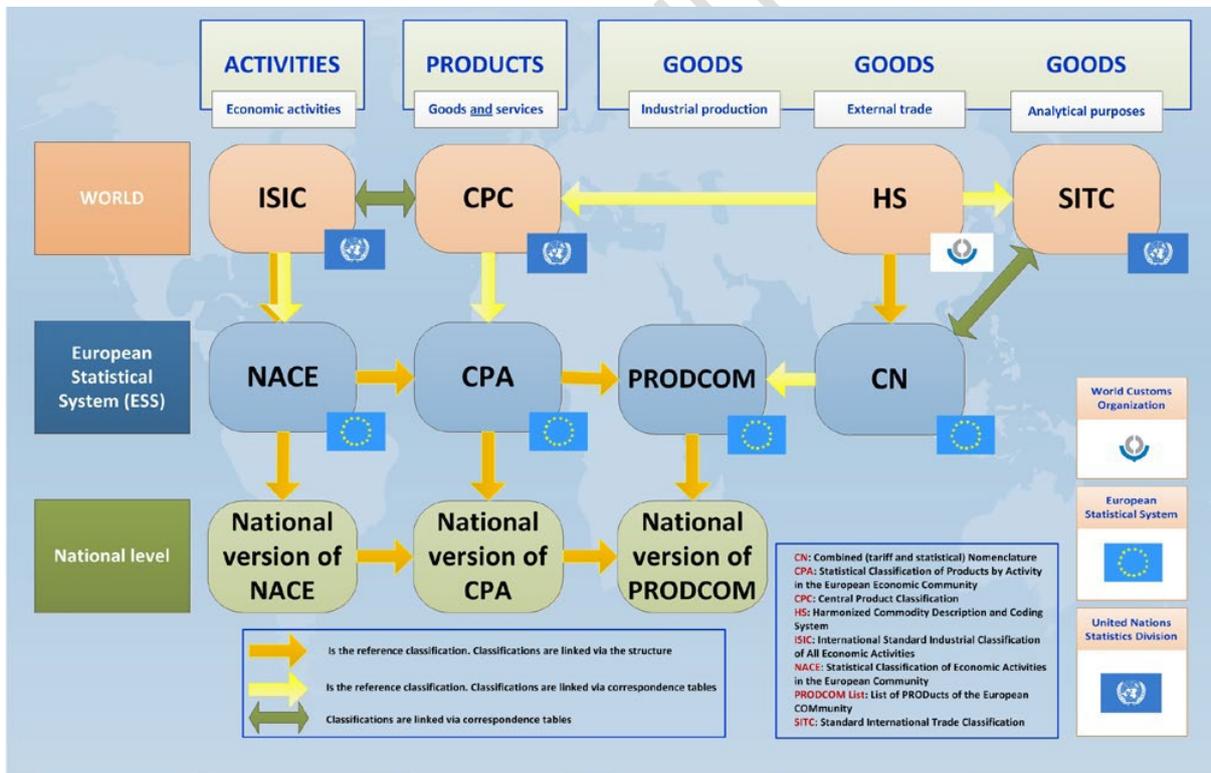
3102 **9.1 PRODCOM and market analysis**

3103 **9.1.1 General description**

3104 PRODCOM is the classification of goods used for statistics in value and quantity on industrial production in the  
 3105 EU. It is abbreviated from the French Production Communautaire and it is regulated by the Commission  
 3106 Implementing Regulation (EU) 2020/1197 <sup>(111)</sup>. **Figure 17** shows the classification of activities, products and  
 3107 goods at level of world, EU and Member States. **Figure 17** describes how PRODCOM classification relates to  
 3108 the other classifications.

3109 PRODCOM was developed in a close relationship with Combined (tariff and statistical) Nomenclature (CN) for  
 3110 external trades, which is strictly related to Harmonised System used in the World Custom Organization. The  
 3111 basic building blocks of PRODCOM are the European Classification of Economic Activities (NACE) <sup>(112)</sup> and the  
 3112 European Classification of Products by Activity (CPA) <sup>(113)</sup>. Products are identified in PRODCOM via their eight-  
 3113 digit code, the PRODCOM List <sup>(114)</sup>. The first four digits of a PRODCOM code refer to the NACE classification, the  
 3114 first six digits refer to the CPA classification, and the last two digits are created specifically for PRODCOM.

3115 **Figure 17. Statistical classifications**



Source: (Eurostat, 2023)

3116

3117

<sup>111</sup> European business statistics. COMMISSION IMPLEMENTING REGULATION (EU) 2020/1197 of 30 July 2020 laying down technical specifications and arrangements pursuant to Regulation (EU) 2019/2152 of the European Parliament and of the Council on European business statistics repealing 10 legal acts in the field of business statistics. Available at [this link](#).

<sup>112</sup> The statistical classification of economic activities NACE Revision 2. Regulation (EC) No 1893/2006. Available at [this link](#).

<sup>113</sup> Statistical Classification of Products by Activity. COMMISSION REGULATION (EU) No 1209/2014 of 29 October 2014 amending Regulation (EC) No 451/2008 of the European Parliament and of the Council establishing a new statistical classification of products by activity (CPA) and repealing Council Regulation (EEC) No 3696/93. Available at [this link](#).

<sup>114</sup> PRODCOM list 2022. Available at [this link](#). Last accessed on 1 December 2023.

3118 NACE is based on the International Standard Industrial Classification of All Economic Activities (ISIC), which is a  
3119 standard classification of economic activities used by the United Nations <sup>(115)</sup>. Both NACE and ISIC are four-digit  
3120 codes, which define four levels of description from the first to the last digit: sections, divisions, groups and  
3121 classes. At the level of division (the first two digits), NACE and ISIC are identical and refer to the same activity.  
3122 At level of group and classes (the third and the fourth digits), NACE and ISIC refer to different  
3123 products/activities <sup>(116)</sup>.

3124 The NACE codes were established in 1970. Along with the evolution of the industrial scenery, the NACE codes  
3125 were subjected to several revisions resulting in changes over time. From 1995 to 2007, the PRODCOM data  
3126 were based on NACE Rev. 1.1, whereas from 2008 onwards the PRODCOM data were based on NACE Rev. 2.  
3127 The NACE Rev. 1.1 classification has 21 sections and 88 divisions, whereas the NACE Rev. 2 counts with 17  
3128 sections and 62 divisions. The changes between different versions of NACE are supported by conversion tables,  
3129 which can show sometimes (1) lack of direct correspondence between the old and new codes, and (2) merging  
3130 of two or more codes into one <sup>(116)</sup>.

3131 Approximately every 2 or 3 years, the PRODCOM Working Group updates the PRODCOM list to reflect changes  
3132 in the production of goods in the European Union. These changes occur with a frequency set by the technological  
3133 developments in the industries and as driven by the related nomenclatures (Eurostat, 2023).

### 3134 **9.1.2 Features of PRODCOM data influencing market analysis**

3135 PRODCOM dataset DS-056120 includes several indicators <sup>(24)</sup>. In the PS, the following indicators were used:

- 3136 — PRODVAL: value of sold production
- 3137 — PRODQNT: quantity of sold production
- 3138 — EXPVAL: value of export
- 3139 — EXPQNT: quantity of export
- 3140 — IMPVAL: value of import
- 3141 — IMPQNT: quantity of import
- 3142 — QNTUNIT: unit used to report quantities

3143 The PRODCOM user's manual reports the following features (Eurostat, 2023).

#### 3144 **PRODQNT**

3145 When a PRODCOM code does not report the unit in QNTUNIT, the figure of PRODQNT is not required to be  
3146 reported. Additionally, figures could be missing due to confidentiality.

#### 3147 **EXPQNT and IMPQNT**

3148 Comext <sup>(117)</sup> is the dataset disseminating the international trades in goods statistics. PRODCOM extracts  
3149 information from Comext. Most of PRODCOM codes have a complete reference to CN, meaning that there is full  
3150 comparability between data from PRODCOM and data from CN. However, data could be missing from PRODCOM  
3151 when:

- 3152 • the corresponding trade data on quantity cannot be provided for PRODCOM codes for which  
3153 unit of measure is not consistent with unit of measure given in CN, even if a PRODCOM code  
3154 has a complete CN reference and/or;
- 3155 • If there is no clear link between PRODCOM and CN.

#### 3156 **Apparent consumption**

3157 The apparent consumption is obtained summing the production to the import and then subtracting the export.  
3158 The use of this economic indicator should consider the following aspects:

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<sup>115</sup> The UNSTATS webpage is available at [this link](#). Last accessed on 26 September 2023.

<sup>116</sup> The introductory guidelines to NACE Rev. 2. Available at [this link](#). Last accessed on 29 September 2023.

<sup>117</sup> Comext dataset. Available at [this link](#). Last accessed on 2 December 2023.

- 3159 1. The integration of production and trade data is challenged by the possible heterogeneity between the  
3160 PRODCOM codes and the trade data reported by Comext.
- 3161 2. The thresholds above which businesses are represented in PRODCOM and Comext could differ.
- 3162 3. Data reported in PRODCOM refer to a specific year, but there are temporal delays in production, import  
3163 and exports. However, the delays are reduced when data are considered over several years.
- 3164 4. The value of exports cannot always be compared directly with that of sold production.
- 3165 (a) Sold production is based on the ex-work selling price (<sup>118</sup>), whereas exports are evaluated at  
3166 the time the goods cross the border.
- 3167 (b) Imported goods can be exported again with a different value, either without being modified  
3168 or after industrial processing.
- 3169 5. Some figures of quantity of sold production could be missing because of confidentiality or because  
3170 Member States are exempted to report them when quantity units are not specified for the specific  
3171 PRODCOM code.

### 3172 9.1.3 Market analysis for the selection of the scope

3173 The market analysis reported in Section 3.1.2 used the PRODCOM codes reporting about the NACE activities  
3174 specified in **Table 35**.

3175 **Table 35.** NACE codes describing the product group of textiles and footwear

Subgroup	NACE codes
Apparel textiles	C1412 - Manufacture of workwear C1413 - Manufacture of other outerwear C1414 - Manufacture of underwear C1419 - Manufacture of other wearing apparel and accessories C1431 - Manufacture of knitted and crocheted hosiery C1439 - Manufacture of other knitted and crocheted apparel
Home/interior textiles	C1392 - Manufacture of made-up textile articles, except apparel C1393 - Manufacture of carpets and rugs
Footwear	C1520 - Manufacture of footwear
Technical textiles	C1394 - Manufacture of cordage, rope, twine and netting C1395 - Manufacture of non-wovens and articles made from non-wovens, except apparel C1396 - Manufacture of other technical and industrial textiles C1399 - Manufacture of other textiles n.e.c.

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3177 **Table 36, Table 37, Table 38, and Table 39** report all the PRODCOM codes used for the analysis of amount  
3178 of sales and trades in EU. They also report the conversion factors used for the quantification of quantities  
3179 expressed in mass.

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<sup>118</sup> Ex-work selling price does not include any transportation cost, which are addressed by the buyer.

**Table 36.** PRODCOM codes describing the subgroup of apparel textiles in 2019

PRODCOM code	Description of the PRODCOM code	QNT UNIT	Type	Conversion factor to kg
14121120	Men's or boys' ensembles, of cotton or man-made fibres, for industrial and occupational wear	p/st	S	0.5
14121130	Men's or boys' jackets and blazers, of cotton or man-made fibres, for industrial and occupational wear	p/st	S	0.95
14121240	Men's or boys' trousers and breeches, of cotton or man-made fibres, for industrial or occupational wear	p/st	S	0.45
14121250	Men's or boys' bib and brace overalls, of cotton or man-made fibres, for industrial or occupational wear	p/st	S	0.45
14122120	Women's or girls' ensembles, of cotton or man-made fibres, for industrial or occupational wear	p/st	S	0.5
14122130	Women's or girls' jackets and blazers, of cotton or man-made fibres, for industrial or occupational wear	p/st	S	0.95
14122240	Women's or girls' trousers and breeches, of cotton or man-made fibres, for industrial or occupational wear	p/st	S	0.45
14122250	Women's or girls' bib and brace overalls, of cotton or man-made fibres, for industrial or occupational wear	p/st	S	0.45
14123013	Men's or boys' other garments, of cotton or man-made fibres, for industrial or occupational wear	p/st	S	0.5
14123023	Women's or girls' other garments, of cotton or man-made fibres, for industrial or occupational wear	p/st	S	0.5
14131110	Men's or boys' overcoats, car-coats, capes, cloaks and similar articles, of knitted or crocheted textiles (excluding jackets and blazers, anoraks, wind-cheaters and wind-jackets)	p/st	S	0.95
14131120	Men's or boys' waistcoats, anoraks, ski-jackets, wind-cheaters, wind-jackets and similar articles, of knitted or crocheted textiles (excluding jackets and blazers)	p/st	S	0.95
14131230	Men's or boys' jackets and blazers, of knitted or crocheted textiles	p/st	S	0.95
14131260	Men's or boys' suits and ensembles, of knitted or crocheted textiles	p/st	S	0.5
14131270	Men's or boys' trousers, breeches, shorts, bib and brace overalls, of knitted or crocheted textiles	p/st	S	0.45
14131310	Women's or girls' overcoats, car-coats, capes, cloaks and similar articles, of knitted or crocheted textiles (excluding jackets and blazers)	p/st	S	0.95
14131320	Women's or girls' waistcoats, anoraks, ski-jackets, wind-cheaters, wind-jackets and similar articles, of knitted or crocheted textiles (excluding jackets and blazers)	p/st	S	0.95
14131430	Women's or girls' jackets and blazers, of knitted or crocheted textiles	p/st	S	0.95
14131460	Women's or girls' suits and ensembles, of knitted or crocheted textiles	p/st	S	0.5
14131470	Women's or girls' dresses, of knitted or crocheted textiles	p/st	S	0.3
14131480	Women's or girls' skirts and divided skirts, of knitted or crocheted textiles	p/st	S	0.25
14131490	Women's or girls' trousers, breeches, shorts, bib and brace overalls, of knitted or crocheted textiles	p/st	S	0.45
14132110	Men's or boys' raincoats	NA	NA	0.5
14132115	Men's or boys' raincoats, overcoats, car-coats, capes, etc.	p/st	NA	0.5
14132116	Men's or boys' overcoats, car coats, capes, cloaks, anoraks (including ski-jackets), wind cheaters, wind-jackets and similar articles (excluding suits, ensembles, jackets, blazers, trousers, bib and brace overalls, breeches and shorts)	NA	S	NA
14132120	Men's or boys' overcoats, car-coats, capes, etc.	NA	NA	0.95
14132130	Men's or boys' waistcoats, anoraks, ski-jackets, wind-jackets and similar articles (excluding jackets and blazers, knitted or crocheted, impregnated, coated, covered, laminated or rubberised)	p/st	NA	0.95
14132200	Men's or boys' suits & ensembles (excluding knitted or crocheted)	p/st	S	0.5
14132210	Men's or boys' suits (excluding knitted or crocheted)	NA	NA	1.4
14132220	Men's or boys' ensembles (excluding knitted or crocheted)	NA	NA	1
14132300	Men's or boys' jackets and blazers (excluding knitted or crocheted)	p/st	S	0.95
14132442	Men's or boys' trousers and breeches, of denim (excluding for industrial or occupational wear)	p/st	S	0.45

PRODCOM code	Description of the PRODCOM code	QNT UNIT	Type	Conversion factor to kg
14132444	Men's or boys' trousers, breeches and shorts, of wool or fine animal hair (excluding knitted or crocheted, for industrial or occupational wear)	p/st	S	0.45
14132445	Men's or boys' trousers and breeches, of man-made fibres (excluding knitted or crocheted, for industrial or occupational wear)	p/st	S	0.45
14132448	Men's or boys' trousers and breeches, of cotton (excluding denim, knitted or crocheted)	p/st	S	0.45
14132449	Men's or boys' trousers, breeches, shorts and bib and brace overalls (excluding of wool, cotton and man-made fibres, knitted or crocheted)	p/st	S	0.45
14132455	Men's or boys' bib and brace overalls (excluding knitted or crocheted, for industrial or occupational wear)	p/st	S	0.45
14132460	Men's or boys' shorts, of cotton or man-made fibres (excluding knitted or crocheted)	p/st	S	0.45
14133110	Woman's or girls' raincoats	NA	NA	0.5
14133115	Woman's or girls' raincoats and overcoats, etc.	p/st	NA	0.5
14133116	Women's or girls' overcoats, car-coats, capes, cloaks, anoraks (including ski jackets), wind-cheaters, wind-jackets and similar articles (excluding suits, ensembles, jackets, blazers, dresses, skirts, divided skirts, trousers, bib and brace overalls, breeches and shorts)	NA	S	NA
14133120	Woman's or girls' overcoats, etc.	NA		0.95
14133130	Women's or girls' waistcoats, anoraks, ski-jackets, wind-jackets and similar articles (excluding jackets and blazers, knitted or crocheted, impregnated, coated, covered, laminated or rubberised)	p/st	NA	0.95
14133200	Women's or girls' suits & ensembles (excluding knitted or crocheted)	p/st	S	0.5
14133210	Women's or girls' suits (excluding knitted or crocheted)	NA	NA	1.4
14133220	Women's or girls' ensembles (excluding knitted or crocheted)	NA	NA	1
14133330	Women's or girls' jackets and blazers (excluding knitted or crocheted)	p/st	S	0.95
14133470	Women's or girls' dresses (excluding knitted or crocheted)	p/st	S	0.3
14133480	Women's or girls' skirts and divided skirts (excluding knitted or crocheted)	p/st	S	0.25
14133542	Women's or girls' trousers and breeches, of denim (excluding for industrial or occupational wear)	p/st	S	0.45
14133548	Women's or girls' trousers and breeches, of cotton (excluding denim, for industrial or occupational wear)	p/st	S	0.45
14133549	Women's or girls' trousers and breeches, of wool or fine animal hair or man-made fibres (excluding knitted or crocheted and for industrial and occupational wear)	p/st	S	0.45
14133551	Women's or girls' bib and brace overalls, of cotton (excluding knitted or crocheted, for industrial or occupational wear)	p/st	S	0.45
14133561	Women's or girls' shorts, of cotton (excluding knitted and crocheted)	p/st	S	0.45
14133563	Women's or girls' bib and brace overalls, of wool or fine animal hair and man-made fibres (excluding cotton, knitted or crocheted, for industrial or occupational wear) and women's or girls' shorts, of wool or fine animal hair (excluding knitted or crocheted)	p/st	S	0.45
14133565	Women's or girls' shorts, of man-made fibres (excluding knitted or crocheted)	p/st	S	0.45
14133569	Women's or girls' trousers, breeches, bib and brace overalls, of textiles (excluding cotton, wool or fine animal hair, man-made fibres, knitted or crocheted)	p/st	S	0.45
14141100	Men's or boys' shirts, knitted or crocheted	p/st	S	0.25
14141220	Men's or boys' underpants and briefs, of knitted or crocheted textiles (including boxer shorts)	p/st	S	0.08
14141230	Men's or boys' nightshirts and pyjamas, of knitted or crocheted textiles	p/st	S	0.15
14141240	Men's or boys' dressing gowns, bathrobes and similar articles, of knitted or crocheted textiles	p/st	S	0.3
14141310	Women's or girls' blouses, shirts and shirt-blouses, of knitted or crocheted textiles	p/st	S	0.25
14141420	Women's or girls' briefs and panties, of knitted or crocheted textiles (including boxer shorts)	p/st	S	0.08
14141430	Women's or girls' nighties and pyjamas, of knitted or crocheted textiles	p/st	S	0.15
14141440	Women's or girls' negligees, bathrobes, dressing gowns and similar articles, of knitted or crocheted textiles	p/st	S	0.3
14141450	Women's or girls' slippers and petticoats, of knitted or crocheted textiles	p/st	S	0.5

PRODCOM code	Description of the PRODCOM code	QNT UNIT	Type	Conversion factor to kg
14142100	Men's or boys' shirts (excluding knitted or crocheted)	p/st	S	0.25
14142220	Men's or boys' underpants and briefs (including boxer shorts) (excluding knitted or crocheted)	p/st	S	0.08
14142230	Men's or boys' nightshirts and pyjamas (excluding knitted or crocheted)	p/st	S	0.15
14142240	Men's or boys' singlets, vests, bathrobes, dressing gowns and similar articles (excluding knitted or crocheted)	p/st	S	0.3
14142300	Women's or girls' blouses, shirts and shirt-blouses (excluding knitted or crocheted)	p/st	S	0.25
14142430	Women's or girls' nightdresses and pyjamas (excluding knitted or crocheted)	p/st	S	0.3
14142450	Women's or girls' slips and petticoats (excluding knitted or crocheted)	p/st	S	0.5
14142460	Women's or girls' singlets and other vests, briefs, panties, negligees, bathrobes, dressing gowns, housecoats and similar articles of cotton (excluding knitted or crocheted)	p/st	S	0.08
14142480	Women's or girls' negligees, bathrobes, dressing gowns, singlets, vests, briefs and panties (including boxer shorts), of man-made fibres (excluding knitted or crocheted)	p/st	S	0.08
14142489	Women's or girls' singlets, vests, briefs, panties, negligees, bathrobes, dressing gowns and similar articles, of textiles (excluding cotton, man-made fibres, knitted or crocheted)	p/st	S	0.08
14142530	Brassieres	p/st	S	0.05
14142550	Girdles, panty-girdles and corselettes (including bodies with adjustable straps)	p/st	S	0.5
14142570	Braces, suspenders, garters and similar articles and parts thereof	NA	S	NA
14143000	T-shirts, singlets and vests, knitted or crocheted	p/st	S	0.17
14191100	Babies' garments and clothing accessories, knitted or crocheted including vests, rompers, underpants, stretch-suits, gloves or mittens or mitts, outerwear (for children of height <= 86 cm)	NA	S	NA
14191210	Track-suits, of knitted or crocheted textiles	p/st	S	0.5
14191230	Ski-suits, of knitted or crocheted textiles	p/st	S	0.5
14191240	Men's or boys' swimwear, of knitted or crocheted textiles	p/st	S	0.12
14191250	Women's or girls' swimwear, of knitted or crocheted textiles	p/st	S	0.12
14191290	Other garments, knitted or crocheted (including bodies with a proper sleeve)	kg	S	1
14191300	Gloves, mittens and mitts, of knitted or crocheted textiles	pa	S	0.1
14191930	Shawls, scarves, mufflers, mantillas, veils and the like, of knitted or crocheted textiles	p/st	S	0.1
14191960	Clothing accessories and parts thereof, of knitted or crocheted textiles (excluding gloves, mittens, shawls, scarves, mufflers, mantillas and veils)	NA	S	NA
14192100	Babies' clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, napkins, gloves, mittens and outerwear	NA	NA	NA
14192150	Babies clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, gloves, mittens and outerwear (excluding sanitary towels and napkins and similar articles)	NA	S	NA
14192210	Other men's or boys' apparel n.e.c., including tracksuits and jogging suits (excluding waistcoats, ski-suits, knitted or crocheted)	p/st	S	0.5
14192220	Other women's or girls' apparel n.e.c., including tracksuits and jogging suits (excluding waistcoats, ski-suits, knitted or crocheted)	p/st	S	0.5
14192230	Ski-suits (excluding of knitted or crocheted textiles)	p/st	S	0.5
14192240	Men's or boys' swimwear (excluding of knitted or crocheted textiles)	p/st	S	0.12
14192250	Women's or girls' swimwear (excluding of knitted or crocheted textiles)	p/st	S	0.12
14192310	Handkerchiefs	p/st	S	0.5
14192333	Shawls, scarves, mufflers, mantillas, veils and the like (excluding articles of silk or silk waste, knitted or crocheted)	p/st	S	0.15
14192338	Shawls, scarves, mufflers, mantillas, veils and the like, of silk or silk waste (excluding knitted or crocheted)	p/st	S	0.15

PRODCOM code	Description of the PRODCOM code	QNT UNIT	Type	Conversion factor to kg
14192353	Ties, bow ties and cravats (excluding articles of silk or silk waste, knitted or crocheted)	p/st	S	0.15
14192358	Ties, bow ties and cravats, of silk or silk waste (excluding knitted or crocheted)	p/st	S	0.15
14192370	Gloves, mittens and mitts (excluding knitted or crocheted)	pa	S	0.1
14192393	Clothing accessories of textiles (excluding shawls, scarves and mufflers, mantillas and veils, ties, bow-ties and cravats, gloves, mittens and mitts, knitted or crocheted)	NA	NA	NA
14192395	Parts of garments or of clothing accessories, of textiles (excluding bras, girdles and corsets, braces, suspenders and garters, knitted or crocheted)	NA	NA	NA
14192396	Clothing accessories, parts of garments or of clothing accessories, of textiles, n.e.c. and parts thereof, (excluding shawls, scarves and mufflers, mantillas and veils, ties, bow-ties and cravats, gloves, mittens and mitts and parts thereof; bras, girdles and corsets, braces, suspenders and garters, knitted or crocheted)	NA	S	NA
14193200	Garments made up of felt or non-wovens, textile fabrics impregnated or coated	p/st	S	0.1
14194130	Hat-forms, hat bodies and hoods, plateaux and manchons of felt (including slit manchons) (excluding those blocked to shape, those with made brims)	p/st	S	0.1
14194150	Hat-shapes, plaited or made by assembling strips of any material (excluding those blocked to shape, those with made brims, those lined or trimmed)	p/st	S	0.1
14194230	Felt hats and other felt headgear, made from hat bodies or hoods and plateaux	p/st	S	0.1
14194250	Hats and other headgear, plaited or made by assembling strips of any material	p/st	S	0.1
14194270	Hats and other headgear, knitted or crocheted or made-up from lace, felt or other textile fabric in the piece (but not in strips); hair-nets of any material	p/st	S	0.1
14194300	Other headgear (except headgear of rubber or of plastics, safety headgear and asbestos headgear); headbands, linings, covers, hat foundations, hat frames, peaks and chinstraps, for headgear	NA	S	NA
14311033	Panty hose and tights, of knitted or crocheted synthetic fibres, measuring per single yarn < 67 decitex	p/st	S	0.07
14311035	Panty hose and tights, of knitted or crocheted synthetic fibres, measuring per single yarn >= 67 decitex	p/st	S	0.07
14311037	Pantyhose and tights of textile materials, knitted or crocheted (excl. graduated compression hosiery, those of synthetic fibres and hosiery for babies)	p/st	S	0.07
14311050	Women's full-length or knee-length knitted or crocheted hosiery, measuring per single yarn < 67 decitex	pa	S	0.01
14311090	Knitted or crocheted hosiery and footwear (including socks; excluding women's full-length/knee-length hosiery, measuring <67decitex, panty-hose and tights, footwear with applied soles)	pa	S	0.07
14391031	Men's or boys' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of wool or fine animal hair (excluding jerseys and pullovers containing >= 50 % of wool and weighing >= 600 g)	p/st	S	0.5
14391032	Women's or girls' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of wool or fine animal hair (excluding jerseys and pullovers containing >= 50 % of wool and weighing >= 600 g)	p/st	S	0.5
14391033	Jerseys and pullovers, containing >= 50 % by weight of wool and weighing >= 600 g per article	p/st	S	0.3
14391053	Lightweight fine knit roll, polo or turtle neck jumpers and pullovers, of cotton	p/st	S	0.5
14391055	Lightweight fine knit roll, polo or turtle neck jumpers and pullovers, of man-made fibres	p/st	S	0.5
14391061	Men's or boys' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of cotton (excluding lightweight fine knit roll, polo or turtle neck jumpers and pullovers)	p/st	S	0.5
14391062	Women's or girls' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of cotton (excluding lightweight fine knit roll, polo or turtle neck jumpers and pullovers)	p/st	S	0.5
14391071	Men's or boys' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of man-made fibres (excluding lightweight fine knit roll, polo or turtle neck jumpers and pullovers)	p/st	S	0.5

PRODCOM code	Description of the PRODCOM code	QNT UNIT	Type	Conversion factor to kg
14391072	Women's or girls' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of man-made fibres (excluding lightweight fine knit roll, polo or turtle neck jumpers and pullovers)	p/st	S	0.5
14391090	Jerseys, pullovers, sweatshirts, waistcoats and cardigans, of textile materials (excluding those of wool or fine animal hair, cotton, man-made fibres)	p/st	S	0.5

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QNTUNIT: PRODCOM indicator about unit used to report quantities.

kg = kilogram; p/st = number of items; pa = number of pairs; NA = data not available

Source: own elaboration based on Eurostat data set DS-056120 (data extracted on 15 November 2023). Conversion factors used to convert the unit reported in EUROSTAT to kg based on (Huygens et al., 2023)

**Table 37.** PRODCOM codes describing the subgroup of home/interior textiles in 2019

PRODCOM code	Description of the PRODCOM code	QNTUNIT	TYPE	Conversion Factor to kg
13921130	Blankets and travelling rugs of wool or fine animal hair (excluding electric blankets)	p/st	S	0.5
13921150	Blankets and travelling rugs of synthetic fibres (excluding electric blankets)	p/st	S	0.5
13921190	Blankets (excluding electric blankets) and travelling rugs of textile materials (excluding of wool or fine animal hair, of synthetic fibres)	p/st	S	0.5
13921230	Bed linen of knitted or crocheted textiles	kg	S	1
13921253	Bed linen of cotton (excluding knitted or crocheted)	kg	S	1
13921255	Bed linen of flax or ramie (excluding knitted or crocheted)	kg	S	1
13921259	Bed linen of woven textiles (excluding of cotton, of flax or ramie)	kg	S	1
13921270	Bed linen of non-woven man-made fibres (excluding knitted or crocheted)	kg	S	1
13921330	Table linen of knitted or crocheted textiles	kg	S	1
13921353	Table linen of cotton (excluding knitted or crocheted)	kg	S	1
13921355	Table linen of flax (excluding knitted or crocheted)	kg	S	1
13921359	Table linen of woven man-made fibres and of other woven or non-woven textiles (excluding of cotton, of flax)	kg	S	1
13921370	Table linen of non-woven man-made fibres	kg	S	1
13921430	Toilet linen and kitchen linen, of terry towelling or similar terry fabrics of cotton	kg	S	1
13921450	Woven toilet linen and kitchen linen, of textiles (excluding terry towelling or similar terry fabrics of cotton)	kg	S	1
13921470	Toilet linen and kitchen linen, of non-woven man-made fibres	kg	S	1
13921530	Curtains and interior blinds, curtain or bed valances, of knitted or crocheted materials	m <sup>2</sup>	S	0.25
13921550	Curtains and interior blinds, curtain or bed valances, of woven materials	m <sup>2</sup>	S	0.25
13921570	Curtains and interior blinds, curtain or bed valances, of non-woven materials	m <sup>2</sup>	S	0.25
13921620	Hand-woven tapestries of the type Gobelins, Flanders, Aubusson, Beauvais, and needle-worked tapestries (including petit point, cross-stitch) whether or not made up	NA	S	NA
13921640	Bedspreads (excluding eiderdowns)	p/st	S	0.5
13921660	Furnishing articles including furniture and cushion covers as well as cushion covers, etc. for car seats (excluding blankets, travelling rugs, bed linen, table linen, toilet linen, kitchen linen, curtains, blinds, valances and bedspreads)	NA	S	NA
13921680	Sets of woven fabrics and yarns for making up into rugs, tapestries, embroidered table cloths, serviettes, or similar textile articles, p.r.s.	NA	S	NA

PRODCOM code	Description of the PRODCOM code	QNTUNIT	TYPE	Conversion Factor to kg
13922130	Sacks and bags, of cotton, used for packing goods	kg	S	1
13922150	Sacks and bags, of knitted or crocheted polyethylene or polypropylene strip, used for packing goods	kg	S	1
13922170	Sacks and bags, of polyethylene or polypropylene strip, used for packing goods (excluding knitted or crocheted)	kg	S	1
13922173	Sacks and bags, of polyethylene or polypropylene strip, weighing <= 120 g/m2, used for packing goods (excluding knitted or crocheted)	NA	NA	NA
13922175	Sacks and bags, of polyethylene or polypropylene strip, weighing > 120 g/m2, used for packing goods (excluding knitted or crocheted)	NA	NA	NA
13922190	Sacks and bags, used for packing goods (excluding of cotton, polyethylene or polypropylene strip)	kg	S	1
13922210	Tarpaulins, awnings and sunblinds (excluding caravan awnings)	kg	S	1
13922230	Tents (including caravan awnings)	kg	S	1
13922250	Sails	kg	S	1
13922270	Pneumatic mattresses and other camping goods (excluding caravan awnings, tents, sleeping bags)	kg	S	1
13922300	Parachutes and rotochutes, parts and accessories (including dirigible parachutes)	kg	S	1
13922430	Sleeping bags	p/st	S	0.5
13922493	Articles of bedding of feathers or down (including quilts and eiderdowns, cushions, pouffes, pillows) (excluding mattresses, sleeping bags)	p/st	S	0.5
13922499	Articles of bedding filled other than with feathers or down (including quilts and eiderdowns, cushions, pouffes, pillows) (excluding mattresses, sleeping bags)	p/st	S	0.5
13922953	Floor-cloths, dish-cloths, dusters and similar cleaning cloths, of non-woven textiles	kg	S	1
13922957	Floor-cloths, dish-cloths, dusters and similar cleaning cloths (excluding knitted or crocheted, articles of non-woven textiles)	kg	S	1
13922990	Floor-cloths, dish-cloths, dusters and similar cleaning cloths, knitted or crocheted; life-jackets, life-belts and other made up articles	NA	NA	NA
13922993	Sanitary towels, tampons and similar article of textile materials (excluding wadding)	NA	NA	NA
13922997	Napkins and napkin liners for babies and similar article of textile materials (excluding wadding)	NA	NA	NA
13922998	Floor-cloths, dish-cloths, dusters and similar cleaning cloths, knitted or crocheted; life-jackets, life-belts and other made up articles (excluding protective face masks, sanitary towels and napkins and similar articles)	NA	S	NA
13922999	Floor-cloths, dish-cloths, dusters and similar cleaning cloths, knitted or crocheted; life-jackets, life-belts and other made up articles (excluding sanitary towels and napkins and similar articles)	kg	NA	1
13931100	Knotted carpets and other knotted textile floor coverings	m <sup>2</sup>	S	1.6
13931200	Woven carpets and other woven textile coverings (excluding tufted or flocked)	m <sup>2</sup>	S	1.6
13931300	Tufted carpets and other tufted textile floor coverings	m <sup>2</sup>	S	1.38
13931930	Needlefelt carpets and other needlefelt textile floor coverings (excluding tufted or flocked)	m <sup>2</sup>	S	1.6
13931990	Carpets and other textile floor coverings (excluding knotted, woven, tufted, needlefelt)	m <sup>2</sup>	S	1.6

3190 QNTUNIT: PRODCOM indicator about unit used to report quantities.

3191 kg = kilogram; p/st = number of items; NA = data not available, m<sup>2</sup>=square metres

3192 Source: own elaboration based on Eurostat data set DS-056120 (data extracted on 15 November 2023). Conversion factors used to convert the unit reported in EUROSTAT to kg based on (Huygens et al., 2023)

3193

3194 **Table 38.** PRODCOM codes describing the subgroup of footwear in 2019

PRODCOM code	Description of the PRODCOM code	QNTUNIT	TYPE	Conversion Factor to kg
15201100	Waterproof footwear, with uppers in rubber or plastics (excluding incorporating a protective metal toecap)	pa	S	0.9
15201210	Sandals with rubber or plastic outer soles and uppers (including thong-type sandals, flip flops)	pa	S	0.5

PRODCOM code	Description of the PRODCOM code	QNTUNIT	TYPE	Conversion Factor to kg
15201231	Town footwear with rubber or plastic uppers	pa	S	0.9
15201237	Slippers and other indoor footwear with rubber or plastic outer soles and plastic uppers (including bedroom and dancing slippers, mules)	pa	S	0.35
15201330	Footwear with a wooden base and leather uppers (including clogs) (excluding with an inner sole or a protective metal toe-cap)	pa	S	0.9
15201351	Men's town footwear with leather uppers (including boots and shoes; excluding waterproof footwear, footwear with a protective metal toe-cap)	pa	S	0.9
15201352	Women's town footwear with leather uppers (including boots and shoes; excluding waterproof footwear, footwear with a protective metal toe-cap)	pa	S	0.9
15201353	Children's town footwear with leather uppers (including boots and shoes; excluding waterproof footwear, footwear with a protective metal toe-cap)	pa	S	0.9
15201361	Men's sandals with leather uppers (including thong type sandals, flip flops)	pa	S	0.5
15201362	Women's sandals with leather uppers (including thong type sandals, flip flops)	pa	S	0.5
15201363	Children's sandals with leather uppers (including thong type sandals, flip flops)	pa	S	0.5
15201370	Slippers and other indoor footwear with rubber, plastic or leather outer soles and leather uppers (including dancing and bedroom slippers, mules)	pa	S	0.35
15201380	Footwear with wood, cork or other outer soles and leather uppers (excluding outer soles of rubber, plastics or leather)	pa	S	0.9
15201444	Slippers and other indoor footwear (including dancing and bedroom slippers, mules) with uppers of textile materials	pa	S	0.35
15201445	Footwear with rubber, plastic or leather outer soles and textile uppers (excluding slippers and other indoor footwear, sports footwear)	pa	S	0.9
15201446	Footwear with textile uppers (excluding slippers and other indoor footwear as well as footwear with outer soles of rubber, plastics, leather or composition leather)	pa	S	0.9
15202100	Sports footwear with rubber or plastic outer soles and textile uppers (including tennis shoes, basketball shoes, gym shoes, training shoes and the like)	pa	S	0.9
15202900	Other sports footwear, except snow-ski footwear and skating boots	pa	S	0.9
15203120	Footwear (including waterproof footwear), incorporating a protective metal toecap, with outer soles and uppers of rubber or of plastics	pa	S	0.9
15203150	Footwear with rubber, plastic or leather outer soles and leather uppers, and with a protective metal toe-cap	pa	S	0.9
15203200	Wooden footwear, miscellaneous special footwear and other footwear n.e.c.	pa	S	0.9
15204020	Leather uppers and parts thereof of footwear (excluding stiffeners)	NA	S	NA
15204050	Uppers and parts thereof of footwear (excluding stiffeners, of leather)	NA	S	NA
15204080	Parts of footwear (excluding uppers) other materials	NA	S	NA

3195 QNTUNIT: PRODCOM indicator about unit used to report quantities.

3196 pa = number of pairs; NA = data not available

3197 Source: own elaboration based on Eurostat data set DS-056120 (data extracted on 15 November 2023). Conversion factors used to convert the unit reported in EUROSTAT to kg based on (Huygens et al., 2023).

3198

**Table 39.** PRODCOM codes describing the subgroup of technical textiles in 2019

PRODCOM code	Description of the PRODCOM code	QNTUNIT	TYPE	Conversion Factor to kg
13941130	Twine, cordage, rope or cables, of sisal or other textile fibres of 'agave', of jute or other textile bast fibres and hard leaf fibres (excluding binder or baler twine)	kg	S	1
13941133	Twine, cordage, rope or cables, of sisal or other textile fibres of 'agave' measuring >100,000 decitex, of jute or other textile bast fibres and hard leaf fibres (excluding binder or baler twine)	NA	NA	NA
13941135	Twines of sisal measuring <= 100,000 decitex (10 g/m) (excluding binder or baler twine)	NA	NA	NA
13941153	Sisal binder or baler (agricultural) twines	kg	S	1
13941155	Polyethylene or polypropylene binder or baler (agricultural) twines	kg	S	1
13941160	Cordage, ropes or cables of polyethylene, polypropylene, nylon or other polyamides or of polyesters measuring > 50 000 decitex, of other synthetic fibres (excluding binder or baler twine)	kg	S	1
13941170	Twines of polyethylene or polypropylene, of nylon or other polyamides or polyesters measuring <= 50 000 decitex (5 g/m) (excluding binder or baler twine)	kg	S	1
13941190	Twines, cordage, rope and cables of textile materials (excluding jute and other textile bast fibres, sisal, abaca or other hard leaf fibres, synthetic fibres)	kg	S	1
13941233	Made-up fishing nets from twine, cordage or rope of man-made fibres (excluding fish landing nets)	kg	S	1
13941235	Made-up fishing nets from yarn of man-made fibres (excluding fish landing nets)	kg	S	1
13941253	Made-up nets from twine, cable or rope of nylon or other polyamides (excluding netting in the piece produced by crochet, hairnets, sports and fishing nets)	kg	S	1
13941255	Made-up nets of nylon or other polyamides (excluding netting in the piece produced by crochet, hairnets, sports and fishing nets, those made from twine, cable or rope)	kg	S	1
13941259	Knotted netting of textile materials (excluding made-up fishing nets of man-made textiles, other made-up nets of nylon or other polyamides)	kg	S	1
13941280	Articles of twine, cordage, rope or cables	kg	S	1
13951010	Non-wovens of a weight <= 25 g/m <sup>2</sup> (including articles made from non-wovens) (excluding articles of apparel, coated or covered)	kg	S	1
13951020	Non-wovens of a weight of > 25 g/m <sup>2</sup> but <= 70 g/m <sup>2</sup> (including articles made from non-wovens) (excluding articles of apparel, coated or covered)	kg	S	1
13951030	Non-wovens of a weight of > 70 g/m <sup>2</sup> but <= 150 g/m <sup>2</sup> (including articles made from non-wovens) (excluding articles of apparel, coated or covered)	kg	S	1
13951050	Non-wovens of a weight of > 150 g/m <sup>2</sup> (including articles made from non-wovens) (excluding articles of apparel, coated or covered)	kg	S	1
13951070	Non-wovens, coated or covered (including articles made from non-wovens) (excluding articles of apparel)	kg	S	1
13961100	Metallised yarn or metallised gimped yarn	kg	S	1
13961200	Woven fabrics of metal thread and woven fabrics of metallised yarn, used in apparel, as furnishing fabrics or similar purposes	kg	S	1
13961300	Rubber thread and cord, textile covered; textile yarn and strip impregnated, coated, covered or sheathed with rubber or plastics	kg	S	1
13961400	Textile fabrics, impregnated, coated or covered n.e.c.	m <sup>2</sup>	S	0.25
13961500	Tyre cord fabrics of high tenacity yarn, of nylon, other polyamides, polyesters or viscose rayon	m <sup>2</sup>	S	0.25
13961620	Textile hosepiping and similar textile tubing, whether or not impregnated or coated, with or without lining, armour or accessories of other materials	kg	S	1
13961650	Textile wicks, conveyor belts or belting (including reinforced with metal or other material)	kg	S	1
13961680	Textile fabrics and felts, for paper-making machines or similar machines (including for pulp or asbestos-cement)	kg	S	1
13961730	Narrow woven fabrics other than labels, badges and other similar articles	NA	S	NA
13961750	Labels, badges and similar articles in textile materials (excluding embroidered)	NA	S	NA

PRODCOM code	Description of the PRODCOM code	QNTUNIT	TYPE	Conversion Factor to kg
13961770	Braids in the piece; tassels and pompons, ornamental trimmings (excluding knitted or crocheted)	NA	S	NA
13991130	Tulles and other net fabrics (excluding woven, knitted or crocheted)	NA	S	NA
13991150	Machine-made lace in the piece, in strips or in motifs	NA	S	NA
13991170	Hand-made lace in the piece, in strips or in motifs	NA	S	NA
13991230	Embroidery (without visible ground) in the piece, in strips or in motifs	NA	S	NA
13991250	Cotton embroidery in the piece, in strips or in motifs (excluding embroidery without visible ground)	NA	S	NA
13991270	Embroidery of textiles in the piece, in strips or in motifs (excluding without visible ground, cotton)	NA	S	NA
13991300	Felt, whether or not impregnated, coated, covered or laminated, n.e.c.	kg	S	1
13991400	Textile flock and dust and mill neps	kg	S	1
13991500	Gimped yarn and gimped strip and the like, of man-made textile materials of an apparent width <= 5 mm; chenille yarn; loop wale-yarn	kg	S	1
13991600	Quilted textile products in the piece (excluding embroidery)	m <sup>2</sup>	S	0.25
13991900	Powder-puffs and pads for the application of cosmetics or toilet preparations	p/st	S	0.5

3200 QNTUNIT: PRODCOM indicator about unit used to report quantities.

3201 kg = kilogram; p/st = number of items; NA = data not available, m<sup>2</sup>=square metres

3202 Source: own elaboration based on Eurostat data set DS-056120 (data extracted on 15 November 2023). Conversion factors used to convert the unit reported in EUROSTAT to kg based on (Huygens et al., 2023).

#### 3203 9.1.4 PRODCOM codes included in the scope

3204 **Table 40.** List and description of PRODCOM codes included in the scope

Category	PRODCOM code	Description of the PRODCOM code	Allocation of the code in the product category (%)	Reported measure unit in PRODCOM	Conversion Factor to kg
1. T-shirts	14143000	T-shirts, singlets and vests, knitted or crocheted	100	p/st	0.17
	14142240	Men's or boys' singlets, vests, bathrobes, dressing gowns and similar articles (excluding knitted or crocheted)	75	p/st	0.3
	14142460	Women's or girls' singlets and other vests, briefs, panties, negligees, bathrobes, dressing gowns, housecoats and similar articles of cotton (excluding knitted or crocheted)	40	p/st	0.08
	14142480	Women's or girls' negligees, bathrobes, dressing gowns, singlets, vests, briefs and panties (including boxer shorts), of man-made fibres (excluding knitted or crocheted)	40	p/st	0.08
	14142489	Women's or girls' singlets, vests, briefs, panties, negligees, bathrobes, dressing gowns and similar articles, of textiles (excluding cotton, man-made fibres, knitted or crocheted)	40	p/st	0.08
	14123013	Men's or boys' other garments, of cotton or man-made fibres, for industrial or occupational wear	25	p/st	0.5
	14123023	Women's or girls' other garments, of cotton or man-made fibres, for industrial or occupational wear	25	p/st	0.5
	14391053	Lightweight fine knit roll, polo or turtle neck jumpers and pullovers, of cotton	20	p/st	0.5
	14142430	Women's or girls' nightdresses and pyjamas (excluding knitted or crocheted)	25	p/st	0.3
	14142230	Men's or boys' nightshirts and pyjamas (excluding knitted or crocheted)	25	p/st	0.15
	14141430	Women's or girls' nighties and pyjamas, of knitted or crocheted textiles	25	p/st	0.15

Category	PRODCOM code	Description of the PRODCOM code	Allocation of the code in the product category (%)	Reported measure unit in PRODCOM	Conversion Factor to kg
	14391055	Lightweight fine knit roll, polo or turtle neck jumpers and pullovers, of man-made fibres	20	p/st	0.5
	14141230	Men's or boys' nightshirts and pyjamas, of knitted or crocheted textiles	25	p/st	0.15
	14191290	Other garments, knitted or crocheted (including bodies with a proper sleeve)	100	kg	1
2. Shirts and blouses	14141100	Men's or boys' shirts, knitted or crocheted	100	p/st	0.25
	14141310	Women's or girls' blouses, shirts and shirt-blouses, of knitted or crocheted textiles	100	p/st	0.25
	14142100	Men's or boys' shirts (excluding knitted or crocheted)	100	p/st	0.25
	14142300	Women's or girls' blouses, shirts and shirt-blouses (excluding knitted or crocheted)	100	p/st	0.25
	14123013	Men's or boys' other garments, of cotton or man-made fibres, for industrial or occupational wear	25	p/st	0.5
	14123023	Women's or girls' other garments, of cotton or man-made fibres, for industrial or occupational wear	25	p/st	0.5
	14141230	Men's or boys' nightshirts and pyjamas, of knitted or crocheted textiles	25	p/st	0.15
	14142430	Women's or girls' nightdresses and pyjamas (excluding knitted or crocheted)	25	p/st	0.3
	14142230	Men's or boys' nightshirts and pyjamas (excluding knitted or crocheted)	25	p/st	0.15
	14141430	Women's or girls' nighties and pyjamas, of knitted or crocheted textiles	25	p/st	0.15
	14391053	Lightweight fine knit roll, polo or turtle neck jumpers and pullovers, of cotton	40	p/st	0.5
	14391055	Lightweight fine knit roll, polo or turtle neck jumpers and pullovers, of man-made fibres	40	p/st	0.5
3. Sweaters and mid-layers	14391031	Men's or boys' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of wool or fine animal hair (excluding jerseys and pullovers containing $\geq 50\%$ of wool and weighing $\geq 600$ g)	100	p/st	0.5
	14391032	Women's or girls' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of wool or fine animal hair (excluding jerseys and pullovers containing $\geq 50\%$ of wool and weighing $\geq 600$ g)	100	p/st	0.5
	14391033	Jerseys and pullovers, containing $\geq 50\%$ by weight of wool and weighing $\geq 600$ g per article	100	p/st	0.3
	14391053	Lightweight fine knit roll, polo or turtle neck jumpers and pullovers, of cotton	40	p/st	0.5
	14391055	Lightweight fine knit roll, polo or turtle neck jumpers and pullovers, of man-made fibres	40	p/st	0.5
	14391061	Men's or boys' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of cotton (excluding lightweight fine knit roll, polo or turtle neck jumpers and pullovers)	100	p/st	0.5
	14391062	Women's or girls' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of cotton (excluding lightweight fine knit roll, polo or turtle neck jumpers and pullovers)	100	p/st	0.5
	14132130	Men's or boys' waistcoats, anoraks, ski-jackets, wind-jackets and similar articles (excluding jackets and blazers, knitted or crocheted, impregnated, coated, covered, laminated or rubberised)	20	p/st	0.95
	14133130	Women's or girls' waistcoats, anoraks, ski-jackets, wind-jackets and similar articles (excluding jackets and blazers, knitted or crocheted, impregnated, coated, covered, laminated or rubberised)	20	p/st	0.95
	14391071	Men's or boys' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of man-made fibres (excluding lightweight fine knit roll, polo or turtle neck jumpers and pullovers)	100	p/st	0.5
	14391072	Women's or girls' jerseys, pullovers, sweatshirts, waistcoats and cardigans, of man-made fibres (excluding lightweight fine knit roll, polo or turtle neck jumpers and pullovers)	100	p/st	0.5

Category	PRODCOM code	Description of the PRODCOM code	Allocation of the code in the product category (%)	Reported measure unit in PRODCOM	Conversion Factor to kg
	14391090	Jerseys, pullovers, sweatshirts, waistcoats and cardigans, of textile materials (excluding those of wool or fine animal hair, cotton, man-made fibres)	100	p/st	0.5
	14131120	Men's or boys' waistcoats, anoraks, ski-jackets, wind-cheaters, wind-jackets and similar articles, of knitted or crocheted textiles (excluding jackets and blazers)	20	p/st	0.95
	14131320	Women's or girls' waistcoats, anoraks, ski-jackets, wind-cheaters, wind-jackets and similar articles, of knitted or crocheted textiles (excluding jackets and blazers)	20	p/st	0.95
4. Jackets and coats	14121130	Men's or boys' jackets and blazers, of cotton or man-made fibres, for industrial and occupational wear	100	p/st	0.95
	14122130	Women's or girls' jackets and blazers, of cotton or man-made fibres, for industrial or occupational wear	100	p/st	0.95
	14131110	Men's or boys' overcoats, car-coats, capes, cloaks and similar articles, of knitted or crocheted textiles (excluding jackets and blazers, anoraks, wind-cheaters and wind-jackets)	100	p/st	0.95
	14131120	Men's or boys' waistcoats, anoraks, ski-jackets, wind-cheaters, wind-jackets and similar articles, of knitted or crocheted textiles (excluding jackets and blazers)	80	p/st	0.95
	14131230	Men's or boys' jackets and blazers, of knitted or crocheted textiles	100	p/st	0.95
	14131310	Women's or girls' overcoats, car-coats, capes, cloaks and similar articles, of knitted or crocheted textiles (excluding jackets and blazers)	100	p/st	0.95
	14131320	Women's or girls' waistcoats, anoraks, ski-jackets, wind-cheaters, wind-jackets and similar articles, of knitted or crocheted textiles (excluding jackets and blazers)	80	p/st	0.95
	14131430	Women's or girls' jackets and blazers, of knitted or crocheted textiles	100	p/st	0.95
	14132115	Men's or boys' raincoats, overcoats, car-coats, capes, etc.	100	p/st	0.5
	14132130	Men's or boys' waistcoats, anoraks, ski-jackets, wind-jackets and similar articles (excluding jackets and blazers, knitted or crocheted, impregnated, coated, covered, laminated or rubberised)	80	p/st	0.95
	14132300	Men's or boys' jackets and blazers (excluding knitted or crocheted)	100	p/st	0.95
	14133110	Woman's or girls' raincoats	100	p/st	0.5
	14133115	Woman's or girls' raincoats and overcoats, etc.	100	p/st	0.5
	14133120	Woman's or girls' overcoats, etc.	100	p/st	0.95
	14133130	Women's or girls' waistcoats, anoraks, ski-jackets, wind-jackets and similar articles (excluding jackets and blazers, knitted or crocheted, impregnated, coated, covered, laminated or rubberised)	80	p/st	0.95
	14133330	Women's or girls' jackets and blazers (excluding knitted or crocheted)	100	p/st	0.95
	14192230	Ski-suits (excluding of knitted or crocheted textiles)	50	p/st	0.5
	14191230	Ski-suits, of knitted or crocheted textiles	50	p/st	0.5
	14191100	Babies' garments and clothing accessories, knitted or crocheted including vests, rompers, underpants, stretch-suits, gloves or mittens or mitts, outerwear (for children of height <= 86 cm)	20	kg	1
	14192150	Babies clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, gloves, mittens and outerwear (excluding sanitary towels and napkins and similar articles)	20	kg	1
	14131260	Men's or boys' suits and ensembles, of knitted or crocheted textiles	40	p/st	0.5

Category	PRODCOM code	Description of the PRODCOM code	Allocation of the code in the product category (%)	Reported measure unit in PRODCOM	Conversion Factor to kg
	14131460	Women's or girls' suits and ensembles, of knitted or crocheted textiles	40	p/st	0.5
	14132200	Men's or boys' suits & ensembles (excluding knitted or crocheted)	40	p/st	0.5
	14133200	Women's or girls' suits & ensembles (excluding knitted or crocheted)	40	p/st	0.5
	14132110	Men's or boys' raincoats	100	p/st	0.5
	14132120	Men's or boys' overcoats, car-coats, capes, etc.	100	p/st	0.95
	14132210	Men's or boys' suits (excluding knitted or crocheted)	50	p/st	1.4
	14132220	Men's or boys' ensembles (excluding knitted or crocheted)	50	p/st	1
	14133210	Women's or girls' suits (excluding knitted or crocheted)	50	p/st	1.4
	14133220	Women's or girls' ensembles (excluding knitted or crocheted)	50	p/st	1
	14192100	Babies' clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, napkins, gloves, mittens and outerwear	20	kg	1
5. Pants and shorts	14131270	Men's or boys' trousers, breeches, shorts, bib and brace overalls, of knitted or crocheted textiles	100	p/st	0.45
	14131490	Women's or girls' trousers, breeches, shorts, bib and brace overalls, of knitted or crocheted textiles	100	p/st	0.45
	14132442	Men's or boys' trousers and breeches, of denim (excluding for industrial or occupational wear)	100	p/st	0.45
	14132444	Men's or boys' trousers, breeches and shorts, of wool or fine animal hair (excluding knitted or crocheted, for industrial or occupational wear)	100	p/st	0.45
	14132445	Men's or boys' trousers and breeches, of man-made fibres (excluding knitted or crocheted, for industrial or occupational wear)	100	p/st	0.45
	14132448	Men's or boys' trousers and breeches, of cotton (excluding denim, knitted or crocheted)	100	p/st	0.45
	14132449	Men's or boys' trousers, breeches, shorts and bib and brace overalls (excluding of wool, cotton and man-made fibres, knitted or crocheted)	100	p/st	0.45
	14141230	Men's or boys' nightshirts and pyjamas, of knitted or crocheted textiles	50	p/st	0.15
	14132455	Men's or boys' bib and brace overalls (excluding knitted or crocheted, for industrial or occupational wear)	100	p/st	0.45
	14132460	Men's or boys' shorts, of cotton or man-made fibres (excluding knitted or crocheted)	100	p/st	0.45
	14133542	Women's or girls' trousers and breeches, of denim (excluding for industrial or occupational wear)	100	p/st	0.45
	14133548	Women's or girls' trousers and breeches, of cotton (excluding denim, for industrial or occupational wear)	100	p/st	0.45
	14133549	Women's or girls' trousers and breeches, of wool or fine animal hair or man-made fibres (excluding knitted or crocheted and for industrial and occupational wear)	100	p/st	0.45
	14133551	Women's or girls' bib and brace overalls, of cotton (excluding knitted or crocheted, for industrial or occupational wear)	100	p/st	0.45
	14142430	Women's or girls' nightdresses and pyjamas (excluding knitted or crocheted)	30	p/st	0.3
14133561	Women's or girls' shorts, of cotton (excluding knitted and crocheted)	100	p/st	0.45	

Category	PRODCOM code	Description of the PRODCOM code	Allocation of the code in the product category (%)	Reported measure unit in PRODCOM	Conversion Factor to kg
	14133563	Women's or girls' bib and brace overalls, of wool or fine animal hair and man-made fibres (excluding cotton, knitted or crocheted, for industrial or occupational wear) and women's or girls' shorts, of wool or fine animal hair (excluding knitted or crocheted)	100	p/st	0.45
	14133565	Women's or girls' shorts, of man-made fibres (excluding knitted or crocheted)	100	p/st	0.45
	14133569	Women's or girls' trousers, breeches, bib and brace overalls, of textiles (excluding cotton, wool or fine animal hair, man-made fibres, knitted or crocheted)	100	p/st	0.45
	14121240	Men's or boys' trousers and breeches, of cotton or man-made fibres, for industrial or occupational wear	100	p/st	0.45
	14121250	Men's or boys' bib and brace overalls, of cotton or man-made fibres, for industrial or occupational wear	100	p/st	0.45
	14122240	Women's or girls' trousers and breeches, of cotton or man-made fibres, for industrial or occupational wear	100	p/st	0.45
	14141430	Women's or girls' nighties and pyjamas, of knitted or crocheted textiles	30	p/st	0.15
	14142230	Men's or boys' nightshirts and pyjamas (excluding knitted or crocheted)	50	p/st	0.15
	14122250	Women's or girls' bib and brace overalls, of cotton or man-made fibres, for industrial or occupational wear	100	p/st	0.45
	14192230	Ski-suits (excluding of knitted or crocheted textiles)	50	p/st	0.5
	14191230	Ski-suits, of knitted or crocheted textiles	50	p/st	0.5
	14131260	Men's or boys' suits and ensembles, of knitted or crocheted textiles	40	p/st	0.5
	14131460	Women's or girls' suits and ensembles, of knitted or crocheted textiles	40	p/st	0.5
	14132200	Men's or boys' suits & ensembles (excluding knitted or crocheted)	40	p/st	0.5
	14133200	Women's or girls' suits & ensembles (excluding knitted or crocheted)	40	p/st	0.5
	14123013	Men's or boys' other garments, of cotton or man-made fibres, for industrial or occupational wear	50	p/st	0.5
	14123023	Women's or girls' other garments, of cotton or man-made fibres, for industrial or occupational wear	50	p/st	0.5
	14132210	Men's or boys' suits (excluding knitted or crocheted)	50	p/st	1
	14132220	Men's or boys' ensembles (excluding knitted or crocheted)	50	p/st	1
	14133210	Women's or girls' suits (excluding knitted or crocheted)	25	p/st	1
	14133220	Women's or girls' ensembles (excluding knitted or crocheted)	25	p/st	1
6. Dresses, Skirts and jumpsuits	14131470	Women's or girls' dresses, of knitted or crocheted textiles	100	p/st	0.3
	14131480	Women's or girls' skirts and divided skirts, of knitted or crocheted textiles	100	p/st	0.25
	14133470	Women's or girls' dresses (excluding knitted or crocheted)	100	p/st	0.3
	14133480	Women's or girls' skirts and divided skirts (excluding knitted or crocheted)	100	p/st	0.25
	14131260	Men's or boys' suits and ensembles, of knitted or crocheted textiles	20	p/st	0.5
	14121120	Men's or boys' ensembles, of cotton or man-made fibres, for industrial and occupational wear	100	p/st	0.5
	14191210	Track-suits, of knitted or crocheted textiles	100	p/st	0.5
	14141430	Women's or girls' nighties and pyjamas, of knitted or crocheted textiles	20	p/st	0.15
	14132200	Men's or boys' suits & ensembles (excluding knitted or crocheted)	20	p/st	0.5

Category	PRODCOM code	Description of the PRODCOM code	Allocation of the code in the product category (%)	Reported measure unit in PRODCOM	Conversion Factor to kg
	14142489	Women's or girls' singlets, vests, briefs, panties, negligees, bathrobes, dressing gowns and similar articles, of textiles (excluding cotton, man-made fibres, knitted or crocheted)	30	p/st	0.08
	14142450	Women's or girls' slips and petticoats (excluding knitted or crocheted)	100	p/st	0.5
	14142480	Women's or girls' negligees, bathrobes, dressing gowns, singlets, vests, briefs and panties (including boxer shorts), of man-made fibres (excluding knitted or crocheted)	30	p/st	0.08
	14142430	Women's or girls' nightdresses and pyjamas (excluding knitted or crocheted)	20	p/st	0.3
	14142240	Men's or boys' singlets, vests, bathrobes, dressing gowns and similar articles (excluding knitted or crocheted)	25	p/st	0.3
	14141440	Women's or girls' negligees, bathrobes, dressing gowns and similar articles, of knitted or crocheted textiles	100	p/st	0.3
	14141450	Women's or girls' slips and petticoats, of knitted or crocheted textiles	100	p/st	0.5
	14141240	Men's or boys' dressing gowns, bathrobes and similar articles, of knitted or crocheted textiles	100	p/st	0.3
	14192210	Other men's or boys' apparel n.e.c., including tracksuits and jogging suits (excluding waistcoats, ski-suits, knitted or crocheted)	100	p/st	0.5
	14192220	Other women's or girls' apparel n.e.c., including tracksuits and jogging suits (excluding waistcoats, ski-suits, knitted or crocheted)	100	p/st	0.5
	14122120	Women's or girls' ensembles, of cotton or man-made fibres, for industrial or occupational wear	100	p/st	0.5
	14131460	Women's or girls' suits and ensembles, of knitted or crocheted textiles	20	p/st	0.5
	14133200	Women's or girls' suits & ensembles (excluding knitted or crocheted)	20	p/st	0.5
	14142460	Women's or girls' singlets and other vests, briefs, panties, negligees, bathrobes, dressing gowns, housecoats and similar articles of cotton (excluding knitted or crocheted)	30	p/st	0.08
	14133210	Women's or girls' suits (excluding knitted or crocheted)	25	p/st	1
	14133220	Women's or girls' ensembles (excluding knitted or crocheted)	25	p/st	1
7. Leggings, Stockings, Tights and socks	14311033	Panty hose and tights, of knitted or crocheted synthetic fibres, measuring per single yarn < 67 decitex	100	p/st	0.07
	14311035	Panty hose and tights, of knitted or crocheted synthetic fibres, measuring per single yarn >= 67 decitex	100	p/st	0.07
	14311037	Panty hose and tights of textile materials, knitted or crocheted (excl. graduated compression hosiery, those of synthetic fibres and hosiery for babies)	100	p/st	0.07
	14311050	Women's full-length or knee-length knitted or crocheted hosiery, measuring per single yarn < 67 decitex	100	pa	0.01
	14311090	Knitted or crocheted hosiery and footwear (including socks; excluding women's full-length/knee-length hosiery, measuring <67decitex, panty-hose and tights, footwear with applied soles)	95	pa	0.07
8. Underwear	14141220	Men's or boys' underpants and briefs, of knitted or crocheted textiles (including boxer shorts)	100	p/st	0.08
	14141420	Women's or girls' briefs and panties, of knitted or crocheted textiles (including boxer shorts)	100	p/st	0.08
	14142220	Men's or boys' underpants and briefs (including boxer shorts) (excluding knitted or crocheted)	100	p/st	0.08

Category	PRODCOM code	Description of the PRODCOM code	Allocation of the code in the product category (%)	Reported measure unit in PRODCOM	Conversion Factor to kg
	14142530	Brassieres	100	p/st	0.05
	14142550	Girdles, panty-girdles and corselettes (including bodies with adjustable straps)	100	p/st	0.5
	14191100	Babies' garments and clothing accessories, knitted or crocheted including vests, rompers, underpants, stretch-suits, gloves or mittens or mitts, outerwear (for children of height <= 86 cm)	50	kg	1
	14192150	Babies clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, gloves, mittens and outerwear (excluding sanitary towels and napkins and similar articles)	50	kg	1
	14142460	Women's or girls' singlets and other vests, briefs, panties, negligees, bathrobes, dressing gowns, housecoats and similar articles of cotton (excluding knitted or crocheted)	30	p/st	0.08
	14142480	Women's or girls' negligees, bathrobes, dressing gowns, singlets, vests, briefs and panties (including boxer shorts), of man-made fibres (excluding knitted or crocheted)	30	p/st	0.08
	14142489	Women's or girls' singlets, vests, briefs, panties, negligees, bathrobes, dressing gowns and similar articles, of textiles (excluding cotton, man-made fibres, knitted or crocheted)	30	p/st	0.08
	14192100	Babies' clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, napkins, gloves, mittens and outerwear	50	kg	1
9. Swimwear	14191240	Men's or boys' swimwear, of knitted or crocheted textiles	100	p/st	0.12
	14191250	Women's or girls' swimwear, of knitted or crocheted textiles	100	p/st	0.12
	14192240	Men's or boys' swimwear (excluding of knitted or crocheted textiles)	100	p/st	0.12
	14192250	Women's or girls' swimwear (excluding of knitted or crocheted textiles)	100	p/st	0.12
10. Accessories	14191300	Gloves, mittens and mitts, of knitted or crocheted textiles	100	pa	0.1
	14191930	Shawls, scarves, mufflers, mantillas, veils and the like, of knitted or crocheted textiles	100	p/st	0.1
	14191960	Clothing accessories and parts thereof, of knitted or crocheted textiles (excluding gloves, mittens, shawls, scarves, mufflers, mantillas and veils)	100	p/st	1
	14192310	Handkerchiefs	100	p/st	0.5
	14192333	Shawls, scarves, mufflers, mantillas, veils and the like (excluding articles of silk or silk waste, knitted or crocheted)	100	p/st	0.15
	14192338	Shawls, scarves, mufflers, mantillas, veils and the like, of silk or silk waste (excluding knitted or crocheted)	100	p/st	0.15
	14192353	Ties, bow ties and cravats (excluding articles of silk or silk waste, knitted or crocheted)	100	p/st	0.15
	14192358	Ties, bow ties and cravats, of silk or silk waste (excluding knitted or crocheted)	100	p/st	0.15
	14192370	Gloves, mittens and mitts (excluding knitted or crocheted)	100	pa	0.1
	14192393	Clothing accessories of textiles (excluding shawls, scarves and mufflers, mantillas and veils, ties, bow-ties and cravats, gloves, mittens and mitts, knitted or crocheted)	100	NA	1
	14192395	Parts of garments or of clothing accessories, of textiles (excluding bras, girdles and corsets, braces, suspenders and garters, knitted or crocheted)	100	NA	1
	14192396	Clothing accessories, parts of garments or of clothing accessories, of textiles, n.e.c. and parts thereof, (excluding shawls, scarves and mufflers, mantillas and veils, ties, bow-ties and cravats, gloves, mittens and mitts and parts thereof; bras, girdles and corsets, braces, suspenders and garters, knitted or crocheted)	100	NA	1

Category	PRODCOM code	Description of the PRODCOM code	Allocation of the code in the product category (%)	Reported measure unit in PRODCOM	Conversion Factor to kg
	14194130	Hat-forms, hat bodies and hoods, plateaux and manchons of felt (including slit manchons) (excluding those blocked to shape, those with made brims)	100	p/st	0.1
	14194150	Hat-shapes, plaited or made by assembling strips of any material (excluding those blocked to shape, those with made brims, those lined or trimmed)	100	p/st	0.1
	14194230	Felt hats and other felt headgear, made from hat bodies or hoods and plateaux	100	p/st	0.1
	14194250	Hats and other headgear, plaited or made by assembling strips of any material	100	p/st	0.1
	14194270	Hats and other headgear, knitted or crocheted or made-up from lace, felt or other textile fabric in the piece (but not in strips); hair-nets of any material	100	p/st	0.1

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kg=kilogram, p/st= Number of items, pa=Number of pairs, NA= Not available

Some codes were assigned to more than one product category with different allocation percentage. This allocation was an estimation of the authors based on the description of the PRODCOM code.

3208

Source: own elaboration based on Eurostat data set DS-056120 (data extracted on 15 November 2023). Conversion factors used to convert the unit reported in EUROSTAT to kg based on (Huygens, Dries et al., 2023).

3209

**Table 41.** Characteristics of data used for the market analysis

PRODCOM codes affected by changes	Subgroup	Product category ID and name (share of the code allocated to the category)	Codes description	Implications of the affected codes (rationale) over the existing codes (merging, newly introduced, complementing, etc.)	Affected indicator	Missing data
14123013	Apparel	1.T-shirts (25%) 2.Shirts and blouses (25%) 5.Pants and shorts (50%)	Men's or boys' other garments, of cotton or man-made fibres, for industrial or occupational wear	The 2 affected codes were added in 2001 to complement the codes about industrial and occupational wear: 14121120 14121130 14121240 14121250 14122120 14122130 14122240 14122250	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	NA
14123023	Apparel	1.T-shirts (25%) 2.Shirts and blouses (25%) 5.Pants and shorts (25%)	Women's or girls' other garments, of cotton or man-made fibres, for industrial or occupational wear			NA
14131260	Apparel	4.Jackets and coats (40%) 5.Pants and shorts (40%) 6.Dresses, Skirts and jumpsuits (20%)	Men's or boys' suits and ensembles, of knitted or crocheted textiles	The 4 affected codes were added in 2001 to complement the codes about knitted and crocheted textiles groups: 14131110 14131120 14131230 14131310 14131320	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	NA
14131270	Apparel	5.Pants and shorts (100%)	Men's or boys' trousers, breeches, shorts, bib and brace overalls, of knitted or crocheted textiles			NA

PRODCOM codes affected by changes	Subgroup	Product category ID and name (share of the code allocated to the category)	Codes description	Implications of the affected codes (rationale) over the existing codes (merging, newly introduced, complementing, etc.)	Affected indicator	Missing data
14131460	Apparel	4.Jackets and coats (40%) 5.Pants and shorts (40%) 6.Dresses, Skirts and jumpsuits (20%)	Women's or girls' suits and ensembles, of knitted or crocheted textiles	14131430 14131470 14131480)		NA
14131490	Apparel	5.Pants and shorts (100%)	Women's or girls' trousers, breeches, shorts, bib and brace overalls, of knitted or crocheted textiles			NA
14132115	Apparel	4.Jackets and coats (100%)	Men's or boys' raincoats, overcoats, car-coats, capes, etc.	The affected code was added in 2013, merging the following 2 codes: 14132110 14132120	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	Data missing for 2022 due to updates of the PRODCOM list.
14132200	Apparel	4.Jackets and coats (40%) 5.Pants and shorts (40%) 6.Dresses, Skirts and jumpsuits (20%)	Men's or boys' suits & ensembles (excluding knitted or crocheted)	The affected code was added in 2013, merging the following 2 codes: 14132210 14132220	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	Data missing for 2022.
14132445	Apparel	5.Pants and shorts (100%)	Men's or boys' trousers and breeches, of man-made fibres (excluding knitted or crocheted, for industrial or occupational wear)	The 3 affected codes start in 2001 as to complement the Men's or boys' trousers, breeches, shorts, bib and brace overalls groups divided into specific fibres excluding knitted and crocheted which are complete codes: 14132442 14132444 14132448 14132449 14132460	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	Data missing for time interval 1995-2001 most probably due to introduction of new codes.
14132455	Apparel	5.Pants and shorts (100%)	Men's or boys' bib and brace overalls (excluding knitted or crocheted, for industrial or occupational wear)			Data missing for time interval 1995-2001 most probably due to introduction of new codes.
14131270	Apparel	5.Pants and shorts (100%)	Men's or boys' trousers, breeches, shorts, bib and brace overalls, of knitted or crocheted textiles			Data missing for time interval 1995-2001 most probably due to introduction of new codes.

PRODCOM codes affected by changes	Subgroup	Product category ID and name (share of the code allocated to the category)	Codes description	Implications of the affected codes (rationale) over the existing codes (merging, newly introduced, complementing, etc.)	Affected indicator	Missing data
14133115	Apparel	4.Jackets and coats (100%)	Woman's or girls' raincoats and overcoats, etc.	The affected code was added in 2012, merging the 2 following codes: 14133110 14133120	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	Data missing for 2022 due to updates of the PRODCOM list
14133130	Apparel	3.Sweaters and mid-layers (20%) 4.Jackets and coats (80%)	Women's or girls' waistcoats, anoraks, ski-jackets, wind-jackets and similar articles (excluding jackets and blazers, knitted or crocheted, impregnated, coated, covered, laminated or rubberised)	NA	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	Data missing for 2022 due to updates of the PRODCOM list
14133200	Apparel	4.Jackets and coats (40%) 5.Pants and shorts (40%) 6.Dresses, Skirts and jumpsuits (20%)	Women's or girls' suits & ensembles (excluding knitted or crocheted)	The affected code was added in 2012, merging the following 2 codes: 14133210 14133220	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	NA
14133565	Apparel	5.Pants and shorts (100%)	Women's or girls' shorts, of man-made fibres (excluding knitted or crocheted)	The affected code was added in 2001 as to complement the Women's or girls' shorts groups divided into specific fibres (excluding knitted and crocheted which are complete codes): 14133551 14133561 14133563	PRODQNT EXPQNT IMPQNT PRODVAL EXPVAL IMPVAL	Data missing for time interval 1995-2001 most probably due to introduction of new codes.
14192150	Apparel	4.Jackets and coats (20%) 8.Underwear (50%)	Babies clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, gloves, mittens and outerwear (excluding sanitary towels and napkins and similar articles)	The affected code was added in 2012 to complement Babies clothing and accessories: 14192100	PRODVAL EXPVAL IMPVAL	NA

PRODCOM codes affected by changes	Subgroup	Product category ID and name (share of the code allocated to the category)	Codes description	Implications of the affected codes (rationale) over the existing codes (merging, newly introduced, complementing, etc.)	Affected indicator	Missing data
14192100	Apparel	4.Jackets and coats (20%) 8.Underwear (50%)	Babies' clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, napkins, gloves, mittens and outerwear	NA	PRODVAL EXPVAL IMPVAL	Data missing for 2022
14191100	Apparel	4.Jackets and coats (20%) 8.Underwear (50%)	Babies' garments and clothing accessories, knitted or crocheted including vests, rompers, underpants, stretch-suits, gloves or mittens or mitts, outerwear (for children of height <= 86 cm)	NA	NA	PRODQNT EXPQNT
14142240	Apparel	1.T-shirts (75%) 6.Dresses, Skirts and jumpsuits (25%)	Men's or boys' singlets, vests, bathrobes, dressing gowns and similar articles (excluding knitted or crocheted)	NA	NA	EXPQNT IMPQNT
14142460	Apparel	1.T-shirts (40%) 6.Dresses, Skirts and jumpsuits (30%) 8.Underwear (30%)	Women's or girls' singlets and other vests, briefs, panties, negligees, bathrobes, dressing gowns, housecoats and similar articles of cotton (excluding knitted or crocheted)	NA	NA	EXPQNT IMPQNT
14142480	Apparel	1.T-shirts (40%) 6.Dresses, Skirts and jumpsuits (30%) 8.Underwear (30%)	Women's or girls' negligees, bathrobes, dressing gowns, singlets, vests, briefs and panties (including boxer shorts), of man-made fibres (excluding knitted or crocheted)	NA	NA	EXPQNT
14142489	Apparel	1.T-shirts (40%) 6.Dresses, Skirts and jumpsuits (30%) 8.Underwear (30%)	Women's or girls' singlets, vests, briefs, panties, negligees, bathrobes, dressing gowns and similar articles, of textiles (excluding cotton, man-made fibres, knitted or crocheted)	NA	NA	IMPQNT
14191230	Apparel	4.Jackets and coats (50%) 5.Pants and shorts (50%)	Ski-suits, of knitted or crocheted textiles	NA	NA	EXPQNT

PRODCOM codes affected by changes	Subgroup	Product category ID and name (share of the code allocated to the category)	Codes description	Implications of the affected codes (rationale) over the existing codes (merging, newly introduced, complementing, etc.)	Affected indicator	Missing data
14192150	Apparel	4.Jackets and coats (50%) 5.Pants and shorts (50%)	Babies clothing and accessories, of textiles, not knitted or crocheted (for children of height <= 86 cm) including vests, rompers, underpants, stretch-suits, gloves, mittens and outerwear (excluding sanitary towels and napkins and similar articles)	NA	NA	EXPQNT IMPQNT PRODQNT
14192210	Apparel	6.Dresses, Skirts and jumpsuits (100%)	Other men's or boys' apparel n.e.c., including tracksuits and jogging suits (excluding waistcoats, ski-suits, knitted or crocheted)	NA	NA	EXPQNT IMPQNT
14192220	Apparel	6.Dresses, Skirts and jumpsuits (100%)	Other women's or girls' apparel n.e.c., including tracksuits and jogging suits (excluding waistcoats, ski-suits, knitted or crocheted)	NA	NA	EXPQNT
14311037	Apparel	7.Leggings, Stockings, Tights and socks (100%)	Pantyhose and tights of textile materials, knitted or crocheted (excl. graduated compression hosiery, those of synthetic fibres and hosiery for babies)	Code included in 2013 complement Hosiery: 14311090	PRODVAL EXPVAL IMPVAL	NA
14192396	Apparel	10. Accessories	Clothing accessories, parts of garments or of clothing accessories, of textiles, n.e.c. and parts thereof, (excluding shawls, scarves and mufflers, mantillas and veils, ties, bow-ties and cravats, gloves, mittens and mitts and parts thereof; bras, girdles and corsets, braces, suspenders and garters, knitted or crocheted)	Code included in 2015 to complement accessories: 14192393 14192395	PRODVAL EXPVAL IMPVAL	PRODQNT IMPQNT EXPQNT
14192393	Apparel	10. Accessories	Clothing accessories of textiles (excluding shawls, scarves and mufflers, mantillas and veils, ties, bow-ties and cravats, gloves, mittens and mitts, knitted or crocheted)	NA	NA	PRODQNT IMPQNT EXPQNT

PRODCOM codes affected by changes	Subgroup	Product category ID and name (share of the code allocated to the category)	Codes description	Implications of the affected codes (rationale) over the existing codes (merging, newly introduced, complementing, etc.)	Affected indicator	Missing data
14192395	Apparel	10. Accessories	Parts of garments or of clothing accessories, of textiles (excluding bras, girdles and corsets, braces, suspenders and garters, knitted or crocheted)	NA	NA	PRODQNT IMPQNT EXPQNT
14194270	Apparel	10. Accessories	Hats and other headgear, knitted or crocheted or made-up from lace, felt or other textile fabric in the piece (but not in strips); hair-nets of any material	NA	NA	IMPQNT EXPQNT
14191930	Apparel	10. Accessories	Shawls, scarves, mufflers, mantillas, veils and the like, of knitted or crocheted textiles	NA	NA	EXPQNT
14191960	Apparel	10. Accessories	Clothing accessories and parts thereof, of knitted or crocheted textiles (excluding gloves, mittens, shawls, scarves, mufflers, mantillas and veils)	NA	NA	EXPQNT

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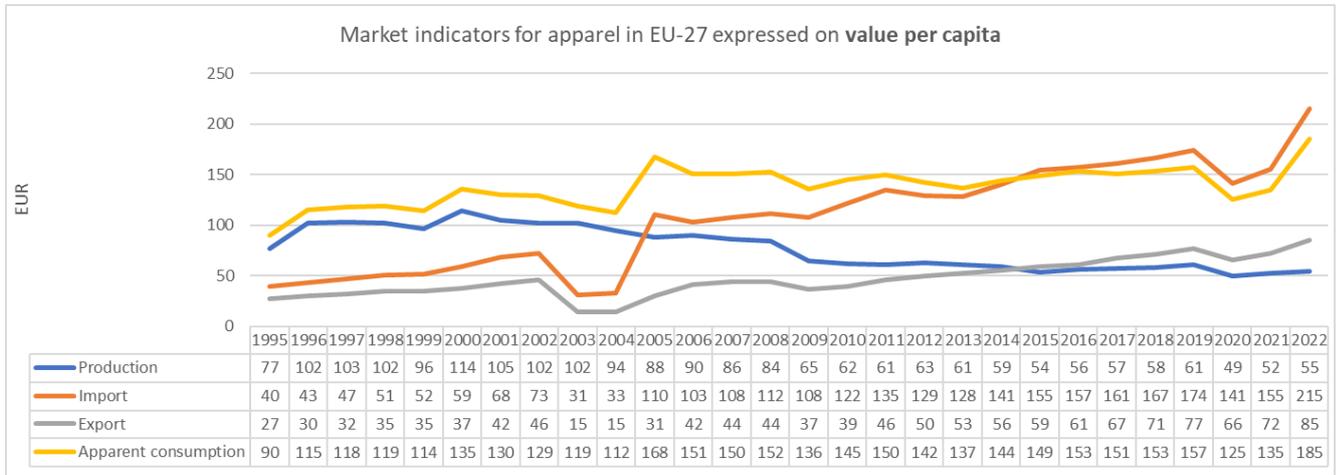
3212

NA: not applicable

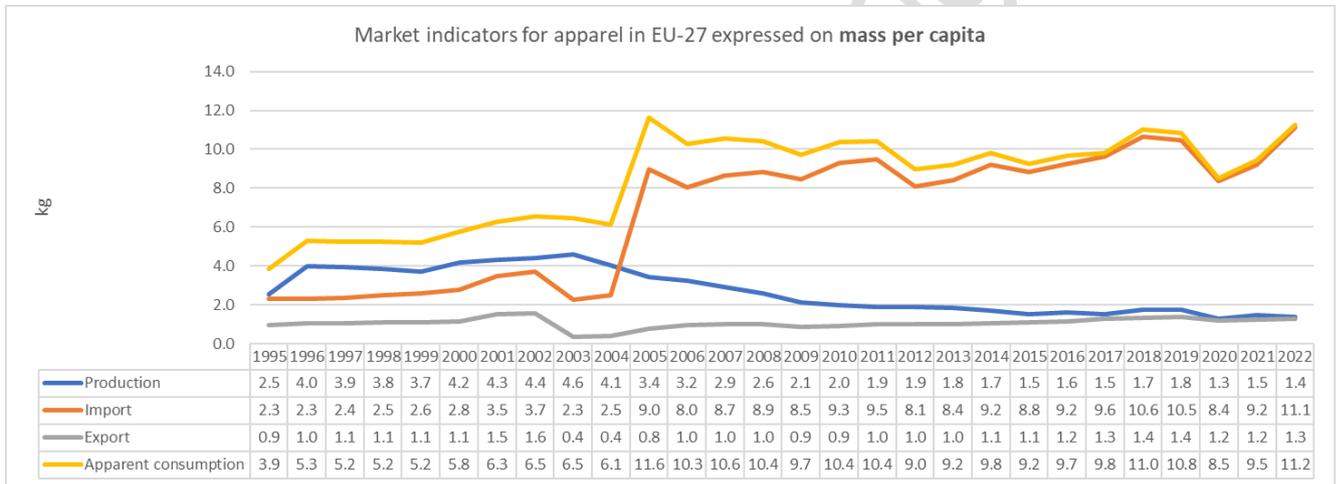
The changes of the affected PRODCOM codes should be understood as merged, changed or newly introduced due to NACE list revision and they are considered complete in the analysis and used.

3213 **9.1.5 Supplementary information about the EU market**

3214 **Figure 18.** Market indicators per capita for apparel textiles in EU-27



3215



3216

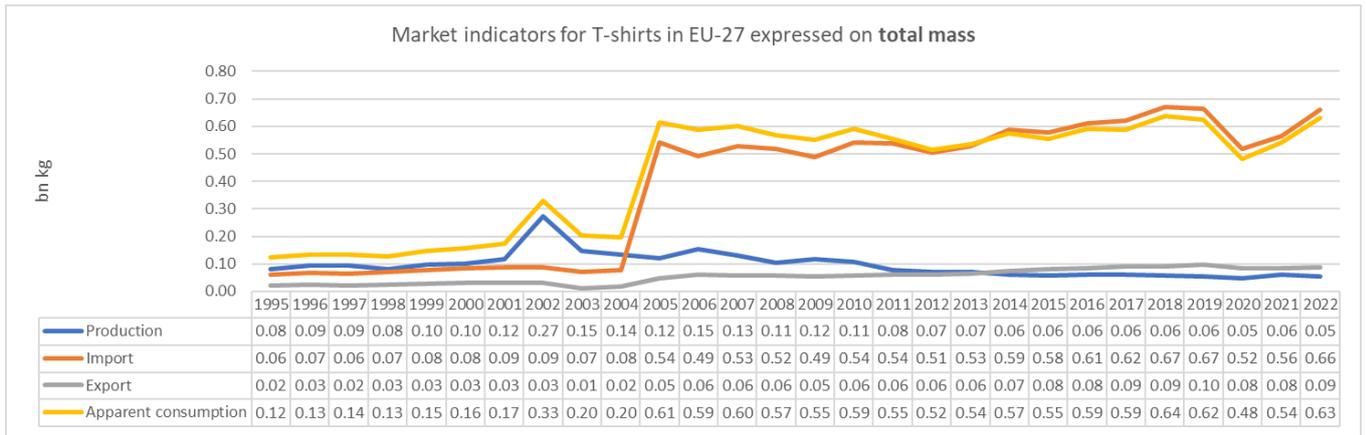
3217

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

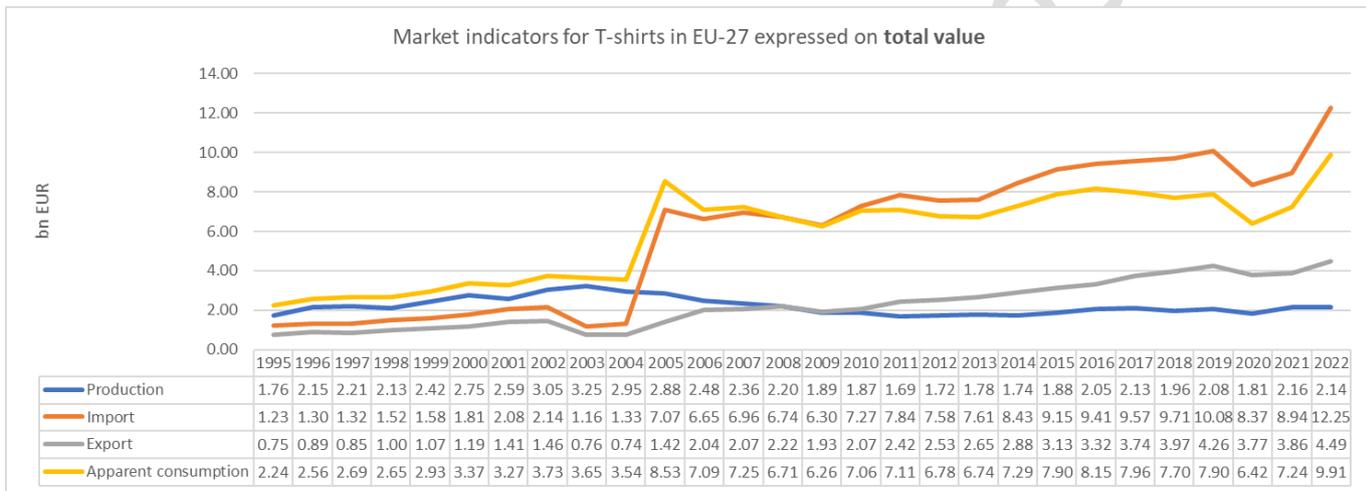
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**Figure 19.** Market indicators for T-shirts in EU-27



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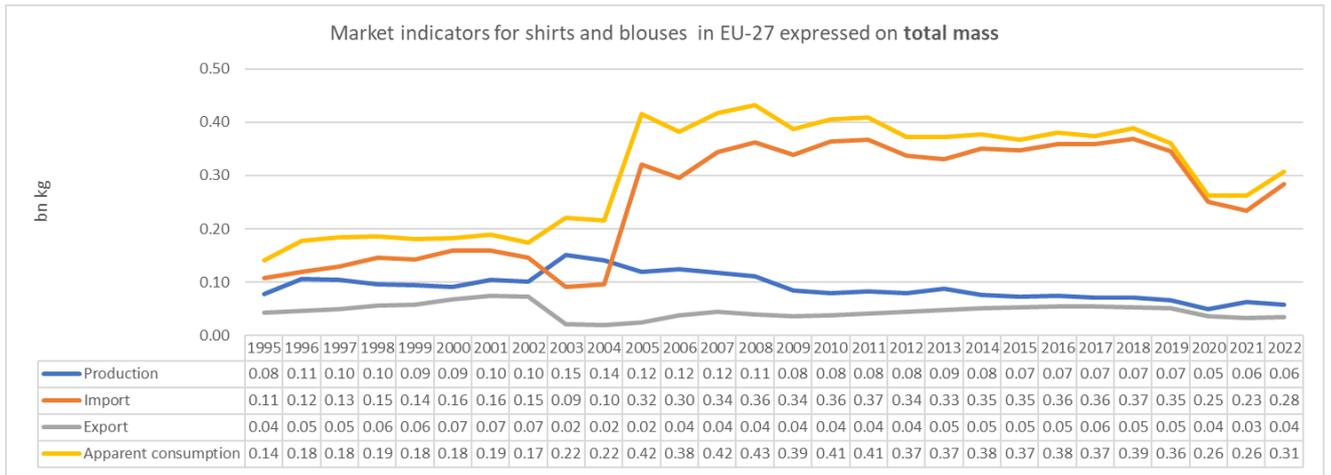
3222

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

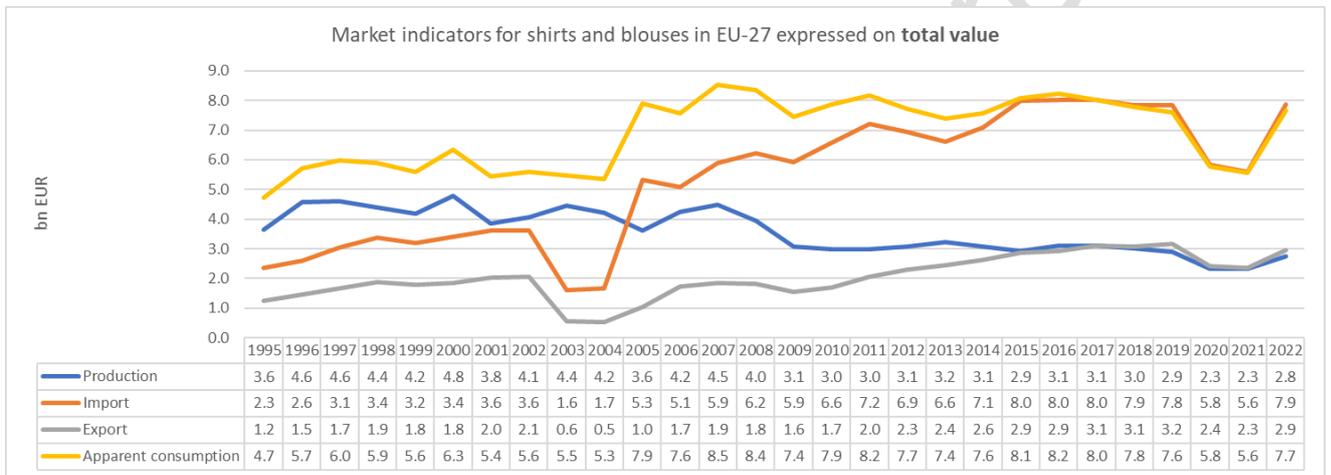
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**Figure 20.** Market indicators for shirts and blouses in EU-27



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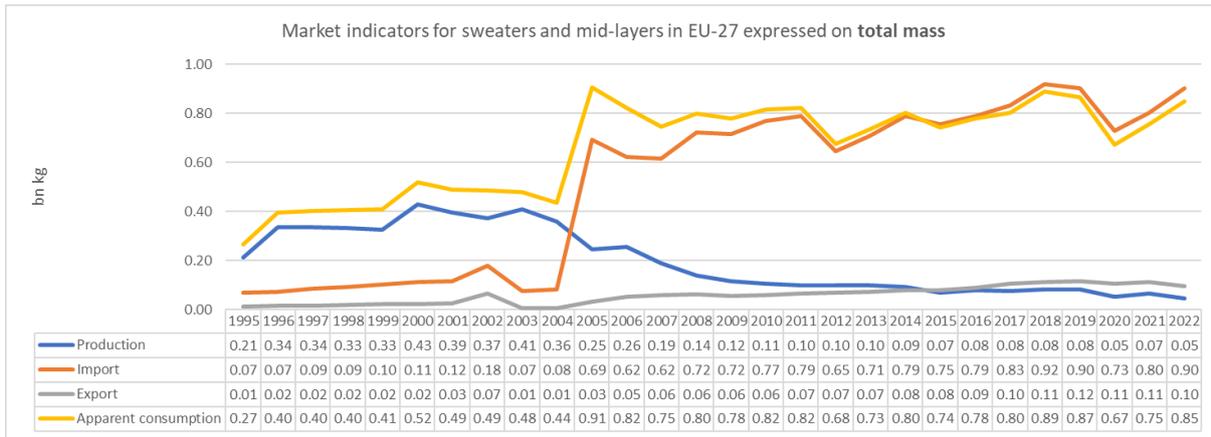
3227

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

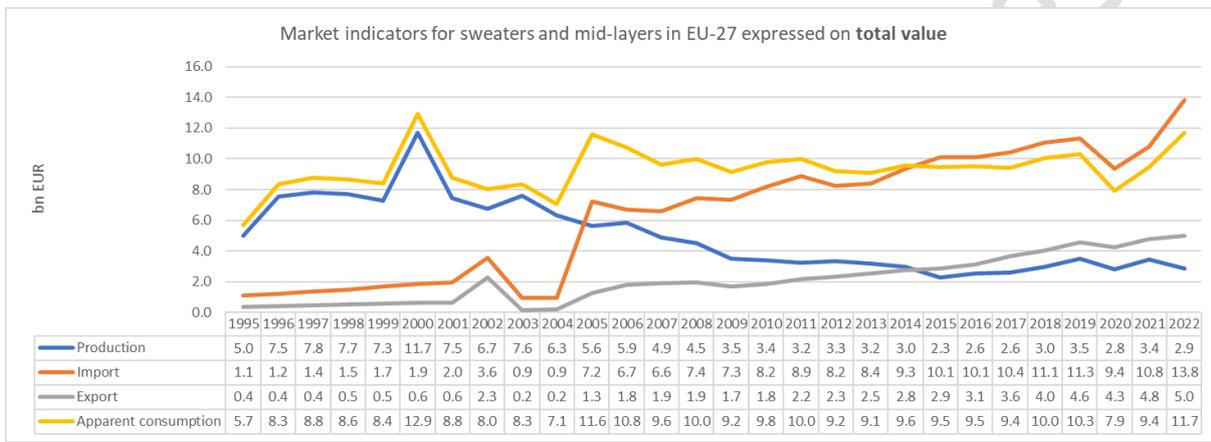
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**Figure 21.** Market indicators for sweaters and mid-layers in EU-27



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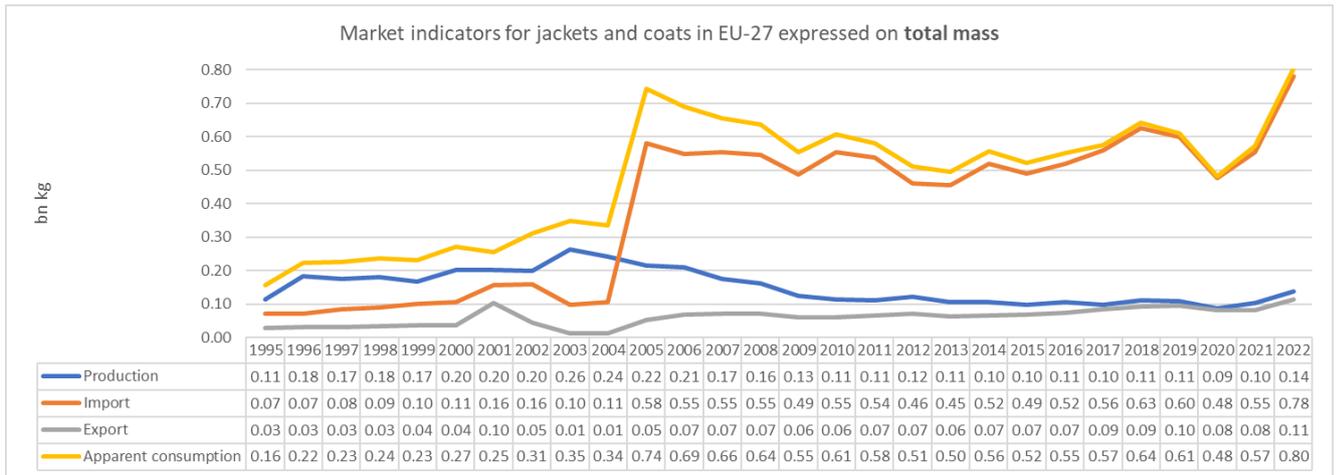
3232

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

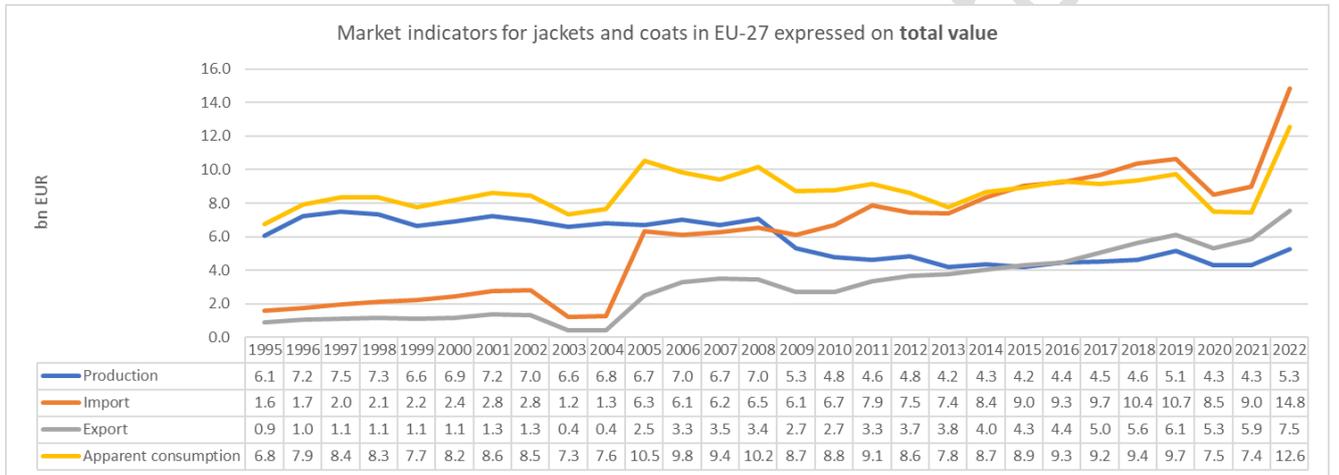
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3234

**Figure 22.** Market indicators for jackets and coats in EU-27



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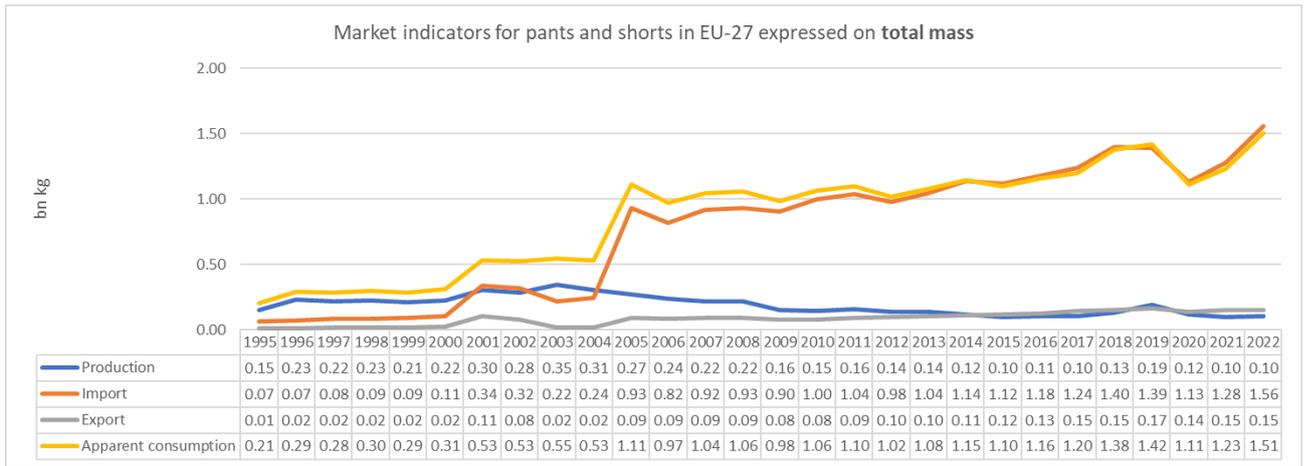
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Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

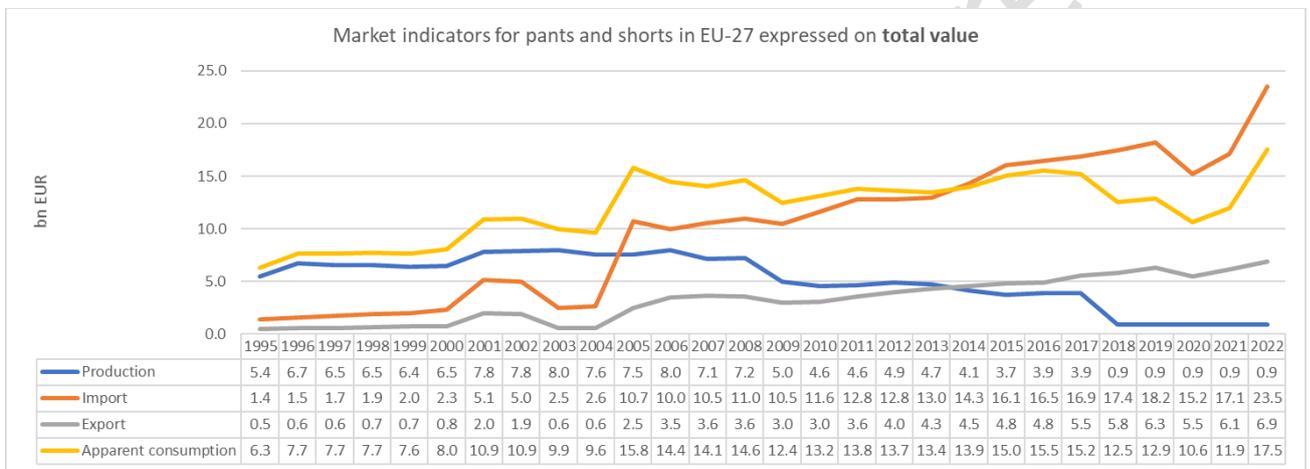
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**Figure 23.** Market indicators for pants and shorts in EU-27



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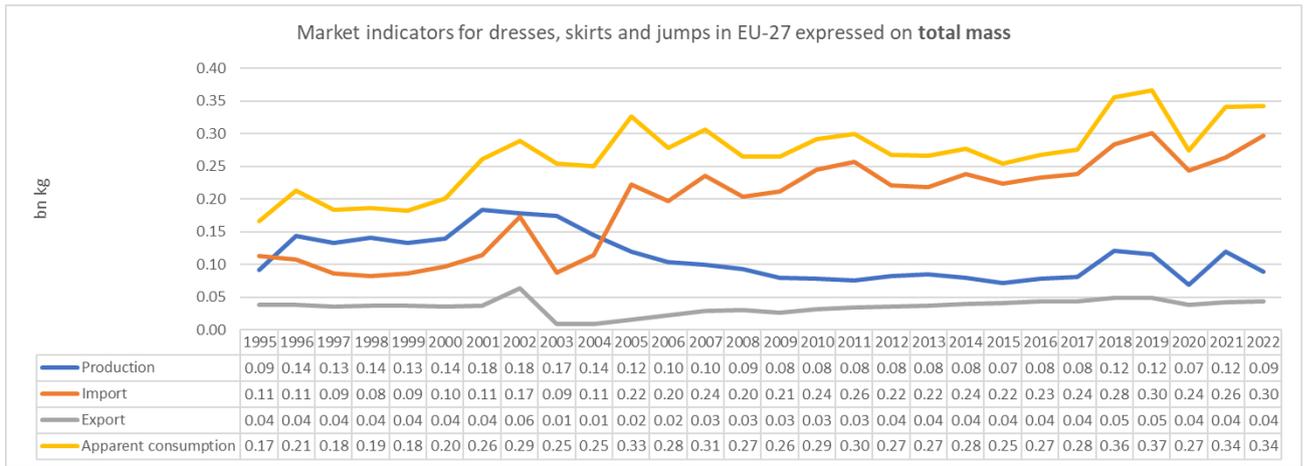
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Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

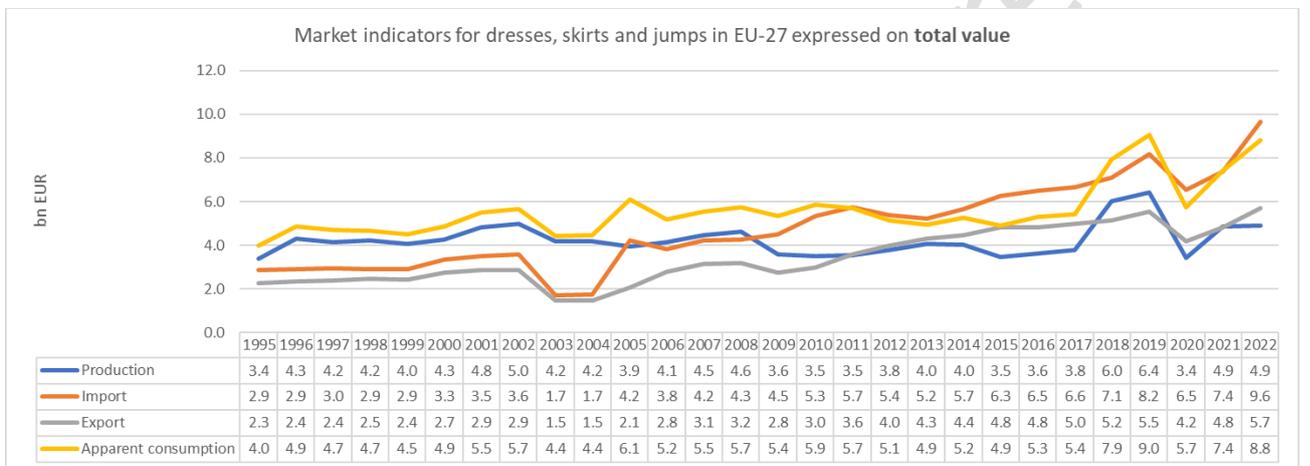
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**Figure 24.** Market indicators for dresses, skirts and jumps in EU-27



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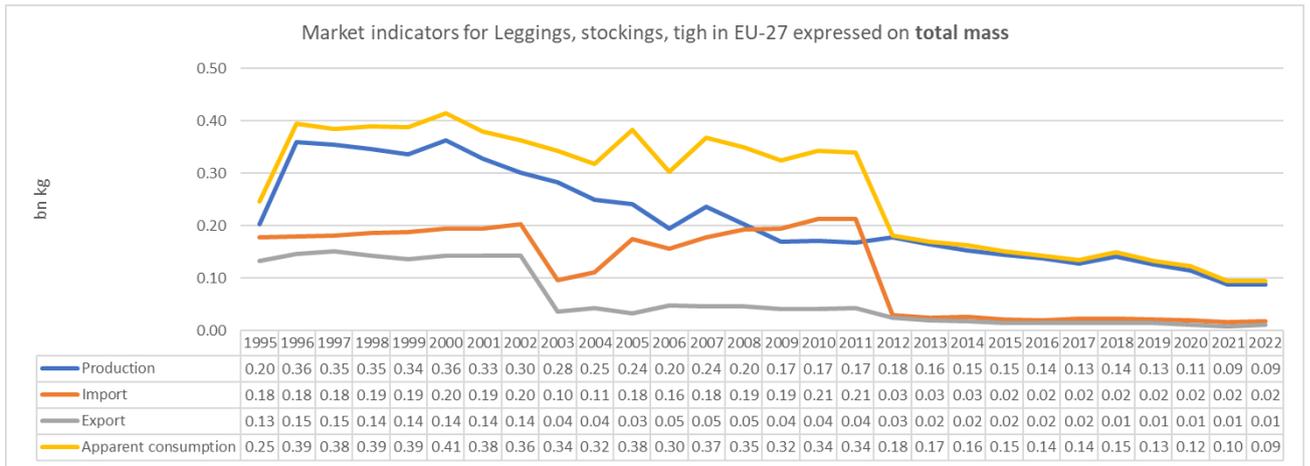
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Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

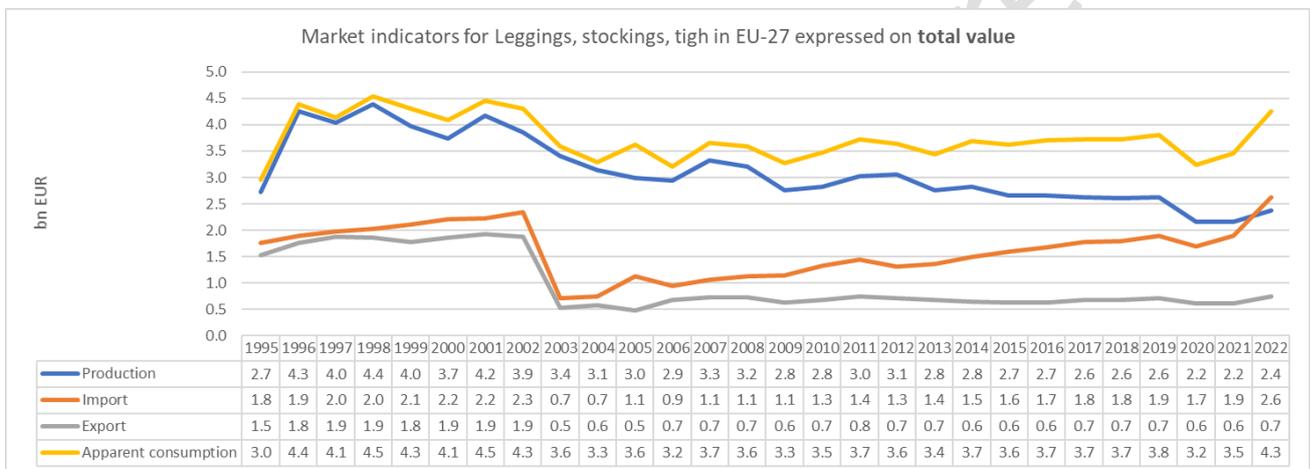
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**Figure 25.** Market indicators for leggings, stockings and tights in EU-27



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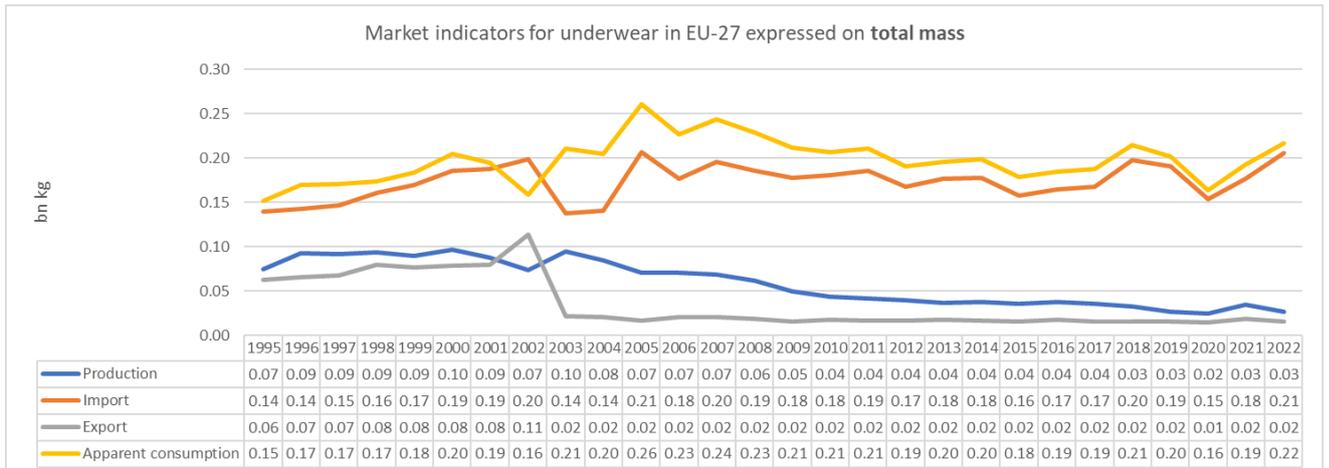
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Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

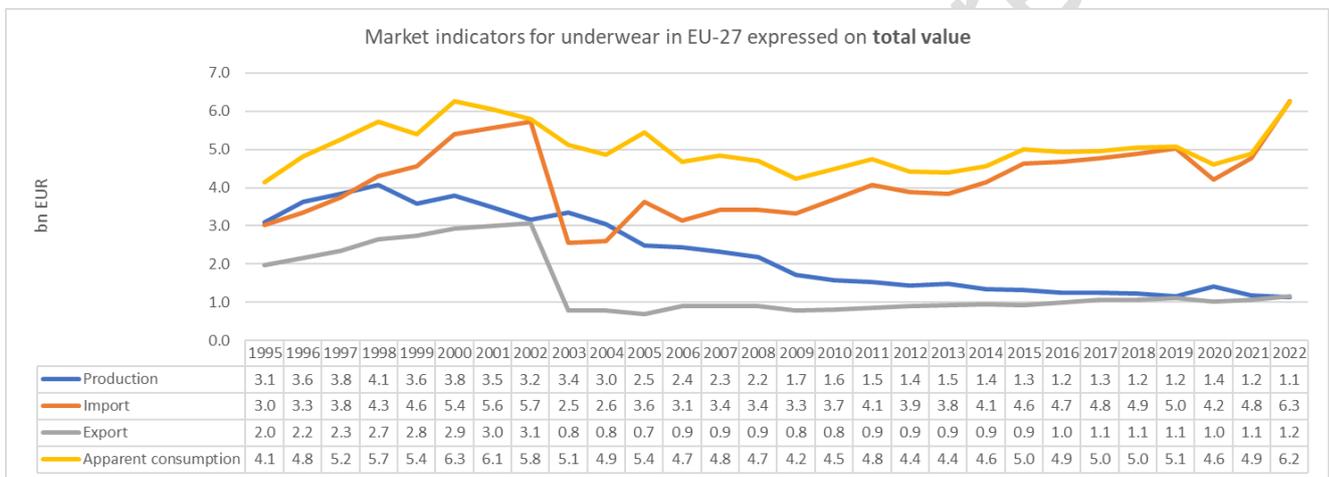
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**Figure 26.** Market indicators for underwear in EU-27



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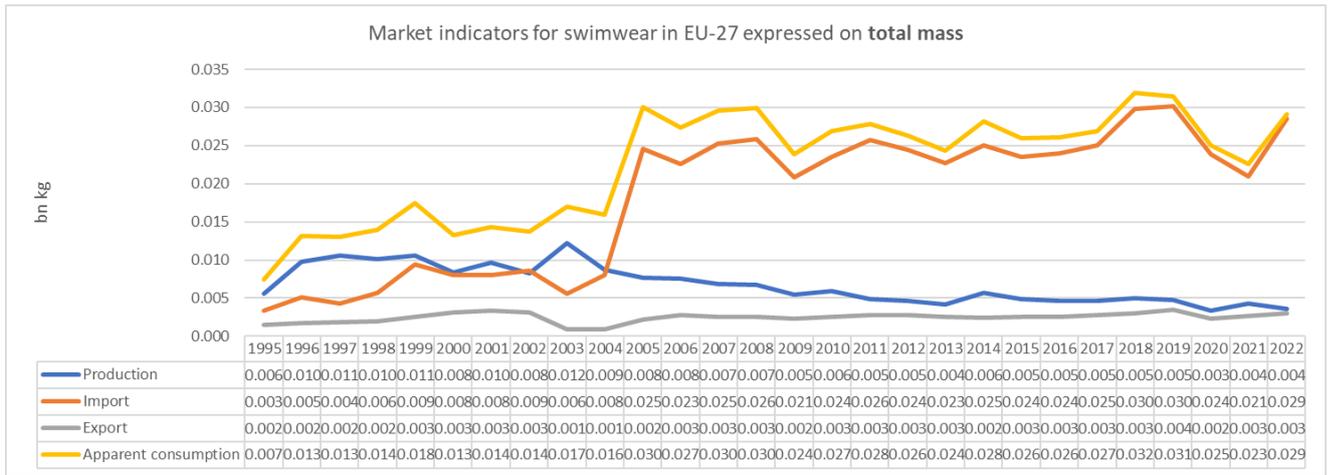
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Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

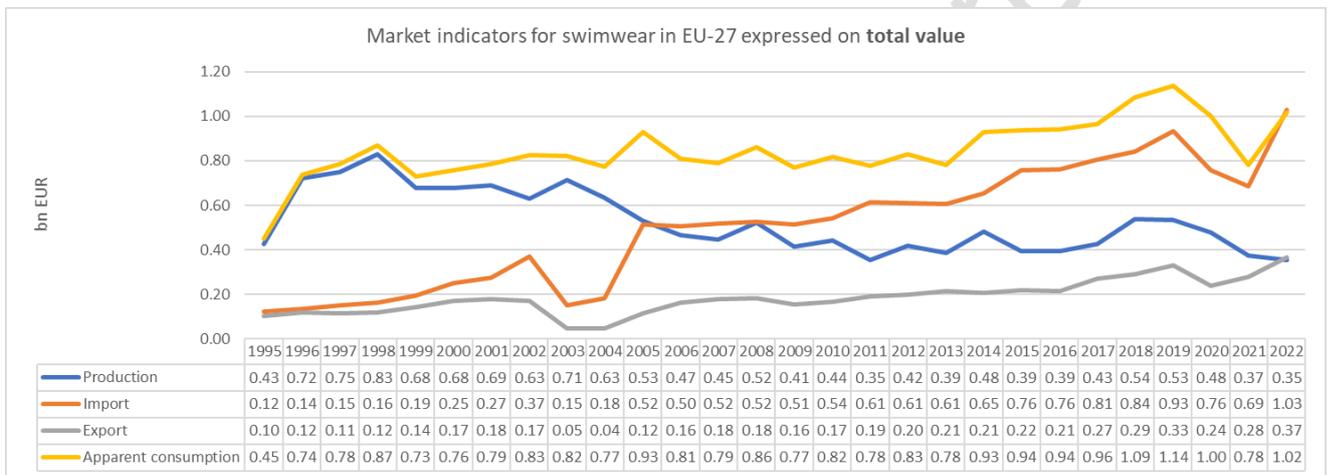
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**Figure 27.** Market indicators for swimwear in EU-27



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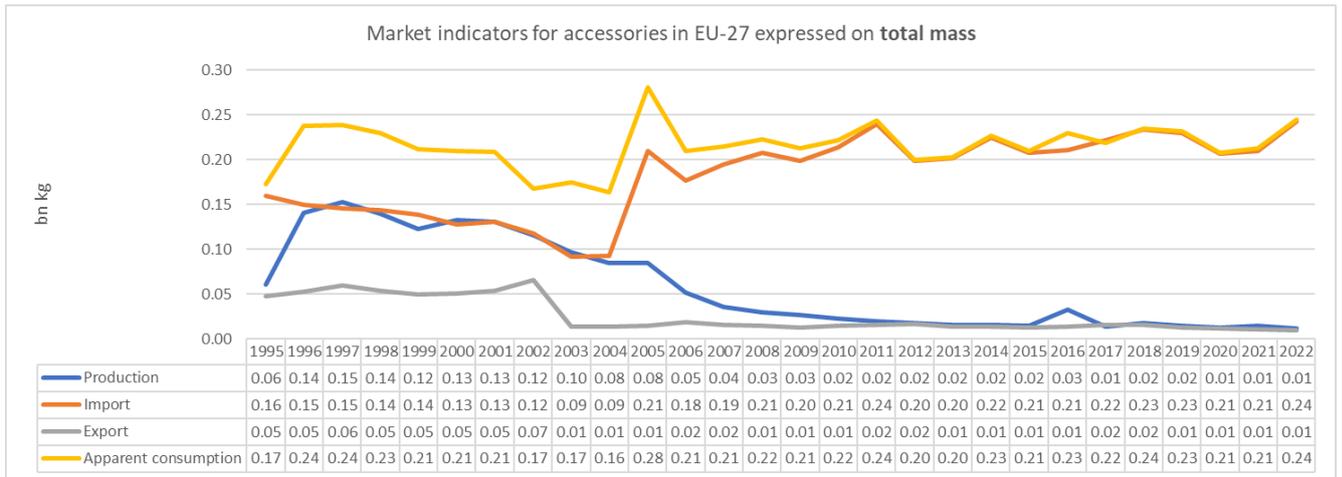
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Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

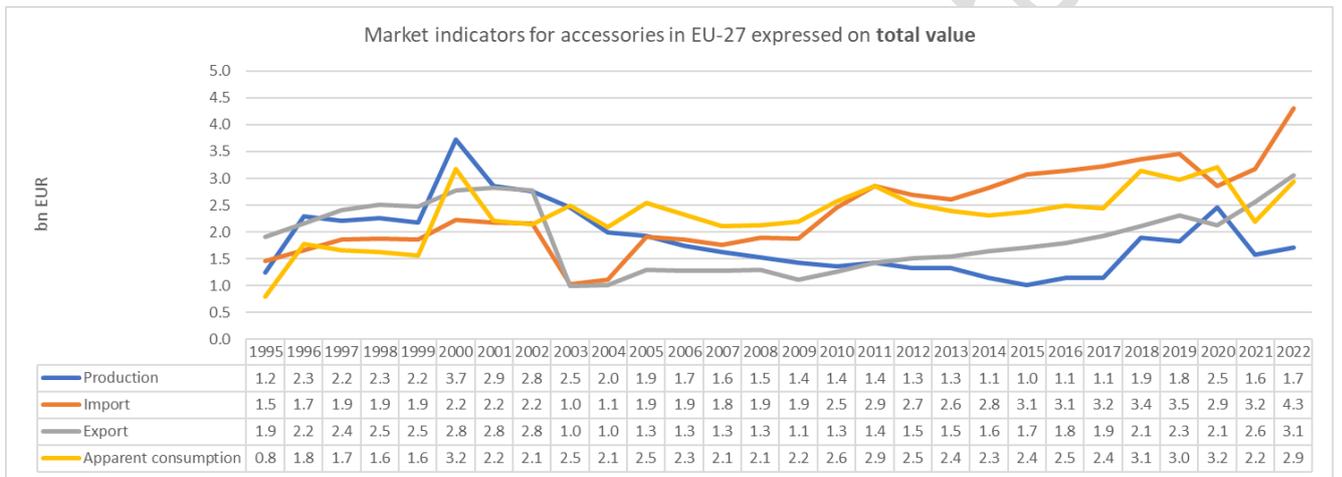
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**Figure 28.** Market indicators for accessories in EU-27



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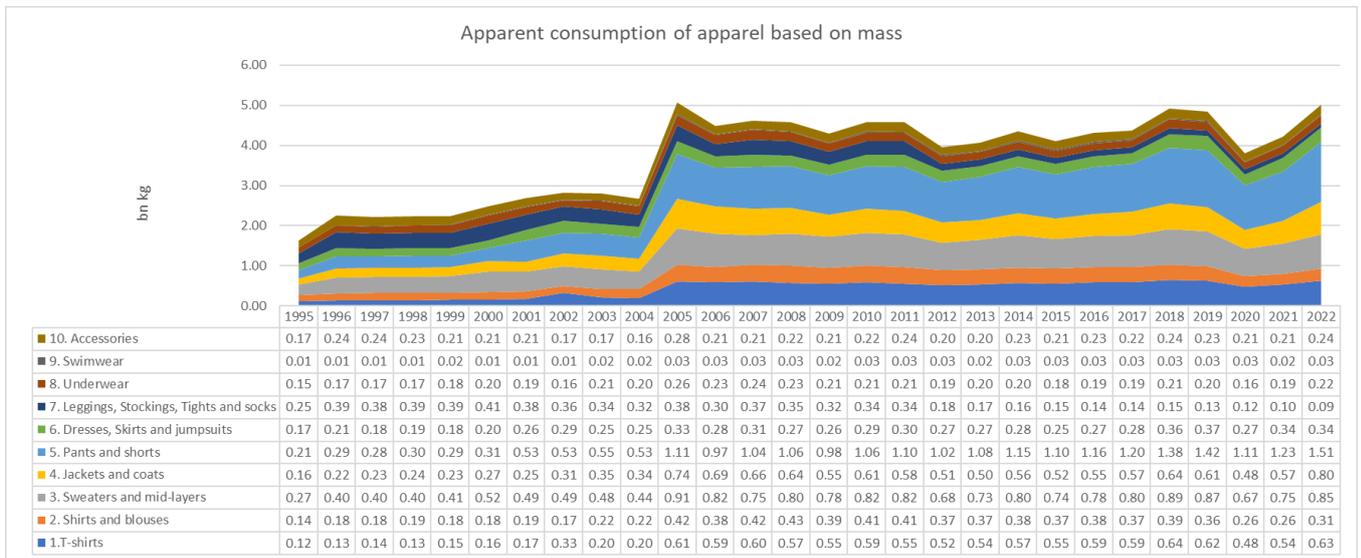
Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

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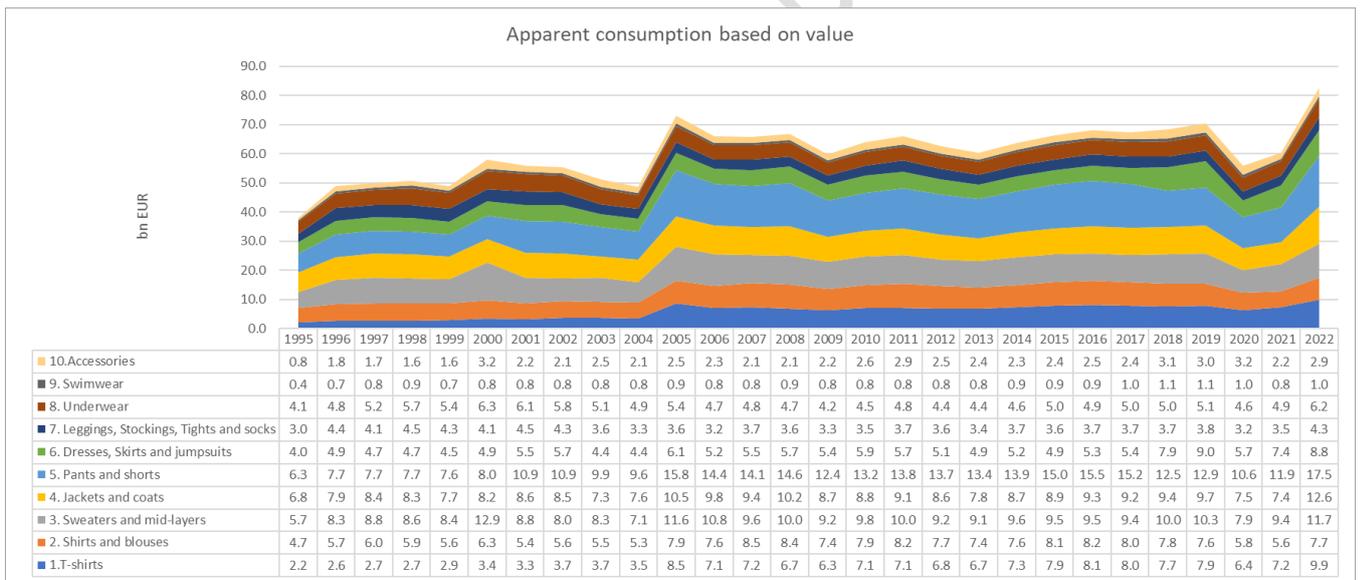
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**Figure 29.** Apparent consumption of apparel textiles categories in EU-27



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(A) Total mass; (B) Total value

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

3276 **Table 42.** Change of apparent consumption after the removal of EU import quota in 2005

Apparel textile category	Mass (bn kg)		Change in mass (%)	Value (bn EUR)		Change in value (%)
	Average value in 1995-2004	Average value in 2005-2019		Average value in 1995-2004	Average value in 2005-2019	
1. T-shirts	0.17	0.58	236	3.15	7.36	133
2. Shirts and blouses	0.19	0.39	110	5.71	7.88	38
3. Sweaters and mid-layers	0.43	0.80	86	8.81	9.83	12
4. Jackets and coats	0.26	0.60	129	8.07	9.21	14
5. Pants and shorts	0.38	1.12	194	8.90	14.03	58
6. Dresses, Skirts and jumpsuits	0.22	0.29	33	4.85	5.83	20
7. Leggings, Stockings, Tights and socks	0.36	0.24	-33	4.13	3.59	-13
8. Underwear	0.18	0.21	15	5.48	4.77	-13
9. Swimwear	0.01	0.03	100	0.79	0.89	13
10. Accessories	0.20	0.22	11	2.08	2.49	20

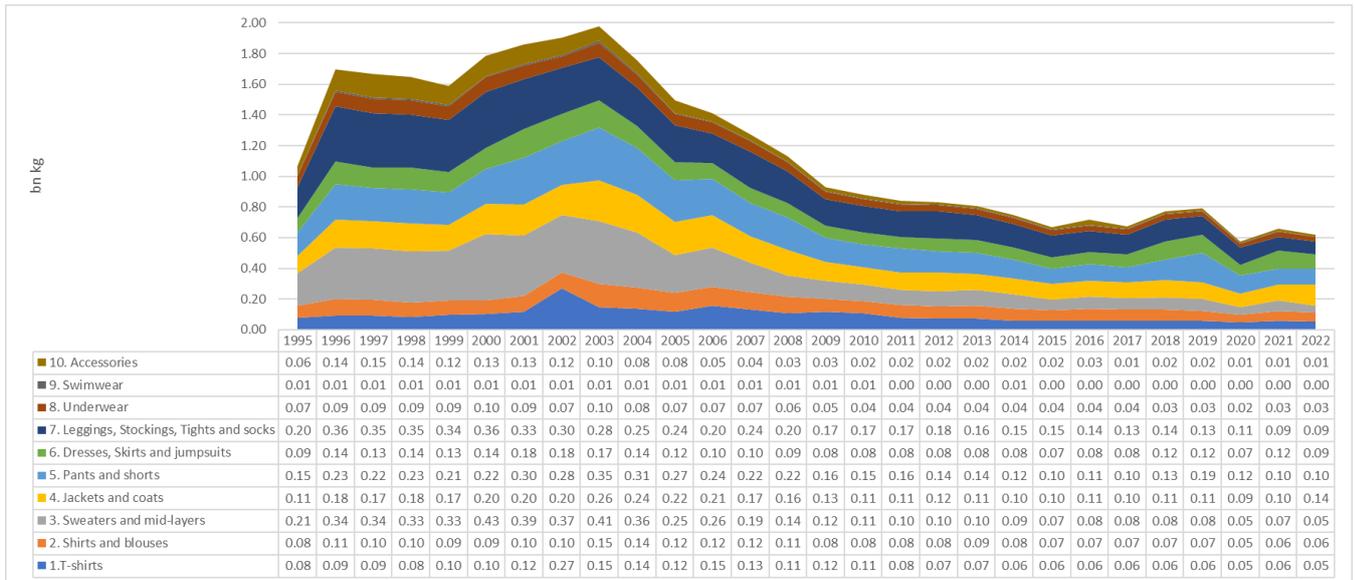
Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

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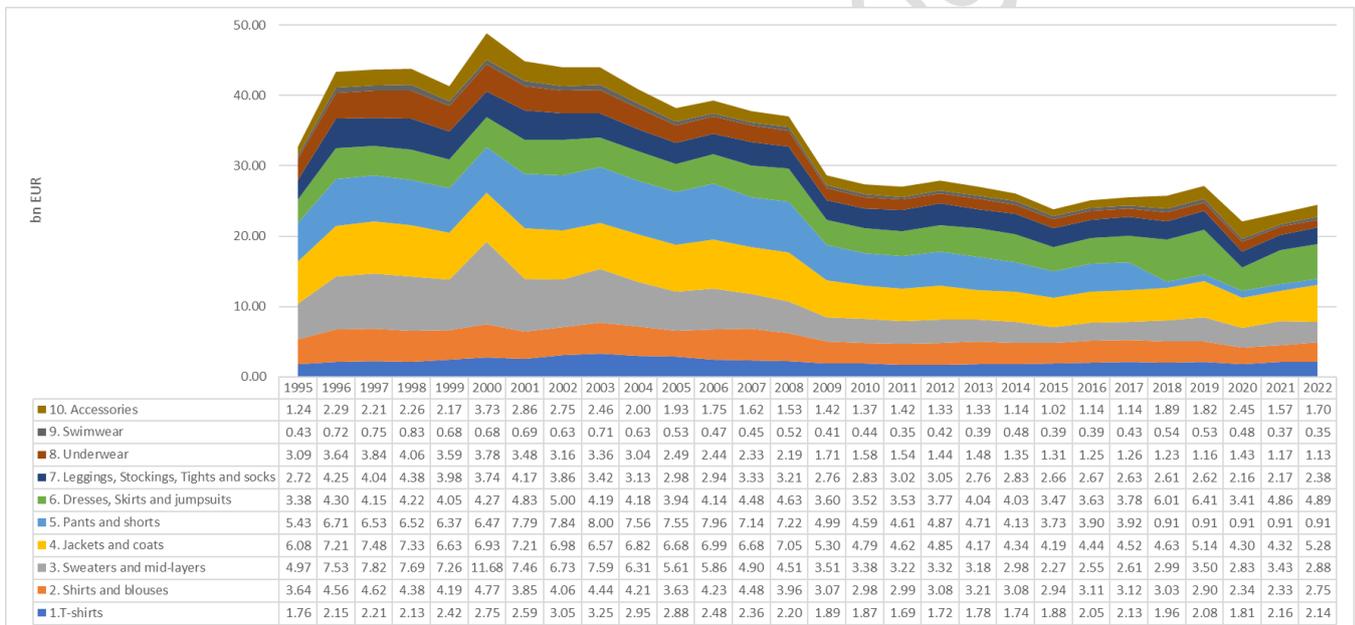
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**Figure 30.** Production of apparel textiles categories in EU-27



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(A) Total mass; (B) Total value

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

3285

3286 **Table 43.** Change of production after the removal of EU import quota in 2005

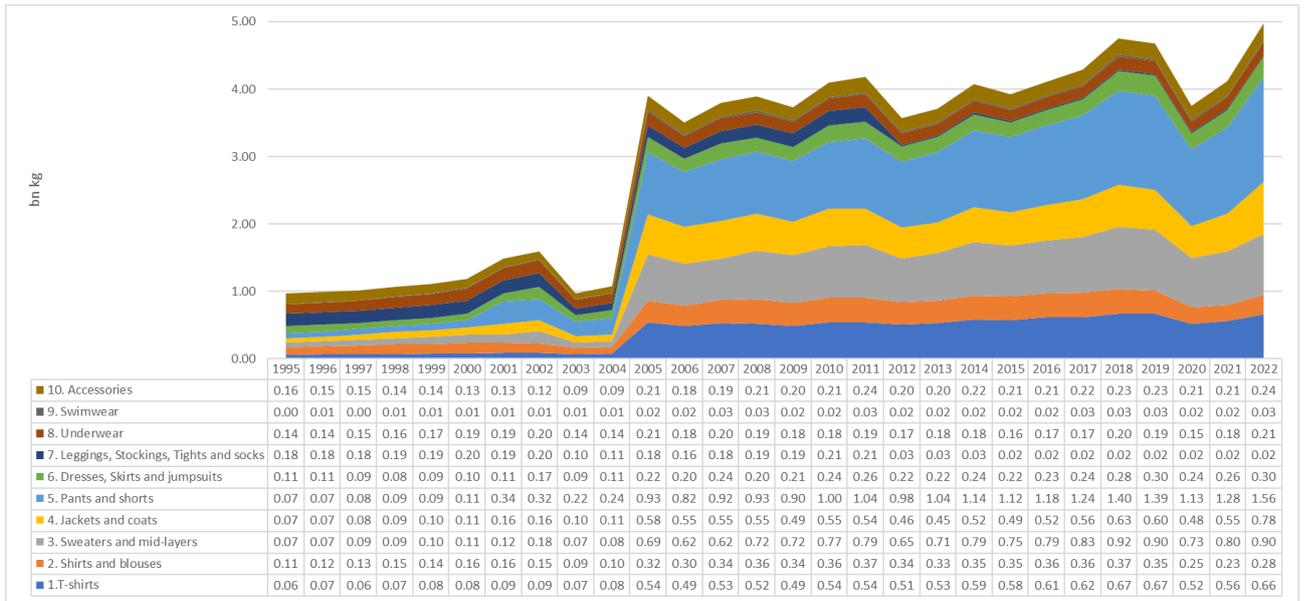
Apparel textile category	Mass (bn kg)		Change in mass (%)	Value (bn EUR)		Change in value (%)
	Average value in 1995-2004	Average value in 2005-2019		Average value in 1995-2004	Average value in 2005-2019	
1. T-shirts	0.12	0.09	-29	2.53	2.05	-19
2. Shirts and blouses	0.11	0.09	-18	4.27	3.32	-22
3. Sweaters and mid-layers	0.35	0.12	-65	7.50	3.63	-52
4. Jackets and coats	0.19	0.13	-32	6.92	5.23	-25
5. Pants and shorts	0.25	0.16	-35	6.92	4.74	-32
6. Dresses, Skirts and jumpsuits	0.15	0.09	-38	4.26	4.20	-1
7. Leggings, Stockings, Tights and socks	0.31	0.17	-45	3.77	2.86	-24
8. Underwear	0.09	0.05	-48	3.50	1.65	-53
9. Swimwear	0.01	0.01	-41	0.68	0.45	-33
10. Accessories	0.12	0.03	-77	2.40	1.46	-39

3287 *Source: own production based on PRODCOM database (Sold production, exports and imports – D5-056120)*

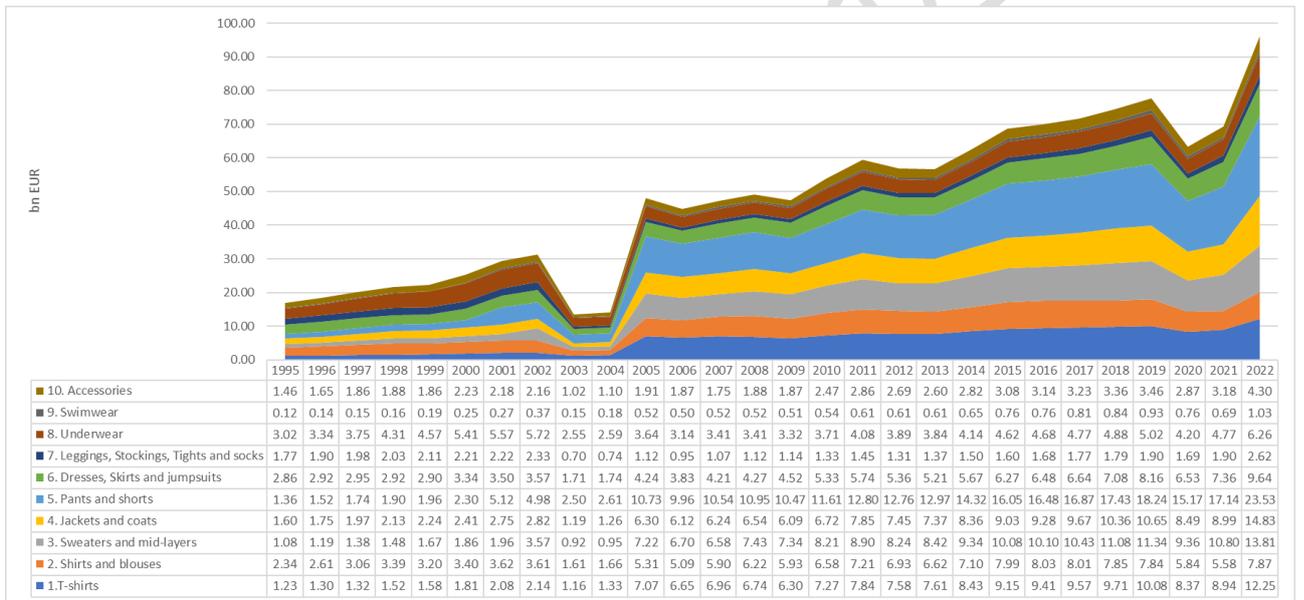
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**Figure 31.** Import of apparel textiles categories in EU-27



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(A) Total mass; (B) Total value

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

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3296 **Table 44.** Change of import after the removal of EU import quota in 2005

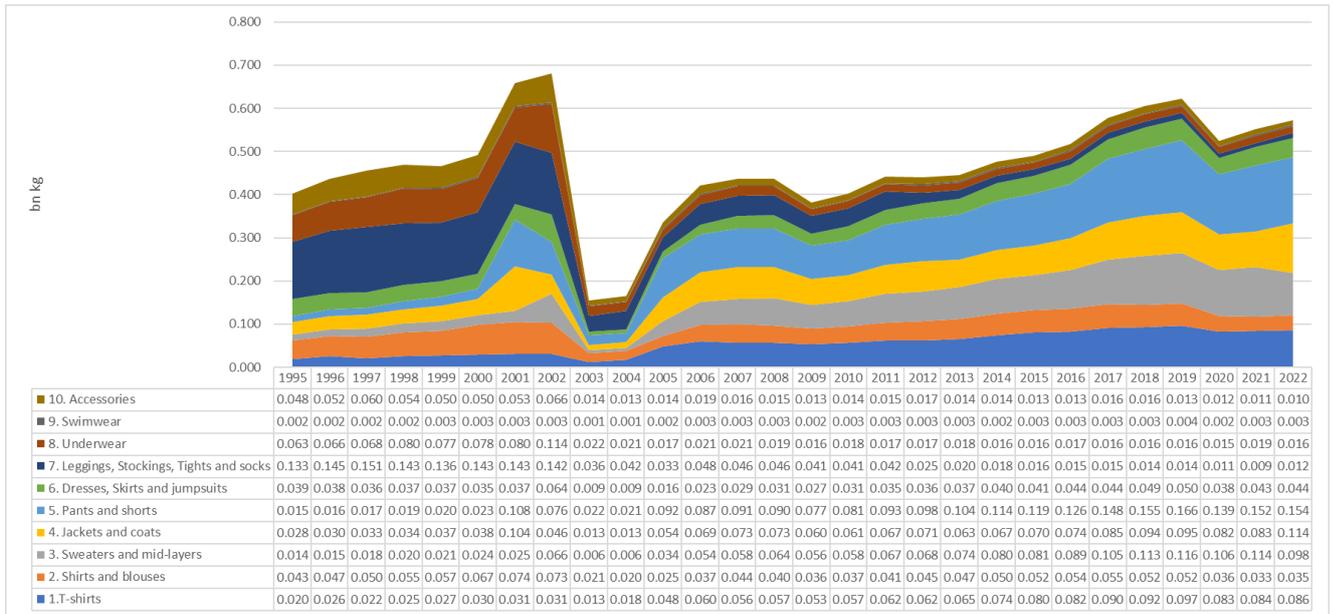
Apparel textile category	Mass (bn kg)		Change in mass (%)	Value (bn EUR)		Change in value (%)
	Average value in 1995-2004	Average value in 2005-2019		Average value in 1995-2004	Average value in 2005-2019	
1.T-shirts	0.07	0.56	650	1.55	8.03	419
2. Shirts and blouses	0.13	0.35	168	2.85	6.84	140
3. Sweaters and mid-layers	0.10	0.75	656	1.60	8.76	446
4. Jackets and coats	0.10	0.54	413	2.01	7.87	291
5. Pants and shorts	0.16	1.07	552	2.60	13.48	419
6. Dresses, Skirts and jumpsuits	0.11	0.24	121	2.84	5.53	95
7. Leggings, Stockings, Tights and socks	0.17	0.10	-41	1.80	1.41	-22
8. Underwear	0.16	0.18	12	4.08	4.04	-1
9. Swimwear	0.01	0.02	274	0.20	0.65	225
10. Accessories	0.13	0.21	63	1.74	2.60	49

3297 *Source: own production based on PRODCOM database (Sold production, exports and imports – D5-056120)*

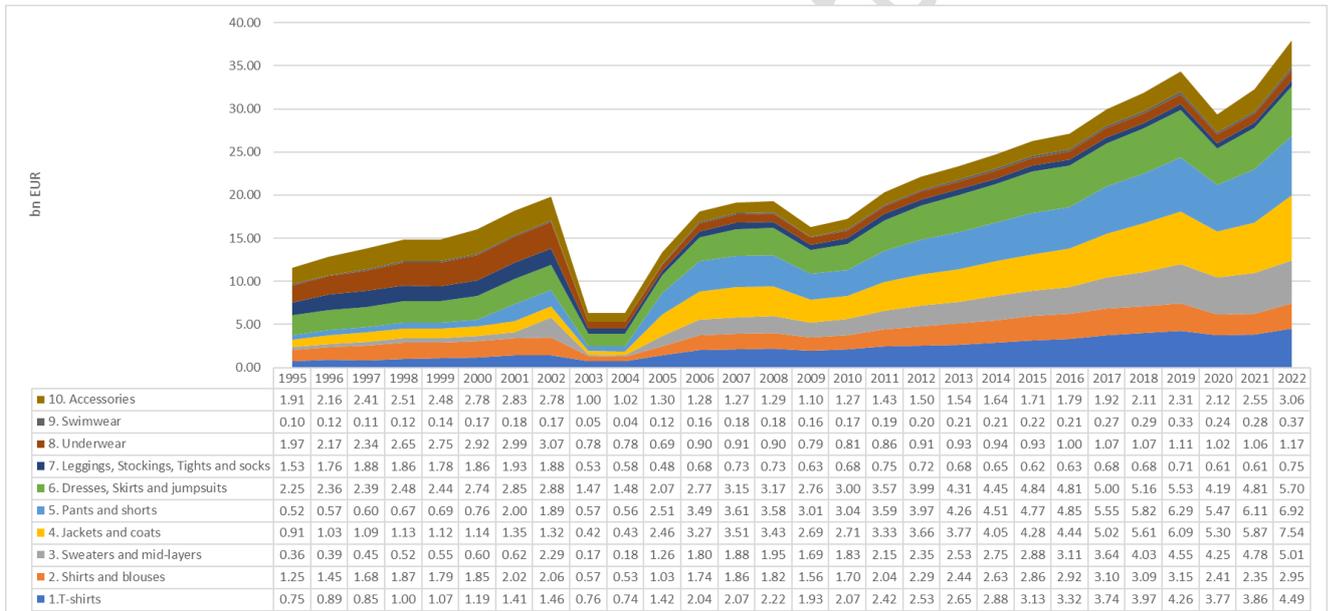
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**Figure 32.** Export of apparel textiles categories in EU-27



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(A) Total mass; (B) Total value

Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)

3305 **Table 45.** Change of export after the removal of EU import quota in 2005

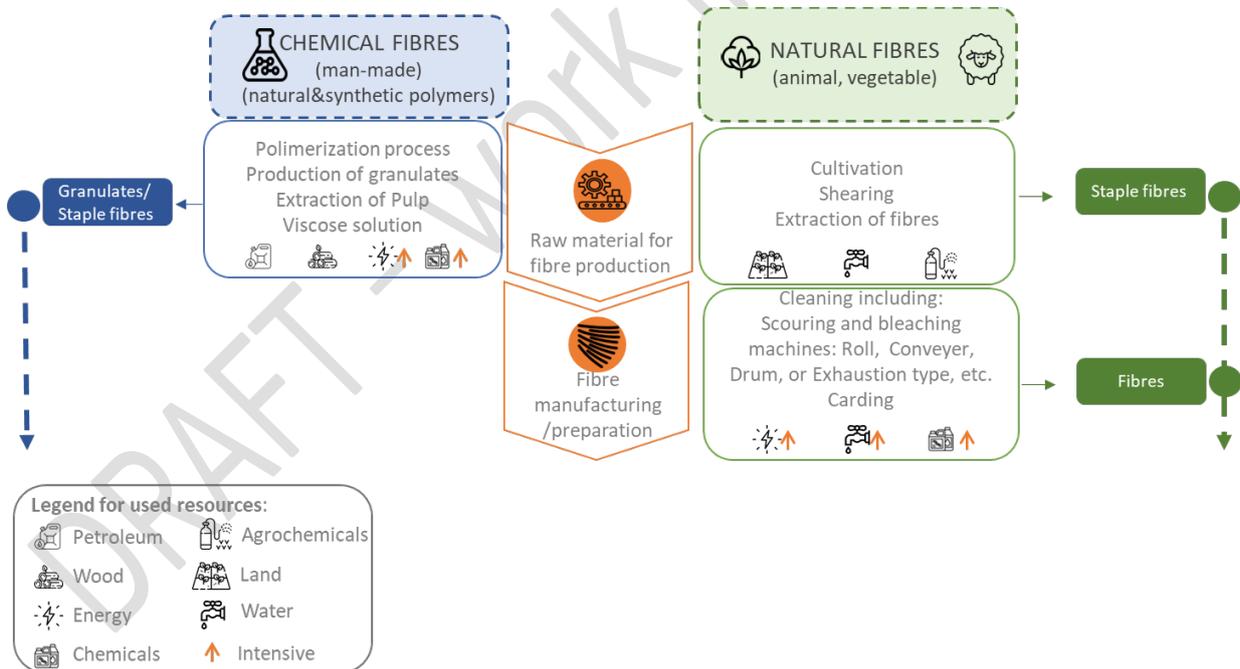
Apparel textile category	Mass (bn kg)		Change in mass (%)	Value (bn EUR)		Change in value (%)
	Average value in 1995-2004	Average value in 2005-2019		Average value in 1995-2004	Average value in 2005-2019	
1. T-shirts	0.02	0.07	186	1.01	2.71	168
2. Shirts and blouses	0.05	0.04	-12	1.51	2.28	51
3. Sweaters and mid-layers	0.02	0.07	246	0.61	2.56	318
4. Jackets and coats	0.04	0.07	91	0.99	3.89	291
5. Pants and shorts	0.03	0.11	226	0.88	4.19	375
6. Dresses, Skirts and jumpsuits	0.03	0.04	4	2.33	3.90	67
7. Leggings, Stockings, Tights and socks	0.12	0.03	-76	1.56	0.67	-57
8. Underwear	0.07	0.02	-74	2.24	0.92	-59
9. Swimwear	0.00	0.00	26	0.12	0.21	70
10. Accessories	0.05	0.01	-68	2.19	1.56	-28

3306 *Source: own production based on PRODCOM database (Sold production, exports and imports – DS-056120)*

3307 **9.2 Life-cycle stages of apparel textiles**

3308 **9.2.1 Raw material and fibre manufacturing**

3309 **Figure 33.** Raw material for fibre production and fibre preparation



3310 *Source: production adapted from (McKinsey & Company, 2022), icons from [www.flaticon.com](http://www.flaticon.com)*

3312 **Raw material for fibre production**

3313 *Natural fibres*

3314 The primary raw material for vegetable-based fibres is cellulose, which is the most prevalent natural polymer  
 3315 in nature. Cellulose is sourced from agricultural crops, which often require significant land and water use. The  
 3316 production process typically involves a high use of chemicals, like pesticides (Jana et al., 2023) (Roth et al.,

3317 2023). After the production process, the result is staple fibres. Following a pre-treatment or preparation phase,  
3318 these fibres then serve as the input for the yarn production stage.

3319 Animal-based fibres, also known as protein fibres, are sourced from animals through methods such as shearing  
3320 or collecting silkworm cocoons. This requires farming animals like sheep or silkworms, either on pastures or  
3321 through sericulture (Roth et al., 2023) (Jana et al., 2023). The production yields staple fibres, which, after a pre-  
3322 treatment phase, are used in yarn production.

### 3323 *Chemical fibres*

3324 Man-made chemical fibres derived from natural polymers use cellulose, often from sources like wood pulp, as  
3325 their primary raw material. This cellulose is then dissolved to produce a solution suitable for the next stage of  
3326 fibre production. The key components in this process are the wood feedstock, which come from various sources,  
3327 and the chemicals used in the dissolution process (Jana et al., 2023).

3328 Man-made chemical fibres made from synthetic polymers use petroleum as raw material. This is processed  
3329 using energy-intensive chemical reactions, which vary depending on the specific synthetic fibre, to produce  
3330 synthetic polymers. These polymers are then turned into granules (Roth et al., 2023). These granules are then  
3331 prepared for the subsequent fibre production process (Jaffe and Menczel, 2020).

3332

### 3333 **Fibre manufacturing/preparation**

#### 3334 *Manufacturing of natural and chemical fibres*

3335 Staple fibres of natural origin, man-made chemical staple fibres derived from natural polymers, and synthetic  
3336 granules produced in the raw material stage all undergo the manufacturing process. The specific production  
3337 steps they undergo vary based on the source of the raw material.

#### 3338 *Preparation of natural fibres*

3339 Natural staple fibres go through similar preparation stages before yarn manufacturing. This typically involves  
3340 a scouring or cleaning process before carding. The exact procedures vary based on the fibre type, whether  
3341 cellulosic (like cotton) or protein-based (like wool). The primary distinction arises from the type and amount of  
3342 impurities present in the natural fibres.

3343 Wool, a protein fibre, undergoes scouring, which is typically a wet cleaning process using detergents to remove  
3344 dirt, oils, and other contaminants. After scouring, the wool is usually bleached with hydrogen peroxide, to remove  
3345 its natural colour and any remaining impurities, preparing it for subsequent treatments or dyeing. This is then  
3346 followed by drying. Overall, this process is intensive in terms of water, energy, and chemicals.

3347 The cotton cleaning process involves dry procedures carried out in a blowing room. This room houses  
3348 technologies that move the raw materials through various airflow cleaning systems, integrated within a  
3349 mechanical cleaning process.

3350 Furthermore, because natural fibres have inconsistent properties, they may undergo wet chemical processes,  
3351 such as bleaching, and other treatments to enhance and modify them.

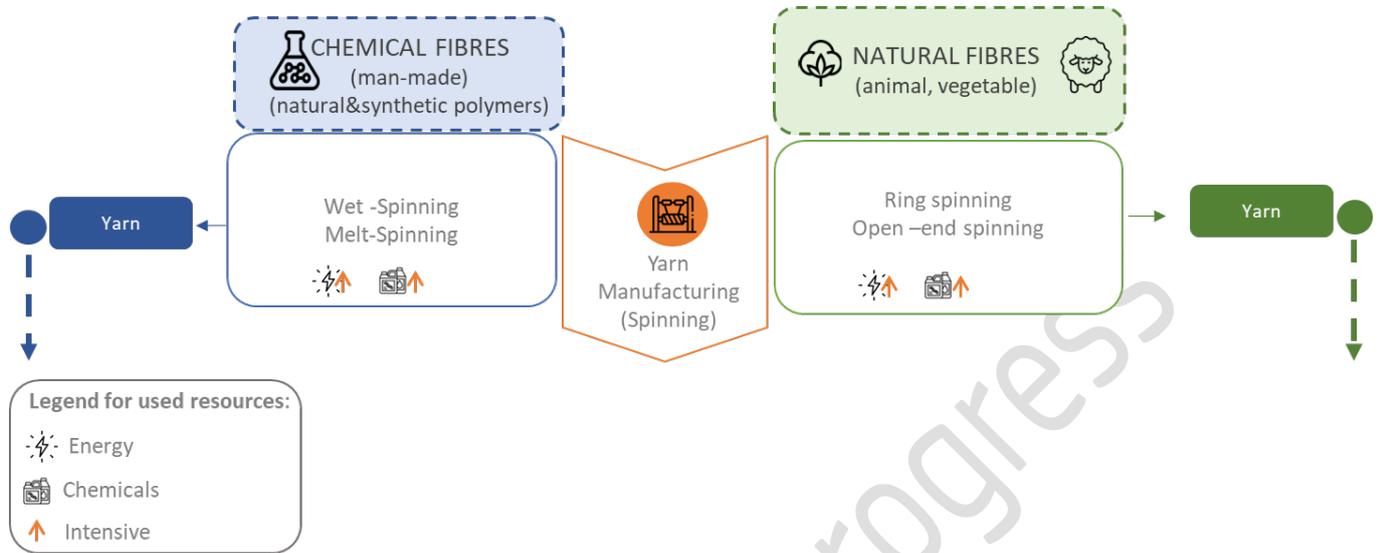
#### 3352 *Preparation of chemical fibres*

3353 Chemical fibres skip the preparation stage, as the staple fibres and granules are used directly for the yarn  
3354 production (spinning).

3355

3356 **9.2.2 Yarn manufacturing**

3357 **Figure 34.** Yarn manufacturing (spinning process)



3358  
3359 *Source: own production and adapted from (McKinsey & Company, 2022), icons from [www.flaticon.com](http://www.flaticon.com)*

3360 Carded natural staple fibres, viscose solution, and polymer granulates serve as inputs for the spinning process,  
3361 which produces yarns.

3362 In the textile industry, the definition of spinning varies based on the type of fibre being processed:

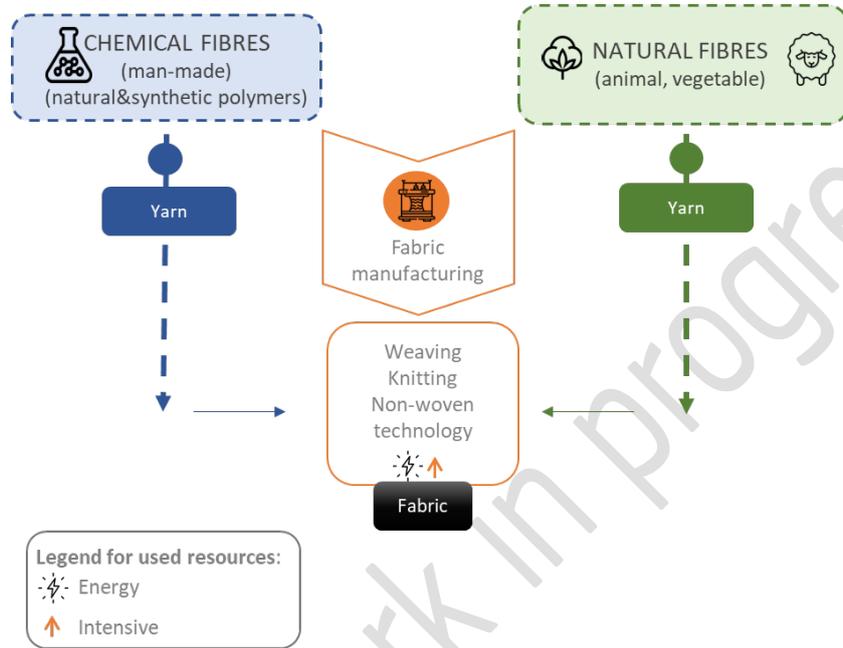
- 3363 — Natural origin fibres: Spinning for these fibres involves passing the staple fibres through a series  
3364 of rollers to straighten and align them, then twisting them to create a continuous yarn (Britannica,  
3365 2019). Each type of natural fibre goes through a unique set of steps for yarn production. For all,  
3366 the initial step is carding, a mechanical process that further cleans and disentangles the fibres,  
3367 aligning them. This is followed by other processes such as combing, drawing, and more. Typical  
3368 spinning machines for natural fibres include ring spinning (primarily for cotton) and open-end  
3369 spinning (usually for wool) (Roth et al., 2023).
- 3370 — Chemical (man-made) fibres: Spinning refers to the extrusion of a solution, like viscose or dissolved  
3371 granules, to produce a fibre or yarn. Standard industrial spinning machines for these fibres are:
  - 3372 • melt spinning: polymer melted in a melt extruder, and is suitable for thermoplastic fibres such as  
3373 polyester, polyamide, polyolefins, glass fibre and many more;
  - 3374 • wet spinning: polymer dissolved in a solvent, being suitable for acetate, triacetate and  
3375 polyacrylonitrile;
  - 3376 • dry spinning: polymer dissolved in a solution, applicable for viscose and acrylic fibres.

3377 Drawing or air texturizing is performed to give to the chemical yarns a texture similar to natural yarns. Such  
3378 treatments are carried out with energy demanding equipment (Roth et al., 2023).

3379

3380 **9.2.3 Fabric manufacturing**

3381 **Figure 35.** Fabric manufacturing process



3382  
3383 Source: own production adopted from (McKinsey & Company, 2022), icons from [www.flaticon.com](http://www.flaticon.com)

3384 The central phase of textile production is fabric manufacturing. This involves creating a two-dimensional  
3385 structure by interlacing yarns. Common methods include weaving, knitting, and producing non-woven fabrics,  
3386 suitable for all yarn types.

3387 **Weaving** is the predominant fabric manufacturing technique. It involves interlacing two sets of yarns at right  
3388 angles on a loom. Most looms are power-driven, termed 'power looms', and are energy intensive. There are also  
3389 manual looms, which are labour-intensive. Key resources in weaving include chemicals for sizing and desizing  
3390 textiles and oils for lubricating the loom. Sizing protects the yarn from the loom's abrasive action, while desizing  
3391 removes these chemicals from the woven fabric after weaving (Roth et al., 2023).

3392 **Knitting** is the second most used fabric manufacturing method. In this case, yarns are interlooped using  
3393 needles to form fabric on knitting machines. These machines are broadly categorised as weft<sup>119</sup> (either flat or  
3394 circular) and warp<sup>120</sup>, based on the fabric's formation direction (horizontal or vertical). They're further classified  
3395 by machine shape and knitting technology. This method is energy intensive. To prevent yarn damage, substances  
3396 like sizing chemicals and lubricants are used for yarn strengthening and reducing friction (Roth et al., 2023).

3397 **Non-woven** technology produces textile structures by bonding fibres or filaments together, either mechanically,  
3398 thermally, or chemically. According to the Association of the Non-woven Fabrics Industry (INDA), they are "flat,  
3399 porous sheets made directly from separate fibres or molten plastic. They are neither woven nor knitted and  
3400 don't convert fibres to yarn" (INDA, 2023). Various non-woven processes exist, categorised by web-forming  
3401 technologies and product consolidation. Common technologies include drylaid<sup>(121)</sup>, wetlaid<sup>(122)</sup>, spunmelt<sup>(123)</sup>,

<sup>119</sup> The fabric is formed based on loops made on horizontal way from a single yarn, which is fed and looped in rows by one or more needles at a time (Roth et al., 2023).

<sup>120</sup> The yarn is fed into the knitting forming vertical loops, and moves diagonally to knit the next course (yarns generate a zigzag from side to side along the length of the fabric) (Ray, 2012).

<sup>121</sup> The process of fabric web forming with a stream of air, applied on dry fibres by using carding equipment (INDA, 2023).

<sup>122</sup> The process of fabric web forming filtering an aqueous suspension of fibre onto a screen conveyor belt or perforated drum. The fibres are retained on the screen, while the water passes through (INDA, 2023).

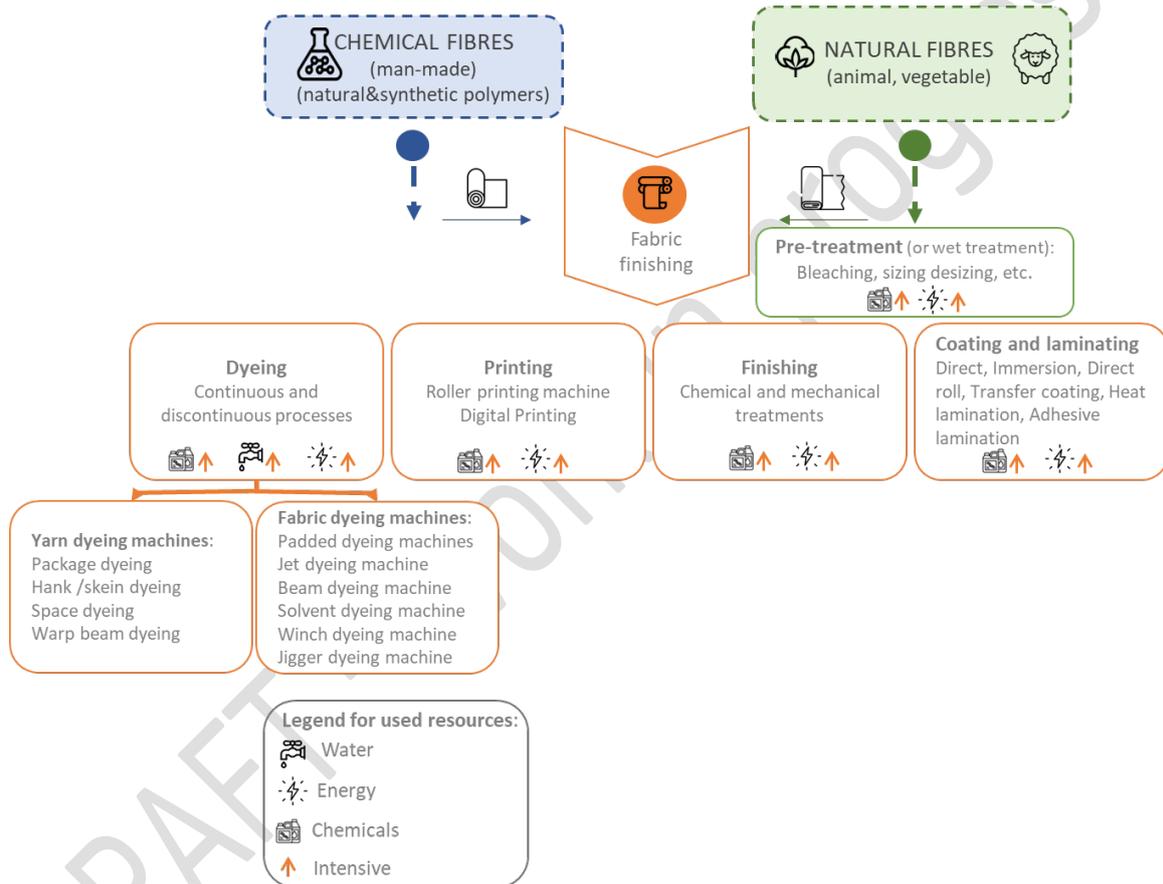
<sup>123</sup> The process of non-woven manufacturing through the extrusion of molten polymer spinneret to form fibres, drawing the fibres, and then laying them on a moving screen to form a web. The term "spunlaid" is often used interchangeably with "spunbond" (INDA, 2023).

3402 and needle-punched <sup>(124)</sup>. However, many other processes are available <sup>(125)</sup> (Batra and Pourdeyhimi, 2012)  
 3403 (Mao, 2016). Overall, non-woven technology is energy intensive.

3404 In the knitting or weaving process, the type of yarn used, and its count (indicating fabric thickness) influence  
 3405 the durability and strength of the final product, such as its seam or tear resistance (Yassen, 2017) (Jankoska  
 3406 and Demboski, 2017). Non-woven fabrics present recycling challenges due to the fibre composition and the  
 3407 consolidation components used in their production.

3408 **9.2.4 Finishing processes**

3409 **Figure 36.** Fabric/yarn finishing processes



3410  
 3411 *Source: own production adapted from (McKinsey & Company, 2022), icons from [www.flaticon.com](http://www.flaticon.com)*

3412 Finishing processes are an intermediate stage in treating yarn and/or fabrics with colorants and chemicals. This  
 3413 includes various wet treatments aimed at different objectives, such as sizing, desizing, pre-treatment, dyeing,  
 3414 printing, finishing, and more. These treatments are applied based on the specific requirements of the final  
 3415 products, rather than in a sequential manner. Each treatment utilises distinct technologies and chemicals,  
 3416 making this one of the most water and chemically intensive stages

3417 *Pre-treatment*

3418 Pre-treatment is typically applied to natural fibre fabrics. It encompasses processes like bleaching, scouring,  
 3419 mercerising <sup>126</sup>, and others, preparing the fabrics for final treatments before dyeing, printing, and finishing. These

<sup>124</sup> The mechanical process that uses barbed needles to pull tufts of fibres from the web and insert them vertically into the web, which bonds the fibres together (INDA, 2023).  
<sup>125</sup> Definitions of the technologies can be found in the Glossary of the Association of the Non-woven Fabrics Industry. Available [here](#).  
<sup>126</sup> Mercerising is the process of treatment of cotton fabrics to increase dyeability (generally involving the use of sodium hydroxide) (Roth et al., 2023).

3420 processes heavily rely on chemicals, using inputs like oxidising agents (e.g., chlorine, sodium hypochlorite,  
 3421 calcium hypochlorite, hydrogen peroxide), scouring alkali (e.g., caustic soda), sodium hydroxide, and also  
 3422 consume significant amounts of energy and water.

3423 *Dyeing*

3424 Dyeing is the process where dye particles diffuse into the textile material. This involves forming chemical bonds  
 3425 between the dye molecules and the textile. This is achieved based on the dye-fibre chemical affinity and the  
 3426 specific dyeing process. Dyes can be natural or man-made (synthetic) and are molecules containing  
 3427 chromophores that interact with light to produce colour (Singh and Bharati, 2014). Textile dyeing uses specific  
 3428 dyes that have an affinity or ‘chemical attraction’ to particular fibres. **Table 46** reports the fibres and their  
 3429 corresponding dyes, ensuring shades meet performance and fastness standards (Roth et al., 2023).

3430 **Table 46.** Affinity relationship between dyes and fibres

Fibre type	Fibre name	Dye type
Cellulosic	Cotton	Direct dyes
	Linen	Reactive dyes
	Hemp	Vat dyes
	Jute	Sulphur dyes
	Modal	
	Lyocell	
Proteic	Wool	Acid dyes
	Silk	Premetallised dyes
	Other fibres of animal hair	Reactive dyes
Man-made	Polyamide	Acid dyes
		Premetallised dyes
	Acrylic	Cationic dyes
Polyester	Disperse dyes	
	Disperse dyes	

3431 *Source: own elaboration based on (Clark, 2011)*

3432 The affinity between the dye and fibre affects the final performance indicators for durability, such as washing  
 3433 and colour fastness. Moreover, various chemicals and auxiliary products are needed to enhance the efficiency  
 3434 and quality of the colouration process.

3435 Dyeing can be conducted in batch, continuous, or semi-continuous modes and is suitable for both yarns and  
 3436 fabrics. The process requires specific temperatures and pressures for set durations. Discontinuous dyeing  
 3437 machines include autoclaves, hank dyeing machines, winches, becks, overflows, jets, jigs, paddles, and drum  
 3438 dyeing machines. Examples of continuous dyeing machines are pad-batch, pad-roll, pad-jig, pad-dry, and  
 3439 thermosol machines.

3440 Overall, the dyeing process consumes significant amounts of water, chemicals, and energy.

3441 *Printing*

3442 Printing is the colouration process that involves applying dye or pigment to the substrate surface with the aid  
 3443 of specific auxiliaries. This allows for colouring different areas and creating patterns.

3444 Pigments, whether natural or man-made, are insoluble molecules containing chromophores and typically lack  
 3445 affinity to fibres (Singh and Bharati, 2014). The colouring process involves applying a colour paste to the textile  
 3446 using various techniques, followed by fixation. An after-treatment may also be applied, though it can be optional.

3447 — Pigment printing is the most commonly used technique. It does not rely on fibre affinity, allowing  
 3448 for the colouring of all fabric types. The colour's fixing to the fabric surface is determined by the  
 3449 auxiliaries used, such as binders, thickening agents, and others.

3450 — Dye printing requires a more intricate composition for the printing paste. This complexity is  
 3451 influenced by the printing technique, substrate type, application method, and fixation procedures.

3452 For both types of printing, the technology determines how the printing paste is applied. The most common  
 3453 methods include flat-screen printing, rotary-screen printing, roller printing, jet printing, and transfer printing  
 3454 (Roth et al., 2023).

3455 The performance indicators for durability, such as washing and colour fastness, are affected by the composition  
3456 of the printing pastes and the fixation methods. Since pigments do not bond with fibres, their colour fastness  
3457 is less efficient as when dyes are used in the colouration process.

3458 Overall, the process requires significant amounts of chemicals and energy.

### 3459 *Finishing*

3460 Finishing includes treatments designed to give textile substrates specific end-use properties, like unique visual  
3461 effects, feel, or functional features such as waterproofing or flame resistance. A variety of chemical and  
3462 mechanical/physical treatments are associated with this manufacturing stage, and they are typically applied  
3463 after the colouration process. This stage consumes significant amounts of chemicals and energy (Roth et al.,  
3464 2023).

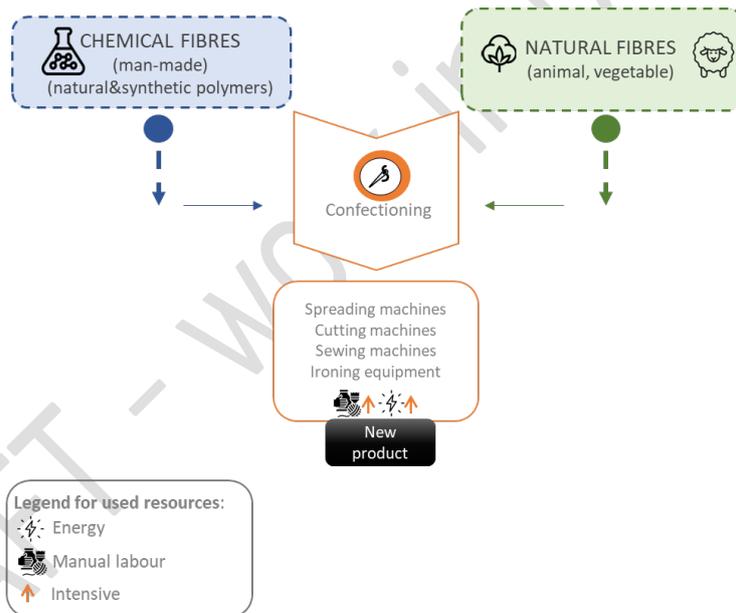
### 3465 *Coating and laminating*

3466 Coating and laminating involve applying a thin, flexible polymeric film directly to the fabric's surface. The  
3467 primary technologies employed are roller, spray, and slot die coating. Adding a polymer coating introduces new  
3468 features to the fabric, such as resistance to dust, liquids, and gases. It can also enhance inherent physical  
3469 properties, like the fabric's ability to resist abrasion. This stage, too, is chemically and energy-intensive (Roth et  
3470 al., 2023).

## 3471 **9.2.5 Confectioning**

3472

**Figure 37.** Confectioning process



3473

3474

Source: own production and adapted from (McKinsey & Company, 2022), icons from [www.flaticon.com](http://www.flaticon.com)

3475 Confectioning is the production stage encompassing product design, fabric cutting, and final product assembly.  
3476 It is the most manual phase in the production process (Nayak and Padhye, 2018). The fabric spreading and  
3477 cutting stage is particularly energy-intensive and can be carried out using either mechanised (operator-assisted)  
3478 or digitalised (automated) machines. The assembly phase is predominantly manual and labour-intensive,  
3479 involving processes like sewing and culminating in ironing, which is also energy intensive.

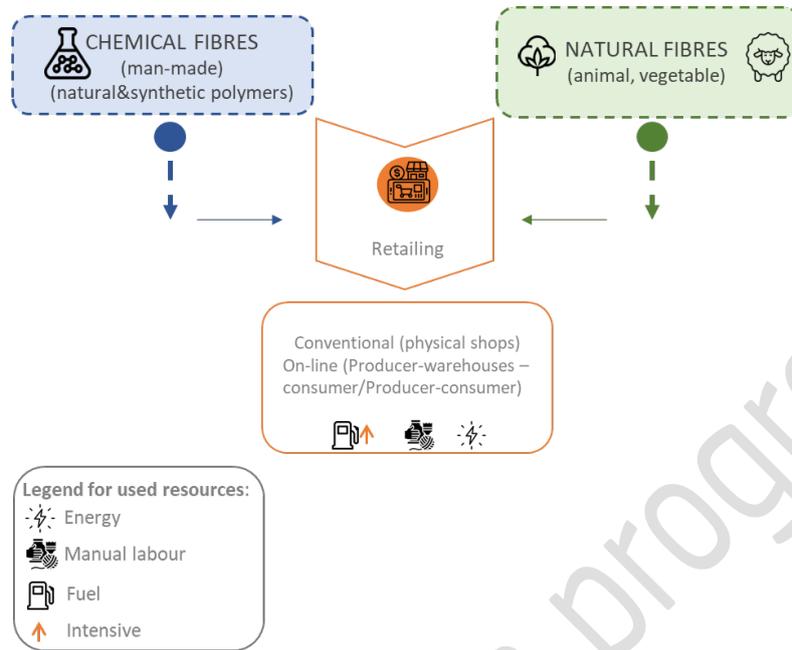
3480 In the final product manufacturing phase, the quality of the sewing process, combined with the sewing stitch  
3481 and yarn count, significantly affects a product's seam strength, a key durability parameter. The type and count  
3482 of the yarn play a crucial role in determining a textile product's longevity (Yassen, 2017) (Jankoska and  
3483 Demboski, 2017).

3484 This is the stage that produces post-industrial waste. By automating and digitalising the design and cutting  
3485 stages, waste quantities can be reduced (de Mattos et al., 2022).

3486 **9.2.6 Retailing**

3487

**Figure 38.** Textile products retailing



3488

3489

Source: own production adapted from (McKinsey & Company, 2022), icons from [www.flaticon.com](http://www.flaticon.com)

3490 Retail, defined by the Oxford dictionary as ‘the activity of selling goods to the public in shops, on the internet,  
 3491 etc.’ (Oxford dictionary, 2023), encompasses the transportation of final products and their sale through various  
 3492 channels (European Commission, 2023). The journey typically involves:

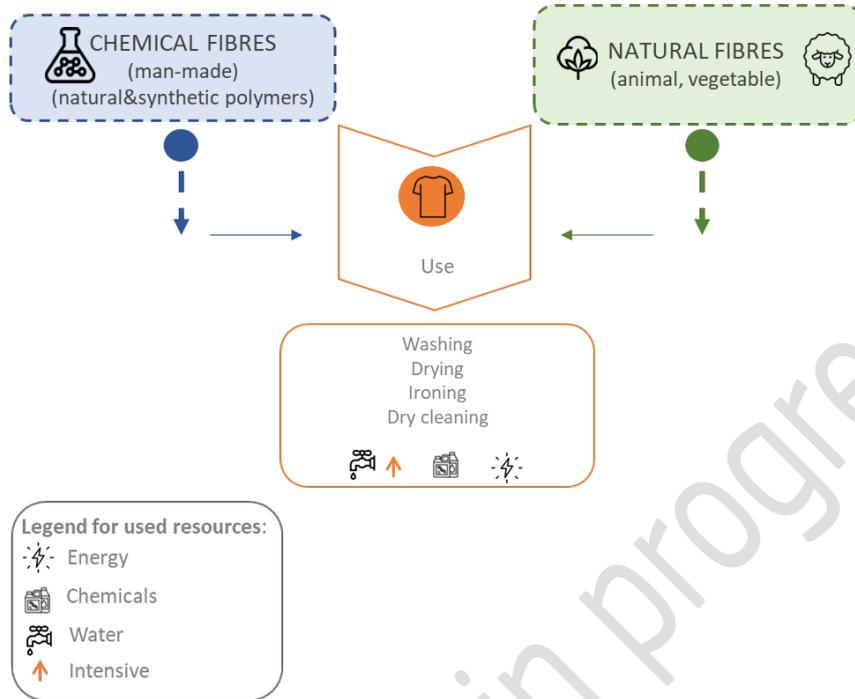
- 3493 — Moving goods from the production network (manufacturers) to the export network (trade firms),  
 3494 and finally to the marketing networks (retailers) (de Mattos et al., 2022).
- 3495 — Using various means of transport, including road, sea, rail, air, or a combination of these  
 3496 (multimodal transportation).

3497 The primary resources used in this stage include fuel for transport, which leads to emissions, as well as labour  
 3498 and energy for sales operations. This stage produces pre-consumer waste. To reduce such waste, strategies like  
 3499 production on demand and integrated management systems for efficient inventory management can be  
 3500 employed (Aslan et al., 2015) (de Mattos et al., 2022) (Alyssa Hardy, 2020).

3501 **9.2.7 Use**

3502

**Figure 39.** Use phase of a textile product



3503

3504

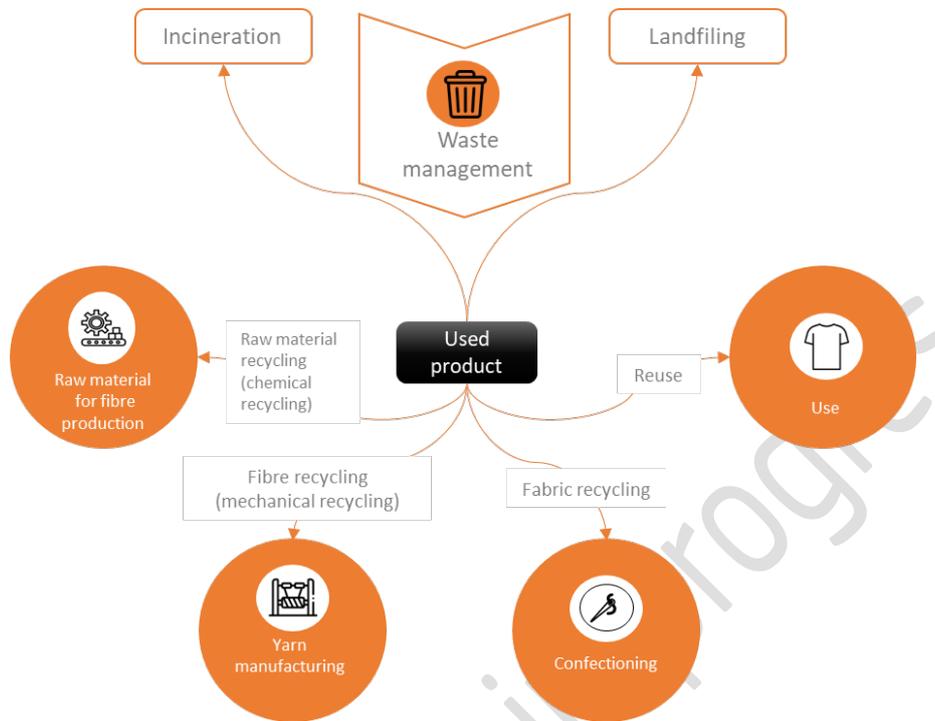
Source: own production and adapted from (McKinsey & Company, 2022), icons from [www.flaticon.com](http://www.flaticon.com)

3505 The 'use' phase of a textile product encompasses activities such as washing, cleaning, drying, ironing, and  
3506 steaming (Quantis, 2022). The specific requirements for these activities depend on the product and are detailed  
3507 in its care label.

3508 This stage primarily consumes water and chemicals, with energy-intensive processes like ironing and steaming  
3509 following closely. The lifespan of a textile product hinges on both the user's adherence to the care label  
3510 instructions and the product's inherent durability.

3511 **9.2.8 Waste management**

3512 **Figure 40.**Textile products waste management



3513

3514 *Source: own production and adapted from (McKinsey & Company, 2022), icons from [www.flaticon.com](http://www.flaticon.com)*

3515 Most disposed apparel textiles, at the end of their life, are either incinerated or sent to landfills. This process  
 3516 not only generates waste and emissions into the environment, but it is also energy intensive. Such discarded  
 3517 textiles, primarily consisting of clothing and home textiles, account for about 85% of total textile waste  
 3518 (McKinsey & Company, 2022). Currently, this follows a linear model. However, the energy recovered from  
 3519 incineration can be repurposed for other applications. The calorific value of textile waste is estimated to be  
 3520 between 3 599 and 5 200 MJ/Kg (Vargas and Yuleimy Ramírez, 2014) (Mustia et al., 2021).

3521 Transitioning from this linear model to a circular one involves collecting, sorting, and pre-processing discarded  
 3522 textiles for fibre-to-fibre recycling. Textile waste management avenues include preparation for reuse, fabric  
 3523 recycling, fibre recycling (mechanical recycling), and raw material recycling (chemical recycling). Currently, only  
 3524 30-35% of textiles are collected, with a significant portion of unsorted waste exported outside Europe (McKinsey  
 3525 & Company, 2022).

3526 Textile recycling technologies fall into three main categories (Jørgensen et al., 2022):

3527 **Fibre or Mechanical Recycling:** This method uses physical processes and can be applied to all textile waste  
 3528 types. It can also precede other recycling methods like thermo-mechanical, chemical, or biochemical (DG  
 3529 GROW, 2021b).

3530 **Raw Material or Chemical Recycling:** This involves chemical processes to recycle monomers or polymers,  
 3531 suitable for materials like cotton, PA6, or PET (DG GROW, 2021b).

3532 **Thermal Recycling:** This method uses heat. Thermo-mechanical recycling melts polymers, mainly for  
 3533 thermoplastic textiles like polyester, while thermo-chemical recycling breaks down polymers into base  
 3534 components, which can then be repurposed (DG GROW, 2021b; McKinsey & Company, 2022).

3535 Additionally, **fabric recycling** involves refurbishing or remanufacturing discarded textiles, resulting in recycled  
 3536 products.

3537 The primary solution to the current textile waste issue is recycling, coupled with waste reduction efforts (DG  
 3538 GROW, 2021b; McKinsey & Company, 2022).

3539 **9.3 Supporting information about tests and standards in the textile industry**

3540 **Table 47.** Working Groups with the involvement of several scientific committees

Working Group	Topic
CEN/TC248/SC1	Burning behaviour of textiles, textile products and textile containing products
CEN/TC248/SC2	Physical properties
CEN/TC248/SC3	Chemical properties
CEN/TC248/WG 10	Size system of clothing
CEN/TC248/WG 11	Monofilaments
CEN/TC248/WG 12	Physical testing of knitted fabrics and garments
CEN/TC248/WG 13	Determination of resistance of textiles to microbiological attack
CEN/TC248/WG 14	UV protective properties
CEN/TC248/WG 15	Multifilament yarns
CEN/TC248/WG 16	Textiles in the healthcare system
CEN/TC248/WG 17	Hygienic quality of textiles proposed in industrial laundries and used in sectors it is necessary to control biocontamination
CEN/TC248/WG 18	AZO dyestuffs- Detection of certain aromatic amines
CEN/TC248/WG 19	Characterization of fibres
CEN/TC248/WG 20	Characterization of children's clothing
CEN/TC248/WG 21	Terry towels
CEN/TC248/WG 22	Elasticity of fabrics
CEN/TC248/WG 23	Burning behaviour of nightwear
CEN/TC248/WG 24	Test methods for the flammability of textiles
CEN/TC248/WG 25	Cosmeto-textiles
CEN/TC248/WG 26	Methods of test for phthalates
CEN/TC248/WG 27	Determination of fibre proof properties of fabrics
CEN/TC248/WG 28	Thermoregulation
CEN/TC248/WG 29	Specifications and test methods for silk articles
CEN/TC248/WG 3	Ropes and agricultural twines and fishing nets
CEN/TC248/WG 30	Quantitative analysis of fibre mixtures
CEN/TC248/WG 31	Smart Textiles
CEN/TC248/WG 32	Organic, green and ecotextiles
CEN/TC248/WG 33	Labelling of superfine wool
CEN/TC248/WG 34	Joint Working Group between CEN/TC248 and CEN/TC 252 Risks in sleeping environment
CEN/TC248/WG 35	Slide (zip) Fasteners
CEN/TC248/WG 36	Classification of textiles and textile products based on burning behaviour
CEN/TC248/WG 37	Microplastics from textile sources
CEN/TC248/WG 38	Circular Textiles Chain- Requirements and categories
CEN/TC248 WG39	Circular Economy for textile products and textile chain. This group is under development
CEN/TC248/WG 4	Coated fabrics
CEN/TC248/WG 5	Touch and close fasteners
CEN/TC248/WG 6	Sewing threads
CEN/TC248/WG 7	Cabinet roller towels
CEN/TC248/WG 8	Upholstery fabrics
CEN/TC248/WG 9	Prioritization of research topics
CEN/TC38/WG 35	Environmental aspects
ISO/TC173/SC/WG2	Urinary absorbing aids

3541 *Source: CEN official website <sup>(127)</sup>*

3542

3543 All standards reported in this section include tests on a specific sample of the final product.

<sup>127</sup> CEN Technical Committee Working Groups available at [this link](#)

**Table 48.** Standards directly related to intrinsic durability

Specific topic	ID code	Title	Type	Status
Abrasion	ISO 129451	Determination of fabric propensity to surface pilling, fuzzing or matting	Standard	Published
Abrasion	ISO 12945-1:2020	Determination of fabric propensity to surface pilling, fuzzing or matting — Part 1: Pilling box method	Standard	Published
Abrasion	ISO 12945-2:2020	Determination of fabric propensity to surface pilling, fuzzing or matting — Part 2: Modified Martindale method	Standard	Published
Pilling and abrasion	ISO 12945-3:2020	Determination of fabric propensity to surface pilling, fuzzing or matting — Part 3: Random tumble pilling method	Standard	Published
Pilling and abrasion	ISO 12945-4:2020	Determination of fabric propensity to surface pilling, fuzzing or matting — Part 4: Assessment of pilling, fuzzing and matting by visual analysis	Standard	Published
Colour fastness	ISO 1052	Tests for colour fastness	Standard	Published
Colour fastness	EN ISO 105-A06:1995	Textiles — Tests for colour fastness — Part A06: Instrumental determination of 1/1 standard depth of colour	Standard	Published
Colour fastness	EN ISO 105-B01:2014	Textiles — Tests for colour fastness — Part B01: Colour fastness to light: Daylight	Standard	Published
Colour fastness	EN ISO 105-B02:2014	Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test	Standard	Published
Colour fastness	EN ISO 105-B03:2014	Textiles — Tests for colour fastness — Part B03: Colour fastness to weathering: Outdoor exposure	Standard	Published
Colour fastness	ISO 105-C06:2010	Tests for colour fastness — Part C06: Colour fastness to domestic and commercial laundering	Standard	Published
Colour fastness	EN ISO 105-C12:2010	Textiles — Tests for colour fastness — Part C12: Colour fastness to industrial laundering	Standard	Published
Colour fastness	EN ISO 105-D01:2010	Textiles — Tests for colour fastness — Part D01: Colour fastness to drycleaning using perchloroethylene solvent	Standard	Published
Colour fastness	EN ISO 105-E01:2013	Textiles – tests for colour fastness – part E01: colour fastness to water	Standard	Published
Colour fastness	EN ISO 105-E02:2013	Textiles – tests for colour fastness – part E02: colour fastness to sea water	Standard	Published
Colour fastness	EN ISO 105-E03:2010	Textiles – tests for colour fastness – part E03: colour fastness to chlorinated water (swimming-pool water)	Standard	Published
Colour fastness	EN ISO 105-E04:2013	Textiles – tests for colour fastness – part E04: colour fastness to perspiration	Standard	Published
Colour fastness	EN ISO 105-E07:2010	Textiles – tests for colour fastness – part E07: colour fastness to spotting: water	Standard	Published
Colour fastness	EN ISO 105-N01:1993	Textiles – tests for colour fastness – part N01: colour fastness to bleaching: hypochlorite	Standard	Published
Colour fastness	EN ISO 105-N02:1995	Textiles – tests for colour fastness – part N02: colour fastness to bleaching: peroxide	Standard	Published
Colour fastness	EN ISO 105-N03:1995	Textiles – tests for colour fastness – part N03: colour fastness to bleaching: sodium chlorite (mild)	Standard	Published
Colour fastness	EN ISO 105-N04:1995	Textiles – tests for colour fastness – part N04: colour fastness to bleaching: sodium chlorite (severe)	Standard	Published

Specific topic	ID code	Title	Type	Status
Colour fastness	EN ISO 105-X11:1994	Textiles — Tests for colour fastness — Part X11: Colour fastness to hot pressing	Standard	Published
Colour fastness	EN ISO 105-X12:2016	Textiles — Tests for colour fastness — Part X12: Colour fastness to rubbing	Standard	Published
Abrasion resistance on coated fabric	ISO 54703	Rubber- or plastics-coated fabrics — Determination of abrasion resistance	Standard	Published
Abrasion resistance on coated fabric	ISO 5470-1:2016	Rubber- or plastics-coated fabrics — Determination of abrasion resistance — Part 1: Taber abrader	Standard	Published
Abrasion resistance on coated fabric	ISO 5470-2:2016	Rubber- or plastics-coated fabrics — Determination of abrasion resistance — Part 2: Martindale abrader	Standard	Published
Abrasion resistance on fabric	ISO 129474	Textiles — Determination of the abrasion resistance of fabrics by the Martindale method	Standard	Published
Abrasion resistance on fabric	ISO 12947-2:2016	Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 2: Determination of specimen breakdown	Standard	Published
Abrasion resistance on fabric	ISO 12947-3:2016	Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 3: Determination of mass loss	Standard	Published
Abrasion resistance on fabric	ISO 12947-4:2016	Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 4: Assessment of appearance change	Standard	Published
Abrasion resistance on fabric	CEN EN 13770:2002	Textiles- Determination of the abrasion resistance of knitted footwear garments	Standard	Published
Abrasion resistance on fabric	ASTM D3884-22	Standard Guide for Abrasion Resistance of Textile Fabrics (Rotary Platform Abrader Method)	Standard	Published
Abrasion resistance on fabric	ASTM D3885 -07A-19	Standard Test Method for Abrasion Resistance of Textile Fabrics (Flexing and Abrasion Method) (woven or nonwoven fabric)	Standard	Published
Abrasion resistance on fabric	ASTM D3886-22	Standard Test Method for Abrasion Resistance of Textile Fabrics (Inflated Diaphragm Apparatus) (both wet and dry/conditioned samples)	Standard	Published
Abrasion resistance on fabric	ASTM D4966-22	Standard Test Method for Abrasion Resistance of Textile Fabrics (Martindale Abrasion Tester Method)	Standard	Published
Abrasion resistance on fabric	ASTM D4158-08-20	Standard Guide for Abrasion Resistance of Textile Fabrics (Uniform Abrasion)	Standard	Published
Antifungal activity (Functional durability)	ISO 136295	Textiles — Determination of antifungal activity of textile products	Standard	Published
Antifungal activity (Functional durability)	ISO 13629-1:2012	Textiles — Determination of antifungal activity of textile products — Part 1: Luminescence method	Standard	Published
Antifungal activity (Functional durability)	ISO 13629-2:2014	Textiles — Determination of antifungal activity of textile products — Part 2: Plate count method	Standard	Published
Antiviral activity (Functional durability)	ISO 18184:2019	Textiles — Determination of antiviral activity of textile products	Standard	Published
Appearance	ISO/TR 16323:2003	Textiles — Three-dimensional measuring apparatus for fabric appearance	Standard	Published
Bursting strength	EN ISO 139386	Textiles: Bursting properties of fabrics.	Standard	Published
Bursting strength	EN ISO 13938-1:2019	Textiles: Bursting properties of fabrics. Part 1: Hydraulic method for determination of bursting strength and bursting distension	Standard	Published
Bursting strength	ISO 13938-2:2019	Textiles: Bursting properties of fabrics. Part 2: Pneumatic method for determination of bursting strength and bursting distension	Standard	Published
Bursting strength	ISO 90737	Textiles — Test methods for nonwovens	Standard	Published
Bursting strength	ISO 9073-5:2008	Textiles — Test methods for nonwovens — Part 5: Determination of resistance to mechanical penetration (ball burst procedure)	Standard	Published

Specific topic	ID code	Title	Type	Status
Bursting strength	ASTM D3786/D3786M-18	Standard test method for bursting strength of textile fabrics. Diaphragm bursting strength tester method. Hydraulic or pneumatic diaphragm bursting tester	Standard	Published
Bursting strength	ASTM D3787-16	Standard test method for bursting strength of textile fabrics. The constant rate of traverse (CRT) Ball burst test	Standard	Published
Bursting strength	ASTM D6797-15	Standard test method for bursting strength of textiles. The constant rate of extension (CRT) Ball burst test	Standard	Published
Colour fastness	BVL B 82.10-1:2011-12	Analysis of commodity goods - Testing of coloured children's toys with respect to their resistance to saliva and perspiration	Standard	Published
Colour fastness	DIN 531608	Determination of the colourfastness of articles for common use.	Standard	Published
Colour fastness	DIN 53160-1:2010-10	Determination of the colourfastness of articles for common use. Part 1 Test with artificial saliva	Standard	Published
Colour fastness	DIN 53160-2:2010-10	Determination of the colourfastness of articles for common use. Part 2 Test with artificial sweat	Standard	Published
Colour fastness	ISO/TR 12116:2008	Textiles — Methods of simulating colour change during actual wear by means of laboratory colour-fastness tests	Standard	Published
Colour fastness	Oeko-Tex Standard 100. Class 1	Colour fastness to saliva and perspiration for children 3 years to younger	Ecolabel	Published
Colour fastness	AATCC8 – 2016e	Test method for colour fastness to crocking	Test method	Published
Colour fastness	AATCC15 -2021e	Test method for colour fastness to perspiration	Standard	Published
Colour fastness	AATCC16 – 2004e	Test method for colour fastness to light	Standard	Published
Crease retention	ISO 7769:2009	Textiles — Test method for assessing the appearance of creases in fabrics after cleansing	Standard	Published
Crease retention	ISO 23139	Textiles — Determination of the recovery from creasing of a folded specimen of fabric by measuring the angle of recovery	Standard	Published
Crease retention	ISO 2313-1:2021	Textiles — Determination of the recovery from creasing of a folded specimen of fabric by measuring the angle of recovery — Part 1: Method of the horizontally folded specimen	Standard	Published
Crease retention	ISO 2313-2:2021	Textiles — Determination of the recovery from creasing of a folded specimen of fabric by measuring the angle of recovery — Part 2: Method of the vertically folded specimen	Standard	Published
Crease retention	AATCC test method 128-2017e	Test Method for wrinkle recovery of fabrics: appearance	Standard	Published. Not approved by ANSI
Crease retention	AATCC test method 66 – 2017e	Test Method for wrinkle recovery of woven fabrics: recovery angle	Standard	Published. Not approved by ANSI
Dimensional stability	EN:ISO 5077:2008	Textiles — Determination of dimensional change in washing and drying	Standard	Published
Dimensional stability	ISO 3005:1978	Textiles — Determination of dimensional change of fabrics induced by free-steam	Standard	Published
Dimensional stability	ISO 7771:1985	Textiles — Determination of dimensional changes of fabrics induced by cold-water immersion	Standard	Published
Dimensional stability	EN 25077:1993	Textiles - Determination of dimensional change in washing and drying	Standard	Published

Specific topic	ID code	Title	Type	Status
Dimensional stability	ISO 1632210	Determination of spirality after laundering	Standard	Published
Dimensional stability	ISO 16322-2:2021	Determination of spirality after laundering- Part 2 Woven and knitted fabrics	Standard	Published
Dimensional stability	ISO 675:2014	Textiles — Woven fabrics — Determination of dimensional change on commercial laundering near the boiling point	Standard	Published
Dimensional stability	ISO 986611	Textiles — Effect of dry heat on fabrics under low pressure	Standard	Published
Dimensional stability	ISO 9866-1:1991	Textiles — Effect of dry heat on fabrics under low pressure — Part 1: Procedure for dry-heat treatment of fabrics	Standard	Published
Dimensional stability	ISO 9866-2:1991	Textiles — Effect of dry heat on fabrics under low pressure — Part 2: Determination of dimensional change in fabrics exposed to dry heat	Standard	Published
Dimensional stability	ISO 21765:2020	Textiles — Determination of fabric deformability by forced mechanical distension	Standard	Published
Dimensional stability	ISO 23231:2008	Textiles — Determination of dimensional change of fabrics — Accelerated machine method	Standard	Published
Dimensional stability (connected standard)	EN ISO 3759:2011	Textiles - Preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change	Standard	Published
Dimensional stability (connected standard)	EN ISO 6330:2012	Domestic washing and drying procedures for textile testing	Standard	Published
Dimensional stability (connected standard)	EN ISO 15797:2018	Industrial washing and finishing procedures for testing of workwear	Standard	Published
Dimensional stability (connected standard)	ISO 317512	Professional care, drycleaning and wet cleaning of fabrics and garments - Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene	Standard	Published
Dimensional stability (connected standard)	ISO 3175-2:2017	Professional care, drycleaning and wet cleaning of fabrics and garments - Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene	Standard	Published
Dimensional stability (connected standard)	ISO 3175-3:2017	Professional care, drycleaning and wet cleaning of fabrics and garments - Part 3: Procedure for testing performance when cleaning and finishing using hydrocarbon solvents	Standard	Published
Dimensional stability (connected standard)	ISO 3175-4:2017	Professional care, drycleaning and wet cleaning of fabrics and garments - Part 4: Procedure for testing performance when cleaning and finishing using simulated wet cleaning	Standard	Published
Easy-Care treatments (functional durability)	ISO 7768:2009	Textiles — Test method for assessing the smoothness appearance of fabrics after cleansing	Standard	Published
Flame retardancy (Functional durability)	ISO 12138:2017	Textiles — Domestic laundering procedures for textile fabrics prior to flammability testing	Standard	Published
Flame retardancy (Functional durability)	BS5651:1978	Method for cleansing procedure for use in the assessment of the effect of cleansing and wetting on the flammability of textile fabrics and fabric assemblies	Standard	Published
Loss of fibre fragments from textiles	AATCC TM212 – 2021e	Fibre fragment release during home laundering	Standard	Published
Loss of fibre fragments from textiles	ISO 448413	Textile and textile products- Microplastics from textile sources. Part1: Determination of material loss from fabrics during washing	Standard	Published
Loss of fibre fragments from textiles	ISO 4484-1:2023	Textile and textile products- Microplastics from textile sources. Part1: Determination of material loss from fabrics during washing	Standard	Published

Specific topic	ID code	Title	Type	Status
Loss of fibre fragments from textiles	ISO/DIS 4484-2	Textile and textile products- Microplastics from textile sources. Part 2: Qualitative and quantitative analysis of microplastics	Standard	Under development
Loss of fibre fragments from textiles	ISO/DIS 4484-3	Textile and textile products- Microplastics from textile sources. Part 3: Measurement of collected material mass released from textile end products by domestic washing method	Standard	Under development
Matting appearance after cleansing	ISO 16847:2016	Textiles — Test method for assessing the matting appearance of napped fabrics after cleansing	Standard	Published
Odour management (Functional durability)	ISO 20743:2021	Textiles — Determination of antibacterial activity of textile products. Part 3 Absorption method	Standard	Published
Oil stain repellency (Functional durability)	ISO 14419:2010	Textiles - Oil repellency - Hydrocarbon resistance test	Standard	Published
Performance requirements	ASTM D5432-12- 19	Standard Performance specification for blanket products for institutional and household use	Standard	Published
Performance requirements	ASTM D411-12 – 19	Standard Performance specification for woven napery and tablecloth fabrics: household and institutional	Standard	Published
Performance requirements	ASTM D5433-12 – 19	Standard Performance specification for towel products for institutional and household use	Standard	Published
Performance requirements	EN 13569:2001	Cabinet roller towels- Performance requirements and processing	Standard	Published
Performance requirements	EN 14697:2005	Textiles. Terry towels and terry towel fabrics. Specifications and methods for tests sets out requirements based on general applicated test methods	Standard	Published
Physiological comfort (Thermal resistance and Breathability (post-laundering) in PEFCR)	JIS L 1099 – 2021e	Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)	Standard	Published
Physiological comfort (Thermal resistance and Breathability (post-laundering) in PEFCR) (Functional property claims)	ISO 11092:2015	Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)	Standard	Published
Quality of buttons and press fasteners	EN 1739414	Textiles and textile products.	Standard	Published
Quality of buttons and press fasteners	EN 17394-2:2021	Textiles and textile products. Part 2: Safety of Children's clothing security of attachment of buttons. Test method	Standard	Published
Quality of buttons and press fasteners	CEN/TS 17394-3:2021	Textiles and textile products. Part 3: Safety of Children's clothing security of attachment of metal mechanically applied press fasteners. Test method	Standard	Published
Quality of zippers	ASTM D2061-07 (2021)	Standard test methods for strength test for zippers	Standard	Published
Quality of zippers	JIS S3015 – 2019e	Methods for measuring zipper dimensions standard test methods for strength	Standard	Published
Quality of zippers	EN 16732:2016	Slide fasteners (zips) Specifications	Standard	Published
Resistance to chlorinated water	ISO 17608:2015	Textiles — Bare elastane yarns — Determination of resistance to chlorinated water (swimming-pool water)	Standard	Published
Resistance to insect	ISO 3998:1977	Textiles — Determination of resistance to certain insect pests	Standard	Published
Resistance to surface wetting (Functional Durability)	ISO 9865:1991	Textiles - Determination of water repellency of fabrics by the Bundesmann rain-shower test	Standard	Published

Specific topic	ID code	Title	Type	Status
Resistance to surface wetting (Thermal resistance and breathability (post-laundering) in PEFCR) (Functional property claims)	ISO 15496:2018	Textiles — Measurement of water vapour permeability of textiles for the purpose of quality control	Standard	Published
Seam slippage (wovens only)	EN-ISO 1393615	Textiles — Determination of the slippage resistance of yarns at a seam in woven fabrics	Standard	Published
Seam slippage (wovens only)	EN-ISO 13936-1:2004	Textiles — Determination of the slippage resistance of yarns at a seam in woven fabrics — Part 1: Fixed seam opening method	Standard	Published
Seam slippage (wovens only)	EN-ISO 13936-2:2004	Textiles — Determination of the slippage resistance of yarns at a seam in woven fabrics — Part 2: Fixed load method	Standard	Published
Seam slippage (wovens only)	EN-ISO 13936-3:2004	Textiles — Determination of the slippage resistance of yarns at a seam in woven fabrics — Part 3: Needle clamp method	Standard	Published
Seam slippage (wovens-only)	ASTM D4035/4034M-19	Standard test method for resistance to yarn slippage at the sewn seam in woven upholstery fabrics	Standard	Published
Seam smoothness	ISO 7770:2009	Textiles — Test method for assessing the smoothness appearance of seams in fabrics after cleansing	Standard	Published
Seam strength	EN-ISO 1393516	Textiles — Seam tensile properties of fabrics and made-up textile articles	Standard	Published
Seam strength	EN-ISO 13935-1:2014	Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 1: Determination of maximum force to seam rupture using the strip method	Standard	Published
Seam strength	EN-ISO 13935-2:2014	Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 2: Determination of maximum force to seam rupture using the grab method	Standard	Published
Seam strength	ASTM D1683-22	Standard test method for failure in sewn seams of woven fabrics	Standard	Published
Seam strength	ASTM D751-19	Standard test method for coated fabrics	Standard	Published
Spirality	ISO 1632217	Textiles — Determination of spirality after laundering	Standard	Published
Spirality	ISO 16322-1:2005	Textiles — Determination of spirality after laundering — Part 1: Percentage of wale spirality change in knitted garments	Standard	Published
Spirality	ISO 16322-3:2021	Textiles — Determination of spirality after laundering — Part 3: Woven and knitted garments	Standard	Published
Stain Repellency (Functional durability)	ISO 22958:2021	Textiles — Water resistance — Rain tests: exposure to a horizontal water spray	Standard	Published
Stretch and recovery	ISO 2093218	Textiles — Determination of the elasticity of fabrics	Standard	Published
Stretch and recovery	ISO 20932-1:2018	Textiles — Determination of the elasticity of fabrics — Part 1: Strip tests	Standard	Published
Stretch and recovery	ISO 20932-2:2018	Textiles — Determination of the elasticity of fabrics — Part 2: Multiaxial tests	Standard	Published
Stretch and recovery	ISO 20932-3:2018	Textiles — Determination of the elasticity of fabrics — Part 3: Narrow fabrics	Standard	Published
Tear Strength	EN ISO 467419	Rubber or plastic-coated fabrics- Determination of tear resistance	Standard	Published
Tear Strength	EN ISO 4674-1:2017	Rubber or plastic-coated fabrics- Determination of tear resistance- Part 1: constant rate of tear methods	Standard	Published
Tear Strength	EN-ISO 1393720	Textiles — Tear properties of fabrics	Standard	Published

Specific topic	ID code	Title	Type	Status
Tear Strength	EN-ISO 13937-1:2000	Textiles — Tear properties of fabrics — Part 1: Determination of tear force using ballistic pendulum method (Elmendorf)	Standard	Published
Tear Strength	EN-ISO 13937-2:2000	Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)	Standard	Published
Tear Strength	EN-ISO 13937-3:2000	Textiles — Tear properties of fabrics — Part 3: Determination of tear force of wing-shaped test specimens (Single tear method)	Standard	Published
Tear Strength	EN-ISO 13937-4:2000	Textiles — Tear properties of fabrics — Part 4: Determination of tear force of tongue-shaped test specimens (Double tear test)	Standard	Published
Tear Strength	ASTM D1424-21	Standard Test Method for Tearing Strength of Fabrics by falling-pendulum (Elmendorf-Type) apparatus	Standard	Published
Tear Strength	ISO 907321	Nonwovens — Test methods	Standard	Published
Tensile strength and elongation (durability parameter according to OVAM report [3])	ISO 9073-3:1989	Textiles — Test methods for nonwovens — Part 3: Determination of tensile strength and elongation	Standard	Published
Tear Strength	ISO 9073-4:2021	Nonwovens — Test methods — Part 4: Determination of tear resistance by the trapezoid procedure	Standard	Published
Tear Strength	ISO 9073-18:2007	Textiles — Test methods for nonwovens — Part 18: Determination of breaking strength and elongation of nonwoven materials using the grab tensile test	Standard	Published
Tensile strength and elongation (durability parameter according to OVAM report [3])	ISO/FDIS 9073-3	Nonwovens — Test methods — Part 3: Determination of tensile strength and elongation at break using the strip method	DIS	Under development
Tear Strength	ASTM D5587 -15-19	Standard Test Method for Tearing Strength of Fabrics by trapezoid procedure apparatus	Standard	Published
Tear Strength	ASTM D2261 -13-17	Standard Test method for Tearing Strength of fabric by the tongue (single rip) procedure (constant rate of extension tensile testing machine)	Standard	Published
Tensile strength (durability parameter according to OVAM report [3])	EN-ISO 1393422	Textiles: Tensile properties of Fabrics	Standard	Published
Tensile strength (durability parameter according to OVAM report [3])	EN-ISO 13934-1:2013	Textiles: Tensile properties of Fabrics Part 1 Determination of maximum force and elongation at maximum force using the strip method	Standard	Published
Tensile strength (durability parameter according to OVAM report [3])	EN-ISO 13934-2:2014	Textiles: Tensile properties of Fabrics. Part 2 Determination of maximum force using the grab method	Standard	Published
Tensile strength and elongation	ASTM D5035-11	Standard test method for breaking force and elongation of textile fabrics (strip method)	Standard	Published
Tensile strength and elongation	ASTM D5034-21	Standard test method for breaking force and elongation of textile fabrics (grab method)	Standard	Published
Tensile strength and elongation	EN ISO 1421 (2016)	Rubber or plastic-coated fabrics - Determination of tensile strength and elongation at break	Standard	Published
Unevenness of textile	ISO 16549:2021	Unevenness of textile strands. Capacitance method	Standard	Published
Visible change after washing	ISO 15487:2018	Textiles — Method for assessing appearance of apparel and other textile end products after domestic washing and drying	standard	Published
Water repellency (Functional Durability)	ISO 4920:2012	Textile fabrics — Determination of resistance to surface wetting (spray test)	Standard	Published
Water resistance after aging	EN 343:2019	Rain Protection	Standard	Published

Specific topic	ID code	Title	Type	Status
Wicking (Functional durability)	AATCC 197-2022e	Test method for vertical wicking rate of textiles to specified distances	Standard	NA
Wrinkle resistance	ISO 9867:2022	Textiles — Evaluation of the wrinkle recovery of fabrics — Appearance method	Standard	Published

3545 Standards made of several parts and only the most used are reported in this Table: <sup>1</sup>Made of 4 parts. <sup>2</sup>Made of 107 parts. <sup>3</sup>Made of 2 parts. <sup>4</sup>Made of 7 parts. <sup>5</sup>Made of 2 parts. <sup>6</sup>Made of 2 parts. <sup>7</sup>Made of 20 parts.  
3546 <sup>8</sup>Made of 3 parts. <sup>9</sup>Made of 2 parts. <sup>10</sup>Made of 3 parts. <sup>11</sup>Made of 2 parts. <sup>12</sup>Made of 6 parts. <sup>13</sup>Made of 3 parts. <sup>14</sup>Made of 2 parts. <sup>15</sup>Made of 3 parts. <sup>16</sup>Made of 2 parts. <sup>17</sup>Made of 3 parts. <sup>18</sup>Made of 4 parts. <sup>19</sup>  
3547 Made of 2 parts. <sup>20</sup>Made of 5 parts. <sup>21</sup>Made of 20 parts. <sup>22</sup>It is made of 2 parts.

3548 Every ID Code indicates the year depending on the Standard reference, as follows:

- ISO/CEN/BVL/BS -> XXX:YEAR (4-DIGIT)
- ASTM ->XXX-YEAR (2-DIGIT)
- AATC/JIS -> XXX-YEARe (4-DIGIT)

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3553 **Table 49.** Standards used by several frameworks to test parameters related to durability of textile products

Parameter	PEFCR A&F	EU Ecolabel	Nordic Ecolabel	Blue Angel
Resistance to pilling and abrasion	ISO 12945-1 (Pilling box method) with assessment by ISO Pilling Grade replicas	ISO 12945-1 Pill box method (Knitted and non-woven products)	ISO 12947-2 Martindale abrasion (Woven fabrics)	ISO 12945-1 Pill box method (Knitted and non-woven products)
	ISO 12947-2 Martindale abrasion (Woven fabrics)	ISO 12945-2 Martindale method (Woven fabrics)		ISO 12945-2 Martindale method (Woven fabrics)
Density and weight	EN 12127 and ISO 3801	NA		
Colour fastness to dry rubbing	NA	ISO 105 X12		
Colour fastness to wet rub (Crocking)	ISO 105 X12 or AATCC 8	ISO 105 X12		
Colour fastness to perspiration	ISO 105 E04 or AATCC 15	ISO 105 E04 (Acid alkaline)	ISO 105 E04 (Acid alkaline) ISO 105 A06 (saliva)	ISO 105 E04 (acid and alkaline, comparison with multi-fibre fabric)
Colour fastness to light exposure	ISO 105-B02, X hours of light exposure OR AATCC 16, Op3, 20 AFU (to light)	ISO 105-B02		
Colour fastness to washing	NA	ISO 105 C06 (Domestic washing) ISO 15797 combined with ISO 105 C06 (Commercial washing)	ISO 105 C06 ISO 105 D01 if dry cleaning	ISO 105 C06 (single wash, at temperature marked on the product, with perborate powder)
Performance Claim	ISO 6330 4N	NA		
Water repellency	Bundesmann ISO 9865 or ISO 4920	NA		ISO 6330 combined with ISO 4920 (Domestic)
				ISO 15797 combined with ISO 4920 (Industrial washing)
Garment Integrity Test after washing	ISO 6330	ISO 6330 in combination with EN ISO 5077 (Domestic washing)		ISO 6330 and ISO 5077
		ISO 15797 in combination with EN ISO 5077 (Industrial washing)		

Parameter	PEFCR A&F	EU Ecolabel	Nordic Ecolabel	Blue Angel
Garment Integrity Test after dryclean	ISO 3175	NA		
Oil repellency	NA	ISO 6330 (Domestic) ISO 15797 (Industrial) both in combination with ISO 14419	NA	
Soil or stain Release	AATCC 130	ISO 6330 (Domestic) ISO 15797 (Industrial) both in combination with ISO 22958	NA	
Flame retardant functions	NA	ISO 6330 in combination with ISO 12138 (Domestic)	NA	ISO 6330 in combination with ISO 12138 (Domestic)
		ISO 10528 in combination with ISO 12138 (Industrial)		ISO 10528 in combination with ISO 12138 (Industrial)
Easy care function	NA	ISO 7768	NA	ISO 7768
Garment Dimensional Stability Shrinkage & Skew/Twist/Torque	ISO 6330 If tumble dry then 10x wash/1 Dry	ISO 6330 combined with ISO 4920 (Domestic)	NA	
	ISO 3175 if dryclean	ISO 15797 combined with ISO 4920 (Industrial washing)		
	ISO 5077 and ISO 16322 spirality			
Appearance	ISO 15487	NA		
Bursting	ISO 13938-2 OR ASTM D3786	NA		
Seam slippage	ISO 13936-2 (Woven fabrics)	NA	ISO 13936-1 o ISO 13936-2 (Woven fabrics)	NA
Fabric Tear Strength	ISO 13937-1 (Woven fabrics)	NA	ISO 13937-1 applied on outer fabric not include any inner lining in the product	NA
Fabric Tensile Strength	ISO 13934-1 (Woven fabrics)	NA	ISO 13934-2	NA
Seam strength	NA		ISO 13935-2 (Woven fabrics)	NA
Product waterproofness	ISO 811	NA		
Fabric smoothness	ISO 5077	NA		
	ISO 6330 (washing)			
	ISO 3175-2 & 3175-1 (dryclean)			
Fabric thermal resistance	ISO11092 RCT	NA		
Fabric wrinkle resistance	ISO 9867	NA		
Fabric wicking	AATCC 197	NA		
Odour management	ISO 20743, Absorption method	NA		
Breathability (Post-laundering)	JIS L1099 and ISO 11092	NA		
Stretch and recovery	EN 14704-1	NA		

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(a) PEFCR A&amp;F: Product Environmental Footprint Category Rules (PEFCR): apparel and footwear;

(b) EU Ecolabel criteria for textile products. Commission Decision (2014/350/EU).

(c) Blue Angel – The German Ecolabel: DE-UZ 154 Basic Award Criteria. Edition January 2023, version 2.

(d) Nordic Swan Ecolabel: Textiles, hides/skins, and leather. Version 5.4.

Source: own elaboration

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3560 **Table 50.** Standards related to the functionality of the textile product

Specific topic	ID code	Title	Type	Status
Soil or stain release (Functional durability)	AATCC 130-18T, 2018	Washing Procedure selection to match care label	Standard	Published
Waterproofness	ISO 811:2018	Textiles — Determination of resistance to water penetration — Hydrostatic pressure test	standard	Published
Water penetration	ISO 18695:2007	Textiles — Determination of resistance to water penetration — Impact penetration test	Standard	Published
Water adsorption	ISO 18696:2006	Textiles — Determination of resistance to water absorption — Tumble-jar absorption test	Standard	Published
Moisturising effect	ISO 21232:2018	Textiles — Determination of moisturizing effect of textile materials by measurement of microclimate between textiles and simulated human skin using sweating guarded hotplate	Standard	Published
Hygroscopic heat generation	ISO 18782:2015	Textiles — Determination of dynamic hygroscopic heat generation	Standard	Published
Aqueous stain resistance	ISO 23232:2009	Textiles — Aqueous liquid repellency — Water/alcohol solution resistance test	Standard	Published
Thermal resistance	ISO 50851	Textiles — Determination of thermal resistance	Standard	Published
Thermal resistance	ISO 5085-1:1989	Textiles — Determination of thermal resistance — Part 1: Low thermal resistance	Standard	Published
Thermal resistance	ISO 5085-2:1990	Textiles — Determination of thermal resistance — Part 2: High thermal resistance	Standard	Published
Fire hazard reduction	ISO/TR 9240:1992	Textiles — Design of apparel for reduced fire hazard	Standard	Published
Superhydrophobic characteristics and durability assessment	ISO/CD TS 10818	Nanotechnologies — Textiles containing nanomaterials and nanostructures — Superhydrophobic characteristics and durability assessment	Technical Specifications	Under development
Resistance of cellulose-containing textiles to micro-organisms	ISO 117212	Textiles — Determination of resistance of cellulose-containing textiles to micro-organisms — Soil burial test	Standard	Published
Resistance of cellulose-containing textiles to micro-organisms	ISO 11721-1:2001	Textiles — Determination of resistance of cellulose-containing textiles to micro-organisms — Soil burial test — Part 1: Assessment of rot-retardant finishing	Standard	Published
Resistance of cellulose-containing textiles to micro-organisms	ISO 11721-2:2003	Textiles — Determination of the resistance of cellulose-containing textiles to micro-organisms — Soil burial test — Part 2: Identification of long-term resistance of a rot retardant finish	Standard	Published
Resistance of cellulose-containing textiles to micro-organisms	ISO/DIS 11737-3	Sterilization of health care products — Microbiological methods — Part 3: Bacterial endotoxin testing	DIS	Under development
Antifungal activity	ISO 136293	Textiles — Determination of antifungal activity of textile products —	Standard	Published
Antifungal activity	ISO 13629-1:2012	Textiles — Determination of antifungal activity of textile products — Part 1: Luminescence method	Standard	Published
Antifungal activity	ISO 13629-2:2014	Textiles — Determination of antifungal activity of textile products — Part 2: Plate count method	Standard	Published
Exothermic and endothermic properties	ISO 16533:2014	Textiles — Measurement of exothermic and endothermic properties of textiles under humidity change	Standard	Published
Deodorant properties	ISO 172994	Textiles — Determination of deodorant property	Standard	Published
Deodorant properties	ISO 17299-1:2014	Textiles — Determination of deodorant property — Part 1: General principle	Standard	Published
Deodorant properties	ISO 17299-2:2014	Textiles — Determination of deodorant property — Part 2: Detector tube method	Standard	Published

Specific topic	ID code	Title	Type	Status
Deodorant properties	ISO 17299-3:2014	Textiles — Determination of deodorant property — Part 3: Gas chromatography method	Standard	Published
Deodorant properties	ISO 17299-4:2015	Textiles — Determination of deodorant property — Part 4: Condensation sampling analysis	Standard	Published
Deodorant properties	ISO 17299-5:2015	Textiles — Determination of deodorant property — Part 5: Metal-oxide semiconductor sensor method	Standard	Published
Moisture drying rate	ISO 17617:2014	Textiles — Determination of moisture drying rate	Standard	Published
Odour management	ISO 20645:2004	Textile fabrics — Determination of antibacterial activity — Agar diffusion plate test	Standard	Published
Total heat transfer	ISO 20852:2020	Textiles — Determination of the total heat transfer through textiles in simulated environments	Standard	Published
Dust mite resistance	ISO 21326:2019	Textiles — Test methods for determining the efficiency of products against house dust mite	Standard	Published
Burning behaviour	ISO 6940:2004	Textile fabrics — Burning behaviour — Determination of ease of ignition of vertically oriented specimens	Standard	Published
Burning behaviour	ISO 6941:2003	Textile fabrics — Burning behaviour — Measurement of flame spread properties of vertically oriented specimens	Standard	Published
Burning behaviour	ISO 10047:1993	Textiles — Determination of surface burning time of fabrics	Standard	Published
Adsorption	ISO 90735	Textiles — Test methods for nonwovens	Standard	Published
Adsorption	ISO 9073-6:2000	Textiles — Test methods for nonwovens — Part 6: Absorption	Standard	Published
Flexural rigidity	ISO 9073-7:1995	Textiles — Test methods for nonwovens — Part 7: Determination of bending length	Standard	Published
Liquid strike-through time	ISO 9073-8:1995	Textiles — Test methods for nonwovens — Part 8: Determination of liquid strike-through time (simulated urine)	Standard	Published
Drapability	ISO 9073-9:2008	Textiles — Test methods for nonwovens — Part 9: Determination of drapability including drape coefficient	Standard	Published
Lint and particle generation	ISO 9073-10:2003	Textiles — Test methods for nonwovens — Part 10: Lint and other particles generation in the dry state	Standard	Published
Run-off of liquids	ISO 9073-11:2002	Textiles — Test methods for nonwovens — Part 11: Run-off	Standard	Published
Absorbency of fabric (wettability)	ISO 9073-12:2002	Textiles — Test methods for nonwovens — Part 12: Demand absorbency	Standard	Published
Liquid strike-through time	ISO 9073-13:2006	Textiles — Test methods for nonwovens — Part 13: Repeated liquid strike-through time	Standard	Published
Air permeability	ISO 9073-15:2007	Textiles — Test methods for nonwovens — Part 15: Determination of air permeability	Standard	Published
Resistance to penetration by water	ISO 9073-16:2007	Textiles — Test methods for nonwovens — Part 16: Determination of resistance to penetration by water (hydrostatic pressure)	Standard	Published
Water penetration	ISO 9073-17:2008	Textiles — Test methods for nonwovens — Part 17: Determination of water penetration (spray impact)	Standard	Published
Biodegradability	ISO 21701:2019	Textiles — Test method for accelerated hydrolysis of textile materials and biodegradation under controlled composting conditions of the resulting hydrolysate	Standard	Published
Air permeability	ISO 9237:1995	Textiles — Determination of the permeability of fabrics to air	Standard	Published
Electrostatic property	ISO 180806	Textiles — Test methods for evaluating the electrostatic propensity of fabrics	Standard	Published

Specific topic	ID code	Title	Type	Status
Electrostatic property	ISO 18080-1:2015	Textiles — Test methods for evaluating the electrostatic propensity of fabrics — Part 1: Test method using corona charging	Standard	Published
Electrostatic property	ISO 18080-2:2015	Textiles — Test methods for evaluating the electrostatic propensity of fabrics — Part 2: Test method using rotary mechanical friction	Standard	Published
Electrostatic property	ISO 18080-3:2015	Textiles — Test methods for evaluating the electrostatic propensity of fabrics — Part 3: Test method using manual friction	Standard	Published
Electrostatic property	ISO 18080-4:2015	Textiles — Test methods for evaluating the electrostatic propensity of fabrics — Part 4: Test method using horizontal mechanical friction	Standard	Published
Distortion of woven fabric	ISO 13015:2013	Woven fabrics — Distortion — Determination of skew and bow	Standard	Published
Max force and elongation at max force	ISO 24281:2021	Textiles — Biaxial tensile properties of woven fabric — Determination of maximum force and elongation at maximum force using the grab method	Standard	Published
Fire hazard reduction	ISO 129527	Textiles — Assessment of the ignitability of bedding items	Standard	Published
Fire hazard reduction	ISO 12952-1:2010	Textiles — Assessment of the ignitability of bedding items — Part 1: Ignition source: smouldering cigarette	Standard	Published
Fire hazard reduction	ISO 12952-2:2010	Textiles — Assessment of the ignitability of bedding items — Part 2: Ignition source: match-flame equivalent	Standard	Published
Drying rate	ISO 13029:2012	Textiles — Determination of drying rate in dynamic state by the modified sweating-guarded hotplate	Standard	Published
Reduction activity of specific proteins	ISO 4333:2022	Textiles — Determination of reduction activity of specific proteins derived from pollen, mite and other sources on textile products	Standard	Published

3561 Standards made of several parts and only the most used are reported in this Table: <sup>1</sup> Made of 2 parts. <sup>2</sup> Made of 2 parts. <sup>3</sup> Made of 2 parts. <sup>4</sup> Made of 5 parts. <sup>5</sup> Made of 20 parts. <sup>6</sup> Made of 4 parts. <sup>7</sup> Made of 2 parts.  
3562 Every ID Code indicates the year depending on the Standard reference, as follows:

- 3563 • ISO -> XXX:YEAR (4-DIGIT)
- 3564 • AATC -> XXX-YEAR (4-DIGIT)

3565 **Table 51.** Standards used for textile characterization

Specific topic	ID code	Title	Type	Status
Mass per unit length and mass per unit area	ISO 3801:1977	Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area	Standard	Published
Mass per unit length and mass per unit area	EN 12127:1998	Textiles. Fabrics. Determination of mass per unit area using small samples.	Standard	Published
Width and length	ISO 22198:2006	Textiles — Fabrics — Determination of width and length	Standard	Published
Colorimetric communication	ISO 10617:2010	Textiles — Standard data format for colorimetric communication — Textiles and related measurements	Standard	Published
Dyestuff identification	ISO 163731	Textiles — Dyestuffs	Standard	Published
Dyestuff identification	ISO 16373-1:2015	Textiles — Dyestuffs — Part 1: General principles of testing coloured textiles for dyestuff identification	Standard	Published
Fibre identification	ISO 18074:2015	Textiles — Identification of some animal fibres by DNA analysis method — Cashmere, wool, yak and their blends	Standard	Published
Thickness	ISO 5084:1996	Textiles — Determination of thickness of textiles and textile products	Standard	Published
Mass per unit area	ISO 90732	Textiles — Test methods for nonwovens	Standard	Published
Mass per unit area	ISO 9073-1:1989	Textiles — Test methods for nonwovens — Part 1: Determination of mass per unit area	Standard	Published

Specific topic	ID code	Title	Type	Status
Thickness	ISO 9073-2:1995	Textiles — Test methods for nonwovens — Part 2: Determination of thickness	Standard	Published
Composition	ISO/TR 11827:2012	Textiles — Composition testing — Identification of fibres	Technical Report	Published

3566 Standards made of several parts and only the most used are reported in this Table: <sup>1</sup> Made of 3 parts. <sup>2</sup> Made of 20 parts.

3567 Every ID Code indicates the year depending on the Standard reference, as follows:

- 3568
- ISO/EN -> XXX:YEAR (4-DIGIT)

3569 **Table 52.** Standards for the determination of specific substances

Specific topic	ID code	Title	Type	Status
Alkylphenol ethoxylates (APEO)	ISO 182541	Textiles — Method for the detection and determination of alkylphenol ethoxylates (APEO)	Standard	Published
Alkylphenol ethoxylates (APEO)	ISO 18254-1:2016	Textiles — Method for the detection and determination of alkylphenol ethoxylates (APEO) — Part 1: Method using HPLC-MS	Standard	Published
Alkylphenol ethoxylates (APEO)	ISO 18254-2:2016	Textiles — Method for the detection and determination of alkylphenol ethoxylates (APEO) — Part 2: Method using NPLC	Standard	Published
Formaldehyde	ISO 141842	Textiles — Determination of formaldehyde	Standard	Published
Formaldehyde	ISO 14184-1:2011	Textiles — Determination of formaldehyde — Part 1: Free and hydrolysed formaldehyde (water extraction method)	Standard	Published
Formaldehyde	ISO 14184-2:2011	Textiles — Determination of formaldehyde — Part 2: Released formaldehyde (vapour absorption method)	Standard	Published
Formaldehyde	ISO/CD 14184	Textiles — Determination of formaldehyde	CD	Under development
Formaldehyde	ISO/CD 14184-3	Textiles — Determination of formaldehyde — Part 3: Free and hydrolysed formaldehyde (extraction method) — Determination by high pressure liquid chromatography	CD	Under development
Phthalate	ISO 14389:2022	Textiles — Determination of the phthalate content — Tetrahydrofuran method	Standard	Published
Phthalate	EN ISO 18856:2004	Water quality- Determination of selected phthalates using gas chromatography/mass spectrometry	Standard	Published
Phthalate	EN 14602:2012	Footwear- Test methods for the assessment of ecological criteria	Standard	Published
Organotin compounds	EN ISO 17353:2007	Water quality- Determination of selected organotin compounds- Gas chromatographic method	Standard	Published
Aromatic amines derived from azo colorants	ISO 143623	Textiles — Methods for determination of certain aromatic amines derived from azo colorants	Standard	Published
Aromatic amines derived from azo colorants	ISO 14362-1:2017	Textiles — Methods for determination of certain aromatic amines derived from azo colorants — Part 1: Detection of the use of certain azo colorants accessible with and without extracting the fibres	Standard	Published
Organotin compounds	ISO 227444	Textiles and textile products — Determination of organotin compounds	Standard	Published
Organotin compounds	ISO 22744-1:2020	Textiles and textile products — Determination of organotin compounds — Part 1: Derivatisation method using gas chromatography	Standard	Published
Organotin compounds	ISO 22744-2:2020	Textiles and textile products — Determination of organotin compounds — Part 2: Direct method using liquid chromatography	Standard	Published
Aromatic amines derived from azo colorants	ISO 143625	Textiles — Methods for determination of certain aromatic amines derived from azo colorants	Standard	Published

Specific topic	ID code	Title	Type	Status
Aromatic amines derived from azo colorants	ISO 14362-3:2017	Textiles — Methods for determination of certain aromatic amines derived from azo colorants — Part 3: Detection of the use of certain azo colorants, which may release 4-aminoazobenzene	Standard	Published
Aromatic amines derived from azo colorants	DIN 54231:2022	Textiles- Determination of dyes after methanol extraction	Standard	Published
Chlorinated benzenes and toluenes	DIN 54232:2010	Textiles. Determination of the content of bonds based on chlorobenzene and chlorotoluene	Standard	Published
Determination of extractable metals	EN ISO 1056	Textiles – tests for colour fastness	Standard	Published
Determination of extractable metals	EN ISO 105-E04:2013	Textiles – tests for colour fastness – part E04: colour fastness to perspiration	Standard	Published
Determination of extractable metals	DIN 542337	Testing of Textiles- Determination of metals.	Standard	Published
Determination of extractable metals	DIN 54233-3:2010	Testing of Textiles- Determination of metals. Part 3 Determination of metals extracting by acid synthetic perspiration solution	Standard	Published
Determination of extractable metals	DIN EN 167118	Textiles- Determination of metal content	Standard	Published
Determination of extractable metals	DIN EN 16711-2:2016	Textiles- Determination of metal content- Part 2: Determination of metals extracted by acidic artificial perspiration solution	Standard	Published
Determination of extractable metals	DIN 38405-24:1987-05	German standard methods for the examination of water, wastewater and sludge: anions (group D; photometric determination of chromium (VI) using 1,5-diphenylcarbonohydrazide (D24)	Standard	Published
Determination of the metallic composition	EN12472-2020	Method for the simulation of the accelerated wear and corrosion for the detection of nickel release from coated items	Standard	Published
Determination of the metallic composition	ISO 1811	Copper and copper alloys- Selection and preparation of samples for chemical analysis.	Standard	Published
Determination of the metallic composition	ISO 1811-1:1998	Copper and copper alloys- Selection and preparation of samples for chemical analysis. Part1: sampling of cast unwrought products	Standard	Published
Determination of chlorophenols	EN ISO 17070:2015	Leather- Chemical test- Determination of tetra chlorophenol, trichlorophenol content	Standard	Published
Dyestuff identification	ISO 163739	Textiles — Dyestuffs	Standard	Published
Dyestuff identification	ISO 16373-2:2014	Textiles — Dyestuffs — Part 2: General method for the determination of extractable dyestuffs including allergenic and carcinogenic dyestuffs (method using pyridine-water)	Standard	Published
Dyestuff identification	ISO 16373-3:2014	Textiles — Dyestuffs — Part 3: Method for determination of certain carcinogenic dyestuffs (method using triethylamine/methanol)	Standard	Published
Flame retardance	ISO 1788110	Textiles — Determination of certain flame retardants	Standard	Published
Flame retardance	ISO 17881-1:2016	Textiles — Determination of certain flame retardants — Part 1: Brominated flame retardants	Standard	Published
Flame retardance	ISO 17881-2:2016	Textiles — Determination of certain flame retardants — Part 2: Phosphorus flame retardants	Standard	Published
Flame retardance	ISO/TR 17881-3:2018	Textiles — Determination of certain flame retardants — Part 3: Chlorinated paraffin flame retardants	Standard	Published
Index ingredients	ISO 2219511	Textiles — Determination of index ingredient from coloured textiles	Standard	Published

Specific topic	ID code	Title	Type	Status
Index ingredients	ISO 22195-1:2020	Textiles — Determination of index ingredient from coloured textiles — Part 1: Madder	Standard	Published
Index ingredients	ISO 22195-2:2020	Textiles — Determination of index ingredient from coloured textiles — Part 2: Turmeric	Standard	Published
Index ingredients	ISO/DIS 22195-3	Textiles — Determination of index ingredient from coloured textile — Part 3: Myrobalan	DIS	Published
Index ingredients	ISO 22195-4:2021	Textiles — Determination of index ingredient from coloured textile — Part 4: Catechu	Standard	Published
Index ingredients	ISO 22195-5:2021	Textiles — Determination of index ingredient from coloured textile — Part 5: Lac	Standard	Published
Index ingredients	ISO 22195-6:2021	Textiles — Determination of index ingredient from coloured textile — Part 6: Punica granatum	Standard	Published
Many substances	CEN/TR 16741:2015	Textiles and textile products - Guidance on health and environmental issues related to chemical content of textile products intended for clothing, interior textiles and upholstery	Technical Report	Published
Quantitative chemical analysis	ISO 1833	Textiles - Quantitative chemical analysis	Standard	Published

3570 Standards made of several parts and only the most used are reported in this Table: <sup>1</sup> Made of 2 parts. <sup>2</sup> made of 2 parts. <sup>3</sup> Made of 2 parts. <sup>4</sup> Made of 2 parts. <sup>5</sup> made of 2 parts. <sup>6</sup> Made of 107 parts. <sup>7</sup> Made of 2 parts. <sup>8</sup> Made of 3 parts. <sup>9</sup> Made of 3 parts. <sup>10</sup> Made of 3 parts. <sup>11</sup> Made of 6 parts.

3571 Every ID Code indicates the year depending on the Standard reference, as follows:

- 3572
- 3573 • ISO/DIN/CEN -> XXX:YEAR (4-DIGIT)

3574 **Table 53.** Standards related to loss of fibre fragments from textiles

Specific topic	ID code	Title	Type	Status
Loss of fibre fragments from textiles	ISO 4484-1	Textile and textile products- Microplastics from textile sources. Part1: Determination of material loss from fabrics during washing	Standard	Published
Loss of fibre fragments from textiles	ISO 4484-2	Textile and textile products- Microplastics from textile sources. Part 2: Qualitative and quantitative analysis of microplastics	Standard	Published
Loss of fibre fragments from textiles	ISO 4484-3	Textile and textile products- Microplastics from textile sources. Part 3: Measurement of collected material mass released from textile end products by domestic washing method	Standard	Published

3575 Standards made of several parts and only the most used are reported in this Table: <sup>1</sup> Made of 3 parts.

3576 Every ID Code indicates the year depending on the Standard reference, as follows:

- 3577
- 3578 • ISO -> XXX:YEAR (4-DIGIT)

3579 **Table 54** Standards potentially related to circularity and environmental aspects

Broader topic	Specific topic	ID code	Title	Type	Status
Definitions	Environmental aspects	ISO/AWI 5157 ISO TC 38	Textiles — Environmental aspects — Vocabulary	Standard	Under development

Broader topic	Specific topic	ID code	Title	Type	Status
Circularity	Principles of circularity	Unknown developed by CEN TC 248 WG 39	Textiles - Circular economy for textile products - General principles and guidance	Standard	Under development
Circularity	Material use	Unknown developed by CEN TC 248 WG 40	Textiles - Circular economy for textile products – Categorisation of and requirements on non-virgin input materials	Standard	Under development
Circularity	Design for circularity	Unknown developed by CEN TC 248 WG 41	Textiles - Circular economy for textile products - design for circularity	Standard	Under development
Environmental claims	Terminology of Environmental claims	CEN/TS 16822:2015	Textiles and textile products - Self-declared environmental claims - Use of the terms	Technical Specifications	Published

3580

3581

**Table 55.** Standards related to topics not covered by **Table 48** to **Table 54**

Broader topic	Specific topic	ID code	Title	Type	Status
Definitions	Definitions of natural fibres	EN ISO 6938:2014	Textiles — Natural fibres — Generic names and definitions	Standard	Published
Definitions	Environmental aspects	ISO/AWI 5157 ISO TC 38	Textiles — Environmental aspects — Vocabulary	Standard	Under development
Definitions	Stitch types	ISO 4915:1991	Textiles — Stitch types — Classification and terminology	Standard	Published
Definitions	Seam types	ISO 4916:1992	Textiles — Seam types — Classification and terminology	Standard	Published
Definitions	Determination of mass	ISO 6348:1980	Textiles — Determination of mass — Vocabulary	Standard	Published
Definitions	Woven fabric	ISO 2959:2011	Textiles — Woven fabric descriptions	Standard	Published
Definitions	Weaves	ISO 3572:1976	Textiles — Weaves — Definitions of general terms and basic weaves	Standard	Published
Definitions	Knitted fabrics	ISO 8388:1998	Knitted fabrics — Types — Vocabulary	Standard	Published
Definitions	Description of defects	ISO 8498:1990	Woven fabrics — Description of defects — Vocabulary	Standard	Published
Definitions	Description of defects	ISO 8499:2003	Knitted fabrics — Description of defects — Vocabulary	Standard	Published
Definitions	Nonwoven	ISO 9092:2019	Nonwovens — Vocabulary	Standard	Published
Definitions	Nonwoven	ISO 11224:2003	Textiles — Web formation and bonding in nonwovens — Vocabulary	Standard	Published
Definitions	Superfine woven wool	ISO 18103:2015	Superfine woven wool fabric labelling — Requirements for Super S code definition	Standard	Published
Definitions	Man-made fibres	ISO 2076:2021	Textiles — Man-made fibres — Generic names	Standard	Published
Labelling	Labelling	ISO 3758:2012	Textiles — Care labelling code using symbols	Standard	Published
Labelling	Symbols on workwear	ISO 30023:2021	Textiles — Qualification symbols for labelling workwear to be industrially laundered	Standard	Published
Circularity	Principles of circularity	Unknown developed by CEN TC 248 WG 39	Textiles - Circular economy for textile products - General principles and guidance	Standard	Under development
Circularity	Material use	Unknown developed by CEN TC 248 WG 40	Textiles - Circular economy for textile products – Categorisation of and requirements on non-virgin input materials	Standard	Under development

Broader topic	Specific topic	ID code	Title	Type	Status
Circularity	Design for circularity	Unknown developed by CEN TC 248 WG 41	Textiles - Circular economy for textile products - design for circularity	Standard	Under development
Environmental claims	Terminology of Environmental claims	CEN/TS 16822:2015	Textiles and textile products - Self-declared environmental claims - Use of the terms	Technical Specifications	Published

3582  
3583  
3584

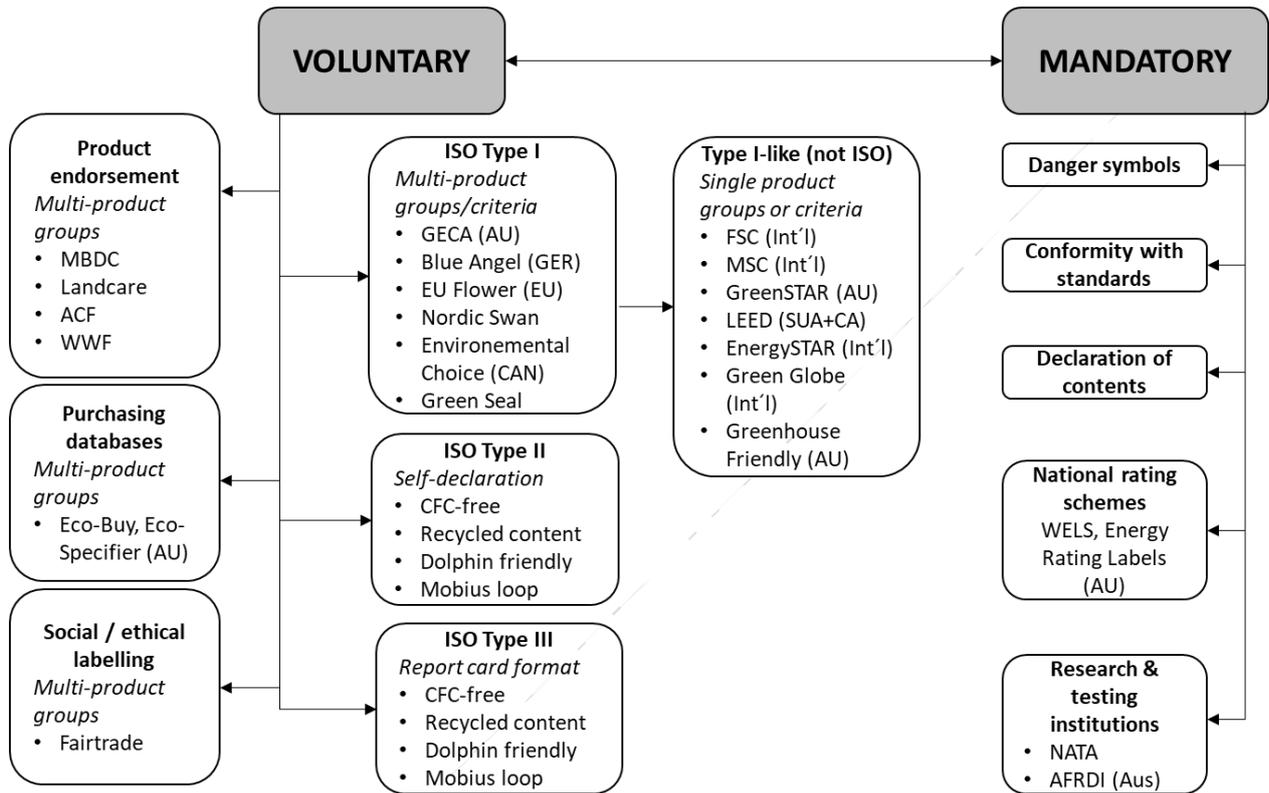
Every ID Code indicates the year depending on the Standard reference, as follows:  
ISO/CEN -> XXX:YEAR (4-DIGIT)

3585 **9.4 Supporting information about environmental labels**

3586 **9.4.1 Types of labels in general**

3587 There are many types of labels, addressing single or multiple environmental issues and covering different  
 3588 sectors and regions. **Figure 41** shows the taxonomy of labels, which includes mandatory and voluntary  
 3589 frameworks (Frydendal et al., 2018).

3590 **Figure 41.** Taxonomy of labels for communication of specific product information



3591  
 3592 *Source: (Frydendal et al., 2018)*

3593 The Ecolabel Index <sup>(128)</sup> is known to be the largest global directory of labels related to environmental and social  
 3594 aspects. On 12 January 2024, it counted 456 labels in 199 countries, and 25 industry sectors. Due to the high  
 3595 number and types of voluntary environmental labels, the International Organization for Standardization (ISO)  
 3596 established specific guidelines.

3597 **ISO Type I environmental labels** (ISO 14024:2018) <sup>(129)</sup>, known as **Ecolabels**, are defined as ‘voluntary,  
 3598 multi-criteria-based and third party-verified labels that indicate an overall environmental preference in a life  
 3599 cycle perspective of a product or service within a specific product category’. Ecolabels are a subset of the  
 3600 environmental labels that recognise a better environmental performance of a given product or service related  
 3601 to other products in the same product group. An Ecolabel must fulfil the following nine requirements (Frydendal  
 3602 et al., 2018):

- 3603 1. It is built on the life cycle thinking;

<sup>128</sup> Ecolabel Index. Website available at [this link](#). Last accessed on 12 January 2024.

<sup>129</sup> ISO 14024:2018. Environmental labels and declarations. Type I environmental labelling. Principles and procedures. Available at [this link](#). Last accessed on 12 January 2024.

- 3604 2. It is based on multiple criteria, therefore it addresses many environmental impact categories, such as  
3605 global warming, eutrophication, etc.;
- 3606 3. Criteria are justified by sound scientific and engineering reasons. Their objectivity is ensured by the  
3607 involvement of a broad range of stakeholders (industries, consumers, governments, etc...) during the  
3608 process of criteria development;
- 3609 4. It comprises requirements related to functional aspects of the product (fitness for use). This  
3610 characteristic guarantees a sufficient quality of labelled products and services;
- 3611 5. Criteria are continuously updated according to changes affecting the labelled products. These changes  
3612 could be related to technologies, the regulatory context and other aspects;
- 3613 6. All stages of criteria development are transparent;
- 3614 7. It is accessible to all potential applicants;
- 3615 8. It involves third-party certification;
- 3616 9. There is compliance monitoring after the licence is awarded.

3617 **ISO Type II environmental labels** (ISO 14021:2016) <sup>(130)</sup>, known as **Self-declared Environmental Claims**,  
3618 are neither third-party verified, nor based on Life Cycle Thinking approach. Many self-declared environmental  
3619 claims on the EU market do not necessarily follow the ISO 14021:2016.

3620 **ISO Type III environmental labels** (ISO 14025:2016) <sup>(131)</sup>, known as **Environmental Declarations**, are  
3621 labels presenting *quantified environmental information on the life cycle of a product to enable comparisons*  
3622 *between products fulfilling the same function*. The Environmental Declarations were mainly envisioned for  
3623 business-to-business communication, but their use in business-to-consumer communication is not precluded.  
3624 The establishment of Product Category Rules ensures that the life cycle assessment is performed with specific  
3625 rules aiming to foster transparency and facilitate comparisons between different Environmental Declarations.  
3626 The EC promotes the establishment of commonly recognised Product Environmental Footprint Category Rules  
3627 (PEFCRs) <sup>(132)</sup>. As any life cycle assessment, the Environmental Declarations are third-party verified.

## 3628 9.4.2 Voluntary environmental labels used in EU

### 3629 Table 56

3630 **Table 56.** Environmental labels used in 2021 in Europe: ISO type and addressed topics

Ecolabel	Criteria	ISO TYPE
AnbefaltToxic	other	NA
Better Cotton Initiative	Biodiversity, chemicals, natural resources, pesticides/herbicides/fungicides, soil, wastewater/sewage, water quality, water use, other	NA
Blue Angel	Carbon/GHG emission, Energy use/efficiency, forests, natural resources, recycling, toxics, waste water/sewage, water quality, water use, other	Type I <sup>133</sup>
bluesign® standard	Carbon/GHG emission, Carbon/GHG offsets, chemicals, energy production/source, energy use/efficiency, material use, natural resources, pesticides/herbicides/fungicides, recycling, toxics, waste, wastewater/sewage, water quality, water use	NA
Carbon Reduction Label	Carbon/GHG emission	NA
Climatop	Animal welfare, biodiversity, Carbon/GHG emission, chemicals, energy production/sources, energy use/efficiency, forests, GMOs, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	NA

<sup>130</sup> ISO 14021:2016. Environmental labels and declarations. Self-declared environmental claims (Type II environmental labelling). Available at [this link](#). Last accessed on 12 January 2024.

<sup>131</sup> ISO 14025:2006. Environmental labels and declarations. Type III environmental declarations. Principles and procedures. Available at [this link](#). Last accessed on 12 January 2024.

<sup>132</sup> European platform on LCA | EPLCA. Environmental footprint. Available at [this link](#). Last accessed on 12 January 2024.

<sup>133</sup> Blue Angel – The German Ecolabel: DE-UZ 154 Basic Award Criteria. Edition January 2023, version 2. Available at [this link](#). Last accessed on 12 January 2024.

Ecolabel	Criteria	ISO TYPE
Compostability Mark of European Bioplastics	Chemicals, Material use, Natural resources, pesticides/herbicides/fungicides, recycling, toxics, waste, water quality	NA
Coop Naturaine:Switzerland	Biodiversity, chemicals, GMOs, natural resources, pesticides/herbicides/fungicides, soil, toxics, wastewater/sewage	NA
Cradle to Cradle Certified (CM) Products Program	Chemicals, energy production/source, energy use/efficiency, forests, material use, natural resources, recycling, toxics, waste, wastewater/sewage, water quality, water use	NA
Danish Indoor Climate Label	Other (emission to indoor air)	NA
ECOLOGO	Animal welfare, biodiversity, Carbon/GHG emissions, Carbon/GHG offsets, Chemicals, energy production/sources, energy use/efficiency, forests, GMOs, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	Type I <sup>134</sup>
Ekologicky setrny vyrobek/Environmentally Friendly Product	Carbon/GHG emission, Carbon/GHG offsets, chemicals, energy production/sources, energy use/efficiency, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	Type I **
Environmental product declaration (EPD)	Carbon/GHG emission, Carbon/GHG offsets, chemicals, energy production/source, energy use/efficiency, material use, natural resources, recycling, toxics, waste, water quality, water use	Type III <sup>135</sup>
EU Ecolabel	Chemicals, energy use/efficiency, forests, material use, natural resources, recycling, toxics, waste, wastewater/sewage, water quality, water use	Type I <sup>136</sup>
Fair for life	Animal welfare, biodiversity, Carbon/GHG emissions, energy use/efficiency, GMOs, natural resources, pesticides/herbicides/fungicides, soil, water use	NA
Fairtrade	Biodiversity, energy use/efficiency, forests, GMOs, natural resources, pesticides/herbicides/fungicides, soil, toxics, waste, water use	Type II***
Global Organic Textile Standard	Chemicals, GMOs, Material use, natural resources, pesticides/herbicides/fungicides, soil, toxics, wastewater/sewage, water quality	Type III <sup>137</sup>
Good Environmental choice "Bra Miljoval"	Chemicals, energy production/sources, energy use/efficiency, forests, material use, natural resources, toxics	Type I <sup>138</sup>
Good Shopping Guide Ethical Award	Animal welfare, Carbon/GHG emissions, Carbon/GHG offsets, chemicals, energy production/sources, energy use/efficiency, GMOs, material use, natural resources, pesticides/herbicides/fungicides, recycling, toxics, waste water quality	NA
Good Weave	Other (workplace environmental conditions)	NA
Green Crane: Ukraine	Biodiversity, Carbon/GHG emissions, chemicals, energy production/sources, energy use/efficiency, forests, material use, natural resources, recycling, toxics, waste, wastewater/sewage, water quality, water use	Type I****
Greenguard	Chemicals, toxics	Type II*
Green Shape	Animal welfare, biodiversity, chemicals, energy use/efficiency, GMOs, material use, natural resources, pesticides/herbicides/fungicides, recycling, toxics, waste, wastewater/sewage, water use	NA
GUT	For floor coverings. Chemicals, toxics, other (indoor air quality)	NA
IMO Certified	Fire testing certification. Chemicals, forests, pesticides/herbicides/fungicides, soil, toxics	NA
Label Step	For carpets. Chemicals, wastewater/sewage, water quality	NA
Milieukeur: the Dutch environmental quality label	Animal welfare, biodiversity, Carbon/GHG emissions, chemicals, energy production/sources, energy use/ efficiency, forests, GMOs, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	Type I**
National Programme of Environmental Assessment and Ecolabelling in the Slovak Republik (NPEHOV)	Carbon/GHG emissions, chemicals, energy production/sources, energy use/efficiency, forests, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	Type I**
Naturland e.V.	Animal welfare, biodiversity, chemicals, forests, GMOs, natural resources, pesticides/herbicides/fungicides, soil, toxics	NA

<sup>134</sup> Ecogloballabel website available [here](#)

<sup>135</sup> EPD website available [here](#)

<sup>136</sup> Ecolabel website available [here](#)

<sup>137</sup> Ecogloballabel website available [here](#)

<sup>138</sup> Idem

Ecolabel	Criteria	ISO TYPE
Nordic Ecolabel or "Swan"	Carbon/GHG emission, chemicals, energy production/sources, energy use/efficiency, material use, natural resources, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	Type I <sup>139</sup>
Oeko-Tex Standard 100	Toxics prohibited by law, chemicals harmful to health	Other Type I-like voluntary sustainable scheme <sup>140</sup>
OK biobased	Carbon/GHG emission, material use, natural resources, waste	NA
ÖkoControl	Forests, natural resources, pesticides/herbicides/fungicides, toxics	NA
Ølabel: Norway	Chemicals, forests, GMOs, pesticides/herbicides/fungicides, soil	NA
Processed Chlorine Free	Biodiversity, Carbon/GHG emissions, Carbon/GHG offsets, chemicals, energy production/sources, energy use/efficiency, forests, material use, natural resources, pesticides/herbicides/fungicides, recycling, toxics, waste, wastewater/sewage, water quality, water use	NA
SEE What You Are Buying Into	Animal welfare, biodiversity, Carbon/GHG emissions, Carbon/GHG offsets, energy production/sources, energy use/efficiency, GMOs, material use, natural resources, recycling, waste, other	NA
Singapore Green Label Scheme (SGLS)	Animal welfare, biodiversity, Carbon/GHG emission, Carbon/GHG offsets, chemicals, energy production/sources, energy use/efficiency, forests, GMOs, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	Type I <sup>141</sup>
Skal Eko Symbol	Pesticides/herbicides/fungicides	NA
SMaRT Consensus Sustainable Product Standards	Animal welfare, biodiversity, Carbon/GHG emissions, Carbon/GHG offsets, Chemicals, energy production/sources, energy use/efficiency, forests, GMOs, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	NA
Soil Association Organic Standard	Animal welfare, biodiversity, chemicals, forests, GMOs, natural resources, pesticides/herbicides/fungicides, soil, toxics	NA
SustentaX	Animal welfare, Carbon/GHG emissions, Carbon/GHG offsets, chemicals, energy production/sources, energy uses/efficiency, forests, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	NA
Terra Cycle	Carbon/GHG offsets, material use, recycling, waste	NA
Totally Chlorine Free	Biodiversity, Carbon/GHG emissions, Carbon/GHG offsets, chemicals, energy production/sources, energy use/efficiency, forests, GMOS, material use, natural resources, pesticides/herbicides/fungicides, recycling, soil, toxics, waste, wastewater/sewage, water quality, water use	NA
WindMade	Carbon/GHG emission, energy production/sources	NA

3631 The topic of 'Toxics' addresses harmful substances that are already prohibited or regulated; whereas the topic of 'Harmful chemicals'  
3632 address substances that are known to be harmful to health, but are not officially banned. N.B. The authors of the referenced study  
3633 use the term 'Chemicals' when referring to 'Harmful chemicals'.

3634 The authors of the referenced study do not specify if the topic of 'Waste' addresses any kind of waste generated along the value chain, or  
3635 waste generated at a specific stage. No further explanation/specification is provided for other topics.

3636 NA: Not available.

3637 Source: own elaboration based on (Ranasinghe and Jayasooriya, 2021) and the Ecolabel Index<sup>(142)</sup>.  
3638 \*(Ranasinghe and Jayasooriya, 2021), \*(LEITAT, 2017), \*(Ziyeh and Cinelli, 2023), \*\*\*\*(UNEP, 2023b)

3639

<sup>139</sup> Nordic Swan website available [here](#)

<sup>140</sup> Ecogloballabel website available [here](#)

<sup>141</sup> Idem

<sup>142</sup> Ecolabel Index. Website available at this link. Last accessed on 12 January 2024.

3640 **9.5 Supporting information on market analysis**

3641 **9.5.1 Recycling plants**

3642 **Table 57.** Number of textile recycling plants classified per location

Region	Country	Mechanical				Chemical				Total
		All	Pilot scale	Full scale	Unknown scale	All	Pilot scale	Full scale	Unknown scale	
EU	Austria	0	NA	NA	NA	1	NA	1	NA	1
	Belgium	3	NA	2	1	0	NA	NA	NA	3
	Denmark	3	NA	2	1	1	1	NA	NA	4
	Finland	3	1	2	NA	2	2	NA	NA	5
	France	4	NA	3	1	1	1	NA	NA	5
	Germany	5	NA	5	NA	0	NA	NA	NA	5
	Italy	13	1	9	3	4	1	3	NA	17
	Netherlands	6	2	3	1	1	1	NA	NA	7
	Spain	11	2	9	NA	0	NA	NA	NA	11
Sweden	0	NA	NA	NA	1	NA	1	NA	1	
Europe (Non-EU)	Norway	0	NA	NA	NA	1	NA	1	NA	1
	Switzerland	0	NA	NA	NA	3	1	1	1	3
	UK	1	NA	1	NA	0	NA	NA	NA	1
Middle East	Israel	0	NA	NA	NA	1	NA	1	NA	1
	Türkiye	3	NA	3	NA	0	NA	NA	NA	3
Africa	Mauritius	1	NA	1	NA	0	NA	NA	NA	1
	Morocco	1	NA	1	NA	0	NA	NA	NA	1
Asia	Bangladesh	1	NA	1	NA	0	NA	NA	NA	1
	China	4	1	2	1	5	NA	4	1	9
	India	11	1	7	3	1	NA	NA	1	12
	Indonesia	1	NA	NA	1	1	NA	1	NA	2
	Japan	3	NA	2	1	1	NA	NA	1	4
	Malaysia	1	NA	1	NA	0	NA	NA	NA	1
	Pakistan	3	NA	2	1	0	NA	NA	NA	3
	Singapore	1	NA	NA	1	0	NA	NA	NA	1
	Taiwan	1	NA	1	NA	8	1	6	1	9
Thailand	1	NA	1	NA	0	NA	NA	NA	1	
America	Canada	1	NA	1	NA	1	1	NA	NA	2
	Guatemala	1	NA	1	NA	0	NA	NA	NA	1
	Mexico	1	NA	1	NA	0	NA	NA	NA	1
	USA	5	NA	5	NA	7	4	1	2	12
Oceania	Australia	0	NA	NA	NA	1	NA	1	NA	1

3643 The recycling plants identified were equal to 130. NA: Not available

3644 Source: own elaboration based on Airtable - Sorting for Circularity - Recyclers Database <sup>(143)</sup>, (Jørgensen et al., 2022; Textile Exchange, 2022)

3646 **Table 58.** Number of textile recycling plants classified per input fibres

Input fibre	Mechanical				Chemical				Total
	Tot	Pilot scale	Full scale	Unknown scale	Tot	Pilot scale	Full scale	Unknown scale	
Cotton	53	4	41	8	17	7	8	2	70
Polyester (PES)	51	2	36	13	26	13	8	5	77
Blends of cotton and PES	14	1	12	1	9	3	5	1	23
Man-Made Cellulosic (MMC)	5	NA	5	NA	5	1	3	1	10
Polyamide (PA)	13	1	10	2	6	NA	5	1	19
Wool	40	5	33	2	0	NA	NA	NA	40
Blends of wool and synthetic fibres	21	NA	17	4	0	NA	NA	NA	21
Acrylic (PAC)	13	1	11	1	0	NA	NA	NA	13
Other plant-based	10	NA	10	NA	1	NA	1	NA	11
Other synthetic	8	NA	7	1	0	NA	NA	NA	8
Other blends	6	NA	5	1	1	NA	1	NA	7

<sup>143</sup> Airtable - Sorting for Circularity - Recyclers Database. Available at [this link](#). Last accessed on 31 January 2024.

Input fibre	Mechanical				Chemical				Total
	Tot	Pilot scale	Full scale	Unknown scale	Tot	Pilot scale	Full scale	Unknown scale	
Silk	4	1	3	NA	0	NA	NA	NA	4

3647 Numerous plants could process more than one type of textile fibre.  
3648 NA: Not available

3649 Source: own elaboration based on Airtable - Sorting for Circularity - Recyclers Database <sup>(144)</sup>, (Jørgensen et al., 2022; Textile Exchange,  
3650 2022)

## 3651 9.5.2 Comparison among BREFs

3652 **Table 59.** Environmental performance levels for emission to water by BREFs in the World

Country/organisation Environmental parameter	European Union (EU-BREF)	India (MINAS)	South Korea	United States (US EPA)	World Bank (EHS Guideline)	China
AOX (mg/L)	0.1-0.4	NA	NA	NA	1	30-40 (only for a specific wool treatment)
BOD (mg/L)	No BAT-AEL applies for BOD (**)	30	NA	1.4-35.2 kg/kkg(*) Daily max 0.7-17.6 kg/kkg (*) 30-day avg New 1.4-16.9 kg/kkg (*) Daily max 0.7-8.7 kg/kkg (*) 30-day avg	30	NA
COD (mg/L)	40-100	100	18-30	21.3-256.8 kg/kkg (*)	160	7-30000
Chromium (mg/L)	0.01-0.1	2	0.5	Daily: 0.023-0.22 kg/kkg (*) 30-day average: 0.011-0.11 kg/kkg (*)	0.5	NA
Copper (mg/L)	0.03-0.4	NA	1	NA	0.5	NA
Nickel (mg/L)	0.01-0.1	NA	0.25	NA	0.5	NA
Zinc (mg/L)	0.04-0.5	NA	-	NA	2	NA

3653 (\*) Kilograms per 1000 Kilograms. The conversion to milligrams per litre (mg/L) is not straightforward. For enhanced accuracy, it is deemed  
3654 more prudent to retain the unit in its original form in accordance with the United States Best Available Technology (BAT) standards.

3655 (\*\*) As an indication, the yearly average BOD5 level in the effluent from a biological wastewater treatment plant will generally be ≤ 10  
3656 mg/L.

3657 Source: (OECD, 2022)

<sup>144</sup> Airtable - Sorting for Circularity - Recyclers Database. Available at [this link](#). Last accessed on 31 January 2024.

3658

**Table 60.** Environmental performance levels for emission to water by the Chinese BREF

Process	Fibres	Origin of wastewater	AOX (mg/L)	COD cr Concentration (mg/L)
Processing of raw materials	Hemp	Biological removal	NA	7-3000
		Chemical removal of glue	NA	2000-4000
		Joint removal of glue	NA	1000-3000
	Silk	Boiling cocoon and filament processes	NA	80-400
		Refining: oil removal	NA	20-12000
		Refining: water washing	NA	800-4000
	Wool	Washing	NA	40-9000
		Carbonization (**)	NA	200-400
		Silk-Resistant (***)	30-40	400-600
Chemical fibres	NA	NA	200-600	
Finishing fabrics	Cotton, Hemp & mixed machine fabrics	Slurry removal	NA	30-10000
		Cooking (****)	NA	1000-2000
		Bleaching	NA	200-400
		Mercerization	NA	500-2000
		Dyeing	NA	500-2500
		Printing	NA	1200-2000
		Organizing (*)	NA	2000-10000
	Wool	Dyeing	NA	800-2000
		Organizing (*)	NA	300-1000
	Silk	Pre-Treatment	NA	1500-2500
		Dyeing	NA	500-1500
		Printing	NA	1200-2000
	Chemical Fibres	Refining	NA	10-8000
		Polyester fabric alkali reduction	NA	10000-30000
		Dyeing	NA	500-800
		Printing	NA	1000-2000
		Organizing (*)	NA	2000-5000
	Knitwear	Finishing	NA	500-800
	Yarn	Finishing	NA	1000-2000

3659

(\*) Organizing wastewater includes waste finishing fluids and equipment cleaning wastewater.

3660

(\*\*) Carbonization is the process of removing plant impurities before the comb process by chemical means.

3661

(\*\*\*) The silk photorestriction process is the process of using chlorine as a chemical auxiliary to remove surface scales of wool and apply softeners.

3662

3663

(\*\*\*\*) Cooking is the process of further removing impurities such as grease, wax, pectin and other impurities of fibre using thermoaline and surfactants

3664

3665

Source:

3666

3667

### 9.5.3 Service lifespan

3668

**Table 61.** Studies addressing the lifespan of apparel textiles

Study	Type of study	Source of data	Comments
(WRAP, 2017a)	Technical report	Online survey	Country: UK Sample: 3 244 people
(Laitala and Klepp, 2020a)	Scientific article	Wardrobe survey and data collected by previous research studies	Wardrobe survey: Countries: China, Germany, Japan, the UK, and the USA Sample: 213-230 respondents per country. Respondents' statistics: 100% 18-64 years old 51.6% Women

Study	Type of study	Source of data	Comments
			48.4% Men  Researched studies from: Australia, Norway, UK (2 studies) Netherlands (2 studies), Denmark, Finland and Norway
(Quantis, 2022)	Technical report	Producer judgement and literature studies	Values proposed by part of the industry within the development of the Product Environmental Footprint Category Rules for apparel and footwear
(Roos et al., 2015)	Technical report	Surveys and expert assumptions supported by national statistics on related topics	The study uses this data to perform an environmental assessment of the Swedish fashion consumption
(Laitala, IG Klepp, et al., 2018a)	Scientific article	Elaboration based on surveys	Average values from surveys carried out in: Norway, Netherlands, Greece, Spain, USA, Sweden, Germany, Poland, Australia, Canada and Finland
(Gray et al., 2022)	Key Findings Report	Surveys	Country: UK  Sample: 6 000 interviewed users who purchase clothing at least once a year. Analysis on 44 807 items
(Drycleaning Institute, 2015)	Technical report	Expert judgement	Data are provided by the association of Australian dry cleaners.

3669 Source: Own elaboration

3670 **Table 62.** Parameters related to lifespan of specific types of apparel

Parameter	T-shirts	Shirts	Knitwear	Jeans	Socks
Average wear days per year	25	16	30	75	50
Implied wear days per month	2.1	1.3	2.5	6.2	4.2
Total days of wear for the garment's whole lifetime	112.5	80	150	300	125
Hours of wear during lifetime	1 350	960	1 800	3 600	1 500
Assumed days of wear per wash	2	2	5	10	2
Hours of wear per wash	24	24	60	120	24
Average number of washes for the target lifetime	56	40	30	30	62

3671 Source: (WRAP, 2017a)

3672

3673 **Table 63.** Possession span expressed as years by studies reported in Laitala et al. (2018)

Apparel type	Wardrobe Audit Survey in Seven Countries	Wardrobe Audit Interviews Norway (Textile Waste)	Survey. Norway	Online Survey. UK	Survey. UK	16 Households' Purchases. Netherlands	Survey. Netherlands	Survey (Germany. Poland. Sweden and USA)	Online Survey. Finland
T-shirts	4.6	4.2	NA	4	3.3	6.8	NA	3-4	4.5
Shirts and blouses	4.6	NA	5.6	3.3 (Blouses) 4.3 (shirts)	3.6	7.2	NA	NA	5.7
Sweaters and midlayers	5.8	NA	10.8 (woollen sweaters)	4.5	3.7	7.1	6.17 (Woollen sweaters)	NA	NA
Jackets and coats	5.3 (Jackets) 6.3 (Coats)	4 (Jackets)	6.4 (Coats)	6.5 (Jackets) 6.2 (Coats)	NA	11.5 (Jackets) / 11.6 (Coats)	NA	NA	7.6 (Coats)
Pants and shorts	4.9 (Pants) 3.9 (Jeans)	4.3 (Jeans)	4.4	5.4 (Pants) 3.8 (Jeans)	3.1 (Jeans)	6.2	2.45 (Cotton jeans)	3-4 (Jeans)	5.3
Dresses. skirts and jumpsuits	4.5 (Dresses) 4.8 (Skirts)	4.1 (Skirts)	NA	4.7 (Dresses) 5.2 (Skirts)	NA	15.2 (Skirts)	NA	NA	NA
Leggings, stockings, tights and socks	3.6 (Socks and stockings)	2.9 (Socks)	NA	2.4 (Socks)	1.8 (Socks)	NA	NA	NA	2.3 (Socks)
Underwear	2.5	4.4	NA	2.4	NA	NA	NA	NA	3
Swimwear	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apparel textile accessories	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: (Laitala, IG Klepp, et al., 2018a)

3674

3675

3676 **Table 64.** Possession span, expressed as years, of types of apparel with specific fibre content

Garment Category	Cotton and blends	Synthetic/Man made	Wool and Blends	Silk
Pants/trousers	4.2	5.1	4.8	NA
Jackets	4.3	4.9	5.7	NA
Coats	5.8	8.4	5.3	NA
Sweaters	5.6	6.5	6.0	NA
Shirts and blouses	3.8	6.2	6.0	8.5
Ties	9.5	12.8	9.3	14.5
Socks and stockings	3.3	4.2	5.5	4.3
Underwear	2.2	3.2	3.9	3.5

Source: (Laitala, IG Klepp, et al., 2018a)

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3678

## 3679 **9.6 Supporting information about user behaviour**

### 3680 **9.6.1 Pre-purchase aspects**

#### 3681 **9.6.1.1 Reasons for purchasing**

3682 McNeill and Moore (2015) distinguished two specific approaches consumers have towards apparel: 1)  
3683 consumers who see apparel as purely functional and 2) those who view apparel as self-representational. This  
3684 influences what aspects are the most important for consumers at the point of sale.

3685 A survey among Dutch consumers show that before shopping, almost half of 1 046 users claim to know what  
3686 they are going to buy (D&B, 2020) and they indicate that the main reasons for buying apparel are the following  
3687 (listed in order from most to less common):

- 3688 1. Look good or fun;
- 3689 2. Replacing old, worn or broken apparel;
- 3690 3. Buy “essential” apparel, meaning apparel that is basic and for everyday wear, i.e. one-colour t-shirt;
- 3691 4. Want to join the trend;
- 3692 5. Want new apparel;
- 3693 6. Need apparel for a special occasion.

3694 A survey representative of the German population showed that a third of respondents associate fun with buying  
3695 apparel. In the 40-70 age group the proportion of those who enjoy buying apparel is significantly higher than  
3696 the population average. In the female surveys from this social group, it is more than 60%. Fun shopping for  
3697 apparel is also widespread among female respondents from the young group (Kleinhückelkotten et al., 2018).

3698 Apparel is often bought spontaneously without thinking long beforehand. Only 16% of the respondents clearly  
3699 disagree with the corresponding statement. In turn, the proportions of spontaneous buyers and those who  
3700 regularly ‘declutter’ their wardrobe to make room for new things are above average in the 40-70 age group.  
3701 More than 60% of female respondents in this population segment are frequent spontaneous buyers. The  
3702 relatively high proportion of spontaneous buyers as a whole, leads to the conclusion that only a minority inform  
3703 themselves correctly before buying apparel. The differences between the social groups are not particularly large  
3704 in this regard (Kleinhückelkotten et al., 2018).

3705 The aspects affecting the purchase decision of apparel among consumers could be influenced by discount offers  
3706 that stimulate impulsive purchases both in on-line sites and in physical shops (Djafarova and Bowes, 2021). In  
3707 fact, a phenomenon that affects both type of stores around the globe is the New Year sales which incentivise  
3708 the purchase motivation (Amasawa and Kimita, 2023). It seems clear that the more impulsive purchases  
3709 consumers make, the more often they buy apparel per year while also spending more money on apparel each  
3710 month (D&B, 2020).

3711 Even though visual aids are used in social media channels to produce a similar purchasing experience to the  
3712 one in physical stores (Djafarova and Bowes, 2021), the impulse purchases seem to be more associated to the  
3713 physical stores and affect especially the younger population (Cook and Yurchisin, 2017). However, online  
3714 retailers have also reported that a significant portion of their customer base comprised individuals who engaged  
3715 in casual shopping for fashion items without a specific utilitarian purpose often characterized as impulse buyers  
3716 (Vinted, 2021). When users have events coming up (parties, travelling plans, etc.) then, purchases of apparel  
3717 become a priority and this may lead to impulsive purchases (Hultén and Vanyushyn, 2014). Impulse purchase  
3718 tendency may be also triggered more often among consumers who are wealthier and also have more time  
3719 available for purchasing apparel (Hultén and Vanyushyn, 2014).

3720 Moreover, according to a survey among 2 500 consumers in the United Kingdom, Sweden, Italy, France and  
3721 Germany, offering discounts can prompt excessive consumption, leading to feelings of regret among buyers.  
3722 Although the initial thrill of finding a bargain can be exhilarating, it often results in impulsive purchases and a  
3723 focus on obtaining deals rather than considering actual needs. Zalando survey indicates that 65% of consumers  
3724 prioritize low prices or discounts when shopping apparel. The allure of a discounted purchase is particularly  
3725 strong, with 52% of females and 46% of males emphasizing the importance of the excitement associated with  
3726 buying. This tendency suggests that many consumers may prioritize the thrill of the purchase over making  
3727 thoughtful, sustainable choices, potentially leading to overconsumption. Interestingly, despite recognizing that  
3728 impulsive bargain hunting contradicts their sustainability values, consumers frequently experience post-  
3729 purchase regret. A substantial 82% of respondents admit to feeling some form of regret after shopping, with  
3730 28% expressing concerns about environmental impacts and labour conditions during production (Heiny and  
3731 Schneide, 2021).

3732 One of the benefits of rental apparel is the fact that many apparel styles can be worn several times and if they  
3733 do not meet the needs of the user these can be returned. This allows the consumer to gain a better  
3734 understanding of their personal needs and become more selective when it comes to buying new apparel. The  
3735 more consumers know about the style that best suits their requirements, the less prompt they are to buy brand  
3736 new apparel (Amasawa and Kimita, 2023).

### 3737 **9.6.1.2 Criteria used when buying apparel**

3738 Studies revealed four main attributes concerning apparel purchase decision: brand, style, place of purchase, and  
3739 price (Iwanow et al., 2005, as cited in Harris et al., 2016). Price being one of the main drivers in apparel purchase  
3740 decision (Adigüzel et al., 2020). On top of these attributes, there are a number of factors that may influence  
3741 consumers buying behaviour: brand perception and exclusivity, personal factors such as age, gender, culture,  
3742 etc., marketing campaigns, economic conditions, etc.) (Anisha and Kalaivani, 2016; Khanna, 2021).

3743 Fashion trends are significantly more important for younger consumers than for older ones (AK Wienn and  
3744 Greenpeace, 2023; Spaepen et al., 2021) and they are even seen as a sign of success (AK Wienn and  
3745 Greenpeace, 2023). Preference for brand new items and aspects such as comfort when wearing an item of  
3746 apparel, its country of origin, type of textile material and even knowledge about the brand are important drivers  
3747 for older generations of consumers (Generation X and Baby Boomers) (Spaepen et al., 2021).

3748 According to Mishra et al., 2023, perceived value refers to “the subjective evaluation of the worth or benefits  
3749 that a customer believes they will receive from a product or service”. In this sense, a survey of over 3 000  
3750 American adults of over 18 years old indicates that ‘value’ was the first driver influencing purchasing behaviour  
3751 across apparel followed by quality (Thredup, 2023). Similarly, 1 506 Austrians were surveyed about their  
3752 apparel consumption and most of them reported functionality (92%) and quality (85%) to be among the most  
3753 important criteria when purchasing apparel (AK Wienn and Greenpeace, 2023). The monetary value of the  
3754 apparel follows the ranking closely with 78% of respondents who claim that a low price is a very important  
3755 factor when acquiring apparel (AK Wienn and Greenpeace, 2023). Sustainability and social standards with  
3756 around 40% of respondents considering them as less important drivers in the purchasing decision (AK Wienn  
3757 and Greenpeace, 2023). This is in line with the responses from German consumers who indicate that ecological  
3758 and social criteria play only a minor role in the purchase of apparel (Kleinhüchelkotten et al., 2018) and the  
3759 average of respondents who claim that environmental aspects were unimportant in their last purchase of a  
3760 coat (Consumers, Health, Agriculture and Food Executive Agency. et al., 2018). Moreover, 35% of 2 500 survey  
3761 respondents indicate that they often opt for a deal instead of a sustainable item (Heiny and Schneide, 2021).  
3762 In the young and low-income population segments such criteria are given far less importance (Kleinhüchelkotten  
3763 et al., 2018). Nonetheless, the responses of three-quarters of respondents to the survey suggest that a possible

3764 pollutant exposure could prevent them from buying certain apparel (Kleinhüchelkotten et al., 2018). In any case,  
 3765 social criteria considerations are relevant for the revision of the EU Ecolabel criteria on textiles.

3766 A survey in Germany explored the social importance given to apparel by gender and by groups with similar  
 3767 socioeconomic positions and cultural values (Kleinhüchelkotten et al., 2018). In this survey, more than half of  
 3768 the respondents indicated a certain reluctance to buy apparel, with 26% who actually try to get by with few  
 3769 apparel. The proportion of men in the precarious group, who claim to be reluctant to buy apparel is significantly  
 3770 higher at 46.6%. In the focus groups it had already become clear that many of them have inhibitions to throw  
 3771 away apparel. This is in line with the fact that 78% of respondents strongly agree with the statement that  
 3772 apparel should be used for as long as possible and should only be disposed if it is no longer wearable. The  
 3773 intention to use the apparel for as long as possible is significantly lower in the higher age groups (40 to 70  
 3774 years with higher level of education). Also the statement “I like apparel that I can wear in many occasions” has  
 3775 been repeated in all groups of survey participants. Although in the youth segment, comparatively there is less  
 3776 interest in versatile apparel (Kleinhüchelkotten et al., 2018).

3777 Additionally, more than half of users below 25 years old (Generation Z) are more likely to shop with a brand  
 3778 that offers second hand alongside new (Thredup, 2023). Moreover, Generation Z values unique apparel and the  
 3779 possibility of ordering and returning items online (Spaepen et al., 2021). Moreover, the Thredup survey (2023)  
 3780 indicates that resale is increasingly driving the purchasing decisions of Generation Z users, in concrete 82% of  
 3781 them have considered the resale value of apparel before buying it compared to only 58% of the overall  
 3782 consumers.

3783 According to Kleinhüchelkotten et al. (2018) purchasing decisions of the German population are not very much  
 3784 influenced by whether the apparel was made nationally or is easy to repair. However, a very large proportion  
 3785 of respondents claim to pay attention to the easy to maintain aspect when buying apparel (Kleinhüchelkotten  
 3786 et al., 2018). In contrast, a survey from Fashion Revolution (2020) revealed that 75% of surveyed German  
 3787 consumers consider important that brands provide repair and care information about an apparel item, the  
 3788 average being 79% of 5 000 consumers across five countries (Fashion Revolution, 2020). The survey  
 3789 participants were between 16 and 75 years old (Fashion Revolution, 2020).

3790 **9.6.1.3 Quality assessment of apparel**

3791 Consumer satisfaction with the quality of an apparel product can be measured in three phases: at the point of  
 3792 purchase, while using the item, and ultimately, when it is disposed. Quality is generally first evaluated “pre-use”  
 3793 and then experienced “during use” (Piippo et al., 2022).

3794 Fashion is a highly tactile experience in which purchasing decisions are often made based on how the apparel  
 3795 or accessory ‘feels’ and how the quality is perceived (De Klerk and Lubbe, 2008; Williams and Ackerman, 2011;  
 3796 McLaren et al., 2016; Vladimirova et al., 2022). Yet, for consumers it is very difficult to assess the quality and  
 3797 durability of apparel at the point of purchase (Harris et al., 2016; McLaren et al., 2016). Goworek et al. (2012)  
 3798 reported that consumers usually judge apparel quality by its feel (personal considerations) and the brand.  
 3799 However, the price is the deal breaker when it comes to decide whether to buy a piece of apparel or not, even  
 3800 among environmentally aware consumers (Harris et al., 2016).

3801 Several researchers have tried to gather the aspects that influence the perception of quality in apparel (**Table**  
 3802 **65**).

3803 **Table 65.** Aspects that influence the perception of quality in apparel

Intrinsic product attributes	Extrinsic producer factors	Experienced features	Values, convictions
Material Manufacturing quality Fit	Price Brand Manufacturing location	Tactile feeling Functionality Durability Emotional value Fit Availability Context Price	Low environmental impact Local production Ethical production

3804 *Source: Adapted from Niinimäki, (2011); Koszewska, (2016); Henninger et al., (2017)*

3805 The aspects reported in **Table 65** are mentioned in different consumer surveys. Overall, it is documented that  
 3806 price is usually associated by consumers as a quality indicator (Keiser et al., 2012 as cited in Wakes et al.,  
 3807 2020). In an American survey, it was documented that 58% of users thought that the apparel with lower price  
 3808 had worse quality compared to higher-priced items, and 78% (ages 13–24 years and 35–70 years) indicated

3809 that “you get what you pay for” implying that apparent better quality apparel may be the ones that have higher  
3810 price (Monitor, Cotton Incorporated Lifestyle, 2018).

3811 Durability and ease of care characteristics seem not to be considered per se, by users when they are buying  
3812 apparel (De Klerk and Lubbe, 2008; Wakes et al., 2020). However, this may be because quality and durability  
3813 are associated by consumers and industry specialists (Yuille, 2015; Wakes et al., 2020). In other words, apparel  
3814 with perceived high quality is expected to be durable.

3815 As it happens when assessing the quality of apparel, consumers’ expectations of apparel longevity are mostly  
3816 related to the price (Forbrugerrådet Tænk, 2022). This is a particular believe for younger generations (Monitor,  
3817 Cotton Incorporated Lifestyle 2018 as cited in Wakes et al., 2020). Nonetheless, price may not correctly reflect  
3818 the quality and hence, the durability to laundering, for instance (Ghaani Farashahi et al., 2018b; Wakes et al.,  
3819 2020; Badgett, 2017). In fact, some studies have proved that cheaper apparel are not always a synonym of  
3820 worse quality (Wakes et al., 2020; Badgett, 2017).

3821 Lifetimes expectations for consumers are also linked to where the apparel are purchased, care requirements,  
3822 material and purpose/context (Forbrugerrådet Tænk, 2022). It is interesting to note that 43% of Austrian survey  
3823 participants declared their willingness to buy long-lasting apparel despite of the price while 30% of them  
3824 already buy them (AK Wienn and Greenpeace, 2023). In a Zalando survey, 58% of 2 500 consumers consider  
3825 long-lasting quality to be significant in apparel, with 52% stating that they frequently consider this aspect while  
3826 shopping. Similarly, 45% of respondents prioritize value for money (Heiny and Schneide, 2021).

#### 3827 **9.6.1.4 Information reported on apparel labels**

3828 Apparel labels and tags can have the same meaning. Generally speaking, the word label is used to refer to an  
3829 attachment that is not meant to be removed from the apparel and provides details about it. The term tag may  
3830 be referred to any type of attachment, whether made out of paper or cardboard including tags attached at the  
3831 point of sale intended for removal.

3832 Textile products sold in the EU must have a label and comply with the EU labelling requirements set in the EU  
3833 Textile Labelling Regulation 1007/2011. According to the mentioned Regulation, the label must be firmly  
3834 attached to the apparel and must contain information on fibre composition. Moreover, the information on textile  
3835 composition must be separated from other type of information such as product care.

3836 In fact, information about care of the apparel is voluntary, according to EU law<sup>145</sup> and in general practice, but  
3837 can also be legally required, notably by Member States and third countries (GINETEX, 2017). When it comes to  
3838 care labelling, manufacturers and even retailers can provide the product care instructions using symbols or  
3839 offering a written explanation (GINETEX, 2017). In certain cases, some labelling specifications may also be  
3840 provided by standards (GINETEX, 2017).

3841 Information about user attention to apparel care labels is available in Section 9.6.2.7. However, when it comes  
3842 to labels in general, little is known about the extent to which consumers pay attention to them. An attitude-  
3843 behaviour gap survey from Zalando showed that 58% of 2 500 respondents indicate that they should  
3844 understand certain aspects of the apparel item, i.e. the materials used. However, just 38% regularly check the  
3845 label for information (Heiny and Schneide, 2021). Similarly, while 60% of the survey participants express the  
3846 significance of transparency about apparel aspects, only 20% actively pursue information during their buying  
3847 journey (Heiny and Schneide, 2021). A survey from the Spanish Consumer Organization (OCU) targeting 340  
3848 Spanish consumers indicated that 42% of respondents admit looking at the origin of the apparel in order to buy  
3849 locally or not to buy from countries contributing to labour exploitation (OCU, 2018). Some of the Spanish  
3850 consumers who responded to the same survey check the labels to get information about the material  
3851 composition as 38% of them have personal preferences towards natural origin fibres while 25% avoid synthetic  
3852 fibres due to the microplastic release occurring after washing the apparel (OCU, 2018). Moreover, users seem  
3853 to be growing interest in EU ecolabelled products in the category of ‘textiles, clothing/footwear’. In particular,  
3854 71% out of 26 635 survey respondents in the EU27 Member States express a desire to find more of the  
3855 abovementioned products carrying the EU Ecolabel. This sentiment is prevalent in all countries, with varying  
3856 percentages (from 54% in Czechia to 83% in Portugal and Romania) (European Commission. Directorate General  
3857 for Environment, 2023).

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145 The ongoing review of the Textile Labelling Regulation is exploring whether to harmonise and even render care labelling mandatory

3858 **9.6.1.5 Attitudes towards second-hand apparel purchase**

3859 In recent years, there has been a notable shift in consumer behaviour towards the adoption of second-hand  
3860 apparel, reflecting evolving preferences and attitudes. In fact, more than three out of ten (34% of 26 595  
3861 respondents) would purchase second-hand textiles (apparel and home textiles included in this category)  
3862 (European Commission. Directorate General for Environment, 2014). Additionally, more than 70% of 27 498  
3863 respondents across the European Union agree that second-hand apparel should be promoted more (European  
3864 Commission, 2019). Despite of this, surveys have found that the attitudes and the consumer behaviours are  
3865 not always aligned. This is the case for 61% of users who think that second-hand purchase is important but  
3866 only 25% of them buy second-hand apparel (Heiny and Schneide, 2021).

3867 There seems to be gender disparities as women exhibit a higher inclination towards buying second-hand  
3868 apparel, with around 40% embracing this trend compared to slightly over 25 % of men (European Commission.  
3869 Directorate General for Environment, 2014; D&B 2020). The age dynamics indicate that younger demographics,  
3870 particularly 18-25 year-olds, lead in second-hand apparel adoption, contrasting with relatively lower  
3871 participation among those aged 26-40 (D&B, 2020).

3872 A compelling correlation emerges, indicating that those who incorporate second-hand apparel into their  
3873 wardrobe tend to purchase fewer new apparel (36.2 average score on a scale of 0-100). The primary drivers  
3874 behind the adoption of second-hand apparel include financial savings, sustainability/environmental  
3875 consciousness, and a preference for unique, vintage pieces (D&B, 2020).

3876 Involving more users through second-hand markets for apparel can result in an extended lifespan. Pre-owned  
3877 apparel items can contribute to a reduced environmental footprint by serving as a substitute for the acquisition  
3878 of new items, thus extending the life of existing apparel.

3879 Based on survey results, approximately one out of ten apparel items have been previously owned, meaning they  
3880 have had at least two different owners, on average, the apparel items have 1.6 users (Klepp et al., 2020).

3881 Nonetheless, establishing consistent figures for pre-owned apparel is a challenging task due to various factors  
3882 that influence this phenomenon, such as the price of the apparel, the user's nationality, the type of apparel, its  
3883 fibre content, the user's age, their income and the fashion trends (Laitala and Klepp, 2020a).

3884 By all accounts, second-hand purchases, generally speaking, tend to have a reduction effect on the purchase of  
3885 new apparel. An online retailer aimed at estimating the 'replacement rate', understood as the proportion of  
3886 number of purchases displacing a first-hand purchase (Vinted, 2021). The results of a survey based on over  
3887 350 000 responses across eight European markets showed that 39 out of 100 people buying a second-hand  
3888 product on the retailer's website would have avoided purchasing a new product (Vinted, 2021). Depending on  
3889 the product category, significant variation in the avoided purchase rate was observed for instance, coats and  
3890 jackets were among the products having high replacement rate (Vinted, 2021). In any case, other variables  
3891 should be taken into account when considering estimations of replacement rates. As for example, an apparel  
3892 item with low quality, sold after just one use, may avoid the purchase of other items. However, due to its low  
3893 quality, the usability of the item may be limited. This means there may be cases in which buying brand-new  
3894 items with higher quality could have better impact on the environment than buying second-hand apparel items  
3895 with lower quality.

3896 **9.6.1.6 Attitudes towards the purchase of apparel made without harmful chemicals**

3897 A survey involving 26 718 citizens across the 27 EU Member States found that the chemicals in the apparel  
3898 fabrics are generally perceived as minimally risky, with 60% of Europeans viewing them as not posing a risk to  
3899 people. Among different fabric types, synthetics are viewed as posing the highest risk, although only 22% of  
3900 Europeans categorize them as presenting a significant health risk (European Commission, 2009).

3901 Fabrics with chemical-specific quality labels indicating the absence of harmful chemicals to health and the  
3902 environment, are thought to carry lower risks and materials like wool, cotton, or linen are perceived as entirely  
3903 risk-free. Europeans hold divergent views on the relevance health and environmental risks when purchasing  
3904 apparel – some consider it highly important, while an equivalent proportion does not find it significant (European  
3905 Commission, 2009).

3906 Europeans were also surveyed about the significance they attribute to potential health and environmental risks  
3907 associated with fabric when purchasing apparel for themselves or their families. Of the respondents, 18%  
3908 consider it fairly important, while nearly four in ten respondents find it very important (39%), and a similar  
3909 proportion deems it not important (37%). A country-level analysis reveals that approximately two-thirds of

3910 respondents in Germany and Slovakia find environmental and health risks very important when buying apparel.  
3911 Conversely, in Denmark and the United Kingdom, more than six in ten respondents consider this aspect not  
3912 important (European Commission, 2009).

3913 Additionally, data from the Fashion Revolution (2020) consumer survey shows that an average of 37% of 5 000  
3914 consumers in the United Kingdom, France, Germany, Italy and Spain consider important to buy apparel that is  
3915 not produced using harmful chemicals. The Fashion Revolution survey does not provide information about the  
3916 type of chemicals. It shall be noted that all age groups, genders and users with different income provided no  
3917 important differences in the responses.

#### 3918 **9.6.1.7 Attitudes towards the purchase of apparel made with recycled materials**

3919 The Fashion Revolution (2020) survey indicated that an average of 11% of 5 000 European consumers from  
3920 the United Kingdom, France, Germany, Italy and Spain pointed out that it is important that the apparel they buy  
3921 contains recycled materials. Italy, is considerably above the average with 51% of users considering important  
3922 the presence of recycled materials in the apparel they purchase. Spain, France and Germany remain in the  
3923 average for the five countries. However, the survey does not offer information about such materials. In this  
3924 case, the group of respondents between 55 and 75 years old consider less important whether the apparel they  
3925 purchase have recycled materials or not, as only 7% declare so as opposed to the youngest age group (12-24  
3926 years old) in which 14% percent of users indicate the importance of buying apparel containing recycled  
3927 materials. No notable differences in survey responses exist between different income and gender groups.

3928 Furthermore, three-quarters of 27 498 respondents of an EU-wide survey declared that apparel should only be  
3929 made from materials that can be recycled (European Commission, 2019).

#### 3930 **9.6.2 Post-purchase aspects: the user behaviour during use**

3931 The post-purchase aspects of apparel encompass the use and care phases. The underlying drivers and barriers  
3932 to sustainable consumer use and care are not sufficiently well captured in the literature, especially regarding  
3933 frequency of laundering apparel, number of uses and product's lifetime (Conrady et al., 2014; Yates and Evans,  
3934 2016; Luo et al., 2023b). In fact, retailers claim that the way users take care of apparel determine their physical  
3935 lifespan (McLaren et al., 2016). This is important as it seems that not many consumers seem to be willing to  
3936 change their laundering behaviour (Uitdenbogerd 2007 as cited in Luo et al., 2023).

3937 The frequency of laundering, washing temperature, number of days apparel are worn between washes and  
3938 chemicals used for washing the apparel are among the factors that affect the durability of apparel and also  
3939 determine the extent of the environmental impacts associated to washing them. All these aspects are heavily  
3940 dependent on the behaviour of users which vary depending on the culture and climate (Klepp and Laitala,  
3941 2023b). As a result, this chapter brings forward different user laundering practices which encompass the sorting  
3942 of the apparel before washing, the washing programme, the drying method, the ironing (if applicable) and the  
3943 storage.

##### 3944 **9.6.2.1 Sorting before washing**

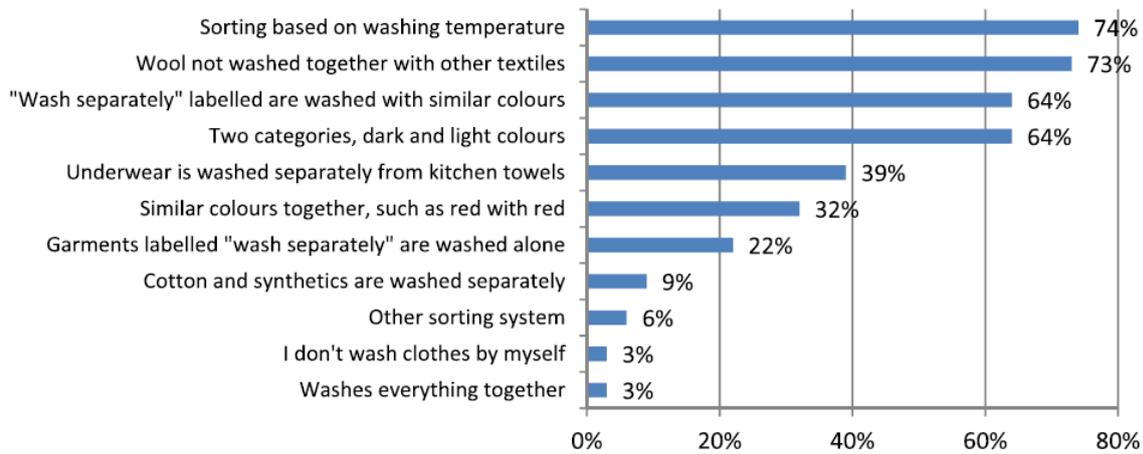
3945 Textile materials have specific cleaning requirements, hence the importance of sorting before washing in order  
3946 to preserve the apparel shape and colour (Cooper and Claxton, 2022b; Klepp and Laitala, 2023b) and hence  
3947 extend the lifetime of the apparel (Cooper and Claxton, 2022b).

3948 Figure 42 gives an overview of different sorting practices and average percentage of users that opt for each of  
3949 them. The results are based on responses from 545 users in Norway. It seems that sorting based on washing  
3950 temperature is the most popular sorting method while washing everything together without differentiation  
3951 between the apparel is not generally chosen by consumers.

3952

3953

**Figure 42.** Laundry sorting methods



3954

3955

Source: Laitala and Boks, (2012)

3956 The sorting processes in laundry exhibit considerable variation, influenced by factors such as washing  
 3957 temperature, colour, fibre type, usage area, and care labelling. Merely 3% of participants indicated a preference  
 3958 for washing all items together. Younger respondents tend to categorize colours into just two groups (light and  
 3959 dark). Sorting based on washing temperature is more prevalent among female participants and those in higher  
 3960 age brackets. Woollen products are commonly segregated from other fibre types, with 73% of survey  
 3961 respondents affirming that they avoid washing wool alongside other textile materials. Some consumers find it  
 3962 challenging to amass a sufficient amount of apparel to fill the machine when using multiple sorting categories  
 3963 (Laitala et al., 2012).

3964 **9.6.2.2 Washing temperature and washing frequency**

3965 The average laundry temperatures differ between different countries. The average European washing  
 3966 temperature was 42.4°C in 2020 (A.I.S.E, 2020), in Scandinavia is 46.2°C and in Southern Europe lower 39.7°C  
 3967 (A.I.S.E, 2017a). In the USA, the average temperature is 30°C, while in Japan is 20°C (Laitala et al., 2020).

3968 **Figure 43** shows that washing cycles at an average of 40°C have been found as the most commonly selected  
 3969 washing temperature among consumers. This is also supported by the study from Laitala et al., (2012).

3970 **Table 66.** Preferred washing temperatures for consumers

Publication	Sample details and characteristics of the study	Country	Preferred washing temperatures <sup>(a)</sup>			
			20 or cold setting	30	40	60
WRAP (2019)	Two waves of online surveys: Wave 1 was conducted in November 2016 and Wave 2 in June 2019. The sample size in 2016 was 1 000 per country. In 2019 the samples were as follows: Denmark 1 046; Germany 1 113; The Netherlands; 1 117 and Italy 1 226.	Denmark (DK), Germany (DE), The Netherlands (NL) and Italy (IT).	NA	Second most frequently used laundry wash temperature in all five countries.	Most frequently used laundry wash temperature in all five countries	NA

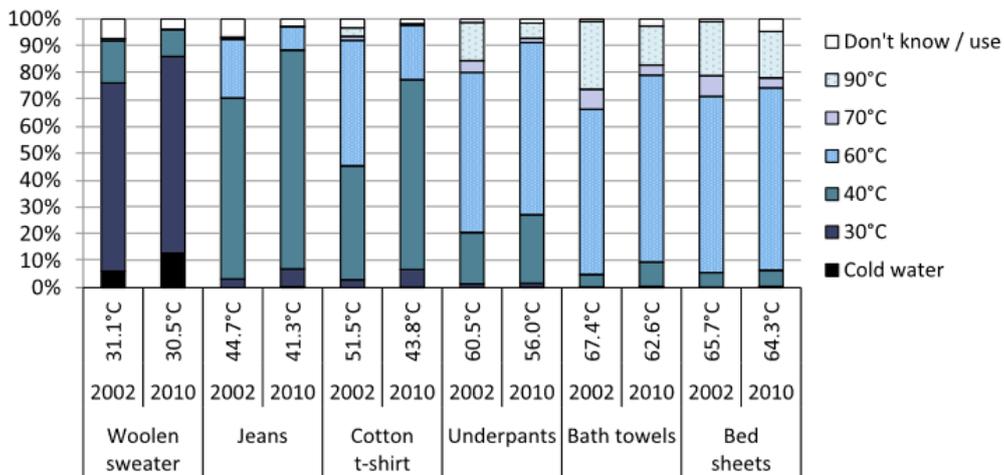
3971 <sup>(a)</sup> There is no information about the correlation between the temperatures indicated and the information reported on the care labels

3972 Source: own production based on references indicated in the first column of the table

3973 Whether the washing temperatures in **Figure 43** are in line with care label recommendations of the apparel in  
 3974 question is not specified in the study from Laitala et al., (2012). A total of 1 008 users participated in the survey  
 3975 from Laitala et al., (2012) while the sample in 2010 was a bit more than half the size with 546 respondents.

3976

**Figure 43.** Distribution of washing temperatures for different textile products



Source: Laitala and Boks, (2012)

3977

3978

3979 The frequency of washing is a crucial factor in determining the longevity of apparel because it represents one  
3980 of the primary factors that can cause the apparel item to wear out and either extend or shorten its lifespan.

3981 The average washing frequency per household in Europe is estimated in 3.8 washing cycles per week (Schmitz  
3982 and Stamminger, 2014; Klepp and Laitala, 2023; Laitala et al., 2018b).

3983 The frequency of washing cycles is closely tied to the household's size. As the number of individuals in the  
3984 household rises, so does the overall number of washing cycles. However, the average number of washing cycles  
3985 per person decreases, suggesting a more efficient utilization of washing machine capacity (Klepp and Laitala,  
3986 2023b).

3987 Other sources indicate that users wash their apparel items on average 10.9 times a month, excluding underwear  
3988 and socks (D&B, 2020). Women (average 11.58 times per month) wash their apparel more often than men  
3989 (average 9.93 times per month). Additionally, users living in metropolitan areas tend to wash less often (8.2  
3990 times a month) than users whose home is in less urban areas (13.3 times a month in a non-urban area). The  
3991 analysis of the survey results from D&B (2020) found no explanation for this behavioural pattern. Age and  
3992 educational level, did not offer different results in washing frequency (D&B, 2020).

3993 The duration of time that apparel is worn before being washed exhibits significant variability among different  
3994 types of apparel. Typically, items like underpants and socks are laundered after each use, whereas certain outer  
3995 apparel are infrequently washed (Laitala et al., 2018).

3996 **Table 67** displays the difference in number of uses prior to washing depending on the purpose of the category  
3997 of apparel.

3998 **Table 67.** Average number of uses of apparel categories prior to washing

Study	T shirts	Shirts and blouses	Sweaters and mid layers	Jackets and coats	Pants and shorts	Dresses skirts and jumpsuits	Leggings stockings tights and socks	Underwear	Swimwear	Apparel textile accessories	Knitwear
Quantis, (2022)	1	2	5	20	3	3	2	1	1	NA	NA
Klepp et al., (2020)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	NA	NA
Laitala, IG Klepp, et al., (2018a)	1.5 (Cotton)	2 / 3 (Woollen undershirts)	10 (Wool) / 5 (Cotton)	NA	5.5 (Jeans)	NA	2	1	NA	NA	NA
WRAP, (2017a)	2	2	NA	NA	10 (Jeans)	NA	2	NA	NA	NA	5
Roos et al., (2015)	2	NA	NA	100	9 (Jeans)	3 (Dresses)	NA	NA	NA	NA	NA
Gray et al., (2022)	2.6	2.3	4.7 (Sweatshirt and hoodie)	14.5 (Non-padded) / 16.7 (Padded)	4.2 (Shorts) / 4.5 (Trousers) / 5.5 (Jeans)	3.2 (Skirt) / 2.6 (Dress)	3.3 (Leggings) / 2.4 (Socks and hosiery)	3.5 (Bras)	1.7	NA	4.3

3999 NA: Not available

4000 Knitwear products could belong to more than one category from those considered

4001 *Source: own production based on references indicated in the first column of the table*

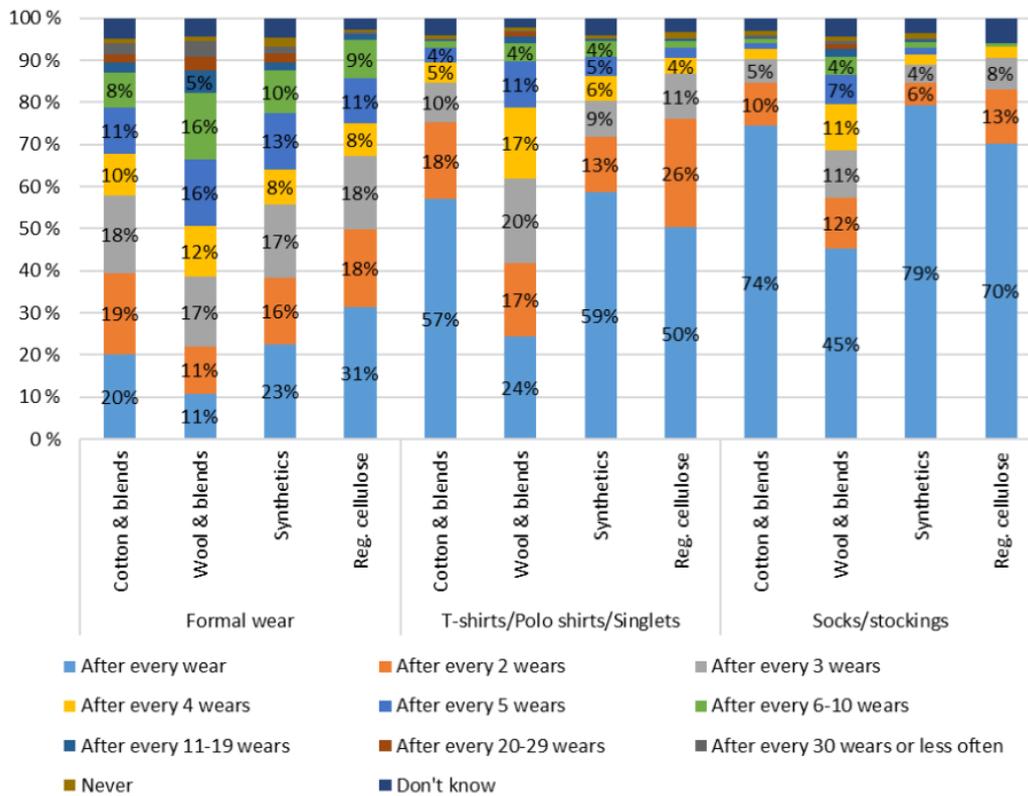
4002

4003 The wardrobe survey conducted by Klepp et al. assessed the cleaning frequency among its respondents.  
 4004 However, there is a big variability among respondents as 39% of them washes the apparel item after every  
 4005 wear, 14% after every 2 wears, 11% after every 3 wears and 29% after every 4 wears or more (Klepp et al.,  
 4006 2020).

4007 The study conducted by Laitala et al., 2018a presents an overview of studies that provide the average count of  
 4008 wear instances before laundry for distinct types of apparel. It indicates that fibre types are an important factor  
 4009 in determining the number of uses before washing (Laitala et al., 2018a).

4010 When it comes to differences in the washing of textile categories and fibres, survey data of 23.392 apparel  
 4011 representing five countries show that socks are washed more frequently compared to t-shirts and formal wear  
 4012 **Figure 44.** In terms of fibres, apparel made out of wool are washed less often compared to other fibres (Laitala  
 4013 et al., 2020).

4014 **Figure 44.** Frequency of wash or dry clean per fibre content



Source: Laitala et al., (2020).

4017 The selection of materials is likely to influence how often apparel is washed, as synthetic fabrics like polyester  
 4018 or polyamide are prone to retaining strong body odours compared to apparel made from natural materials like  
 4019 wool or cotton. Additionally, frequent laundering poses an environmental drawback by accelerating the wear  
 4020 and tear on apparel, indirectly reducing their total lifespan. If laundering fails to effectively remove stains or  
 4021 odours from apparel, it can lead to premature disposal of apparel. These disposed items are more likely to end  
 4022 up in landfills or incineration instead of being directed toward reuse or recycling, thereby exacerbating  
 4023 unsustainable patterns of apparel consumption. (Klepp and Laitala, 2023b).

4024 Additionally, even identical types of apparel may undergo washing at distinct frequencies across various  
 4025 countries. A study comparing laundering habits in five countries revealed that, for instance, the Japanese tend  
 4026 to launder their formal wear less frequently (after an average of 8.8 wears) compared to Chinese and American  
 4027 consumers, who wash them after 3.3 and 3.6 wears, respectively (Laitala et al., 2020). In this context, laundry  
 4028 washes include the generic pre-programmed settings the washing machine runs to complete its work (washing,  
 4029 rinsing, and spinning phase). In view of this, Italy has the highest (5.9) number of laundry washes per week,  
 4030 while Germany has the lowest (4.0). However, the number of laundry washes per week have decreased since

4031 2016 in Denmark (from 5.5 to 4.5 per week), Germany (4.4 to 4.0) and The Netherlands (6.0 to 4.8) (WRAP,  
4032 2019).

4033 The stronger users feel about the fact that washing apparel less often is not a habit a clean person would  
4034 follow, the more often they wash. This association of less washing with poor hygiene is also linked to our image:  
4035 we want to appear to others as a “clean” person, because that is the social norm (D&B, 2020). Additionally, the  
4036 more annoying users find the washing of apparel, the less often they do this. Individual beliefs about hygiene  
4037 and convenience play a role in how often users wash their apparel. Factors such as time, money and  
4038 environmental convictions do not seem to play a role in the frequency of washing apparel (D&B, 2020).

4039 In general, users do not only throw their apparel in the laundry bin when they are actually dirty, but also ‘after  
4040 wearing them several times’. The latter reason indicates customary behaviour also supported by the literature:  
4041 the majority of people do not check whether the apparel are dirty before putting them in the laundry bin because  
4042 they are used to washing them after a certain number of wears (D&B, 2020).

4043 Finally, in addition to the frequency of washing, the examination of lifespan can also involve evaluating the  
4044 number of cleaning cycles that apparel can endure in technical assessments or the number of cleaning cycles  
4045 they experience during consumer studies. It may provide insights into the durability and potential longevity of  
4046 apparel.

4047 It is important also to consider that the cleaning process itself has environmental implications. Therefore, this  
4048 approach holds value both independently and when used in conjunction with other methods for assessing the  
4049 lifespan of apparel.

4050 As established in the study based on the survey conducted by Laitala and Klepp (2020), apparel that are  
4051 laundered less frequently exhibit longer lifespans. Those washed less often than every 30 wears have lifespans  
4052 up to 4.8 years longer than those washed after each wear. Apparel washed after each wear are used 94 times  
4053 less compared to apparel washed less often (washed every 30 wears) (Laitala and Klepp, 2020a).

#### 4054 **9.6.2.3 Choice of softeners and detergents**

4055 According to a 2017 A.I.S.E survey, compared to 2008, fewer consumers are reading information on detergent  
4056 packaging. Nonetheless, in 2017, 52% claimed to read it before purchasing a product, and 60% mentioned  
4057 doing so before using the product (A.I.S.E, 2017b). However, it appears that a majority of consumers continue  
4058 to dose detergent arbitrarily, as indicated by A.I.S.E in 2020 hence overdosing is a common mistake, contributing  
4059 to increased environmental impact and less effective washing results due to poorer rinsing effects (Paloviita  
4060 and Järvi 2008 as cited in Klepp and Laitala, 2023).

4061 Interestingly, when consumers' attention is compelled, the average time spent on a detergent label is  
4062 approximately 20 seconds, irrespective of the label size or content (A.I.S.E, 2017b). When asked if consumers  
4063 deliberately check composition information, 37% of European consumers responded affirmatively. They do so  
4064 primarily to compare products (59%), avoid specific substances (29%), assess the quantity of a particular  
4065 substance (28%), or because they are allergic to a specific substance (24%).

4066 Fabric softeners, also known as fabric conditioners, are chemicals originally developed to reduce static electricity  
4067 in synthetic fabrics and are now more commonly used to soften cotton, ease ironing and add fragrance to  
4068 laundry (Klepp and Laitala, 2023b). Studies suggest that softeners are utilized in about 55% of washing cycles  
4069 in Europe (Stamminger 2016 as cited in Laitala 2023), with significant national variations. In Norway,  
4070 approximately 61% of the population use them often, 19% occasionally, and 19% never (Laitala, K., M.  
4071 Kjeldsberg, and I.G. Klepp 2012 as cited in Klepp and Laitala, 2023), while in Hungary and Romania, only about  
4072 5% use softeners in all wash cycles, and 60% never use (Stamminger 2016 as cited Laitala, K., M. Kjeldsberg,  
4073 and I.G. Klepp 2012 as cited in Klepp and Laitala, 2023).

4074 Further details on the A.I.S.E, 2017a survey results on laundering habits can be found in **Table 68**.

4075 In conclusion, economic factors, such as the price and promotions, play a substantial role in users' choices of  
4076 laundry products. Sustainability is an important criterion for a significant portion of respondents, but less  
4077 important than economic aspects. There is still a segment of users that may add more or less detergent than  
4078 recommended as it happens with the dosing of softeners.

4079 **Table 68.** Summary of surveys on laundering habits related to apparel

Publication	Sample details & characteristics of the study	Country	Washing Habits										
			Choice of laundry detergents and/or softeners by users expressed in % of respondents					Laundry detergents dosage habits per user expressed in %					
			Total price of the box	Specials offers and promotions	The detergent form (i.e. liquid/powder)	The fragrance	Sustainability criteria	Aware of the dosing instructions on the package	Find it easy to dose laundry detergents	Usually measure the quantity of detergent to be used	Check the package for dosing instructions	Add more detergent than recommended	Add less detergent than recommended
A.I.S.E (2017)	4 611 participants (aged 18-65) 200 respondents per country. No details on the demographic or social factors of the subjects.	23 European countries	78	71	70	71	Ranked lower than the economic criteria <sup>(a)</sup>	63	74	62	50	24	23

4080 *Source: own production based on references indicated in the first column of the table*

4081 **9.6.2.4 Drying**

4082 Apparel undergoes diverse drying methods, all of which involve air, causing moisture to evaporate and be carried  
 4083 away. The tools employed by consumers include an array of drying racks and cords utilized both indoors and  
 4084 outdoors, drying cabinets, dryers, and dedicated drying spaces, such as drying ceilings with or without heating.  
 4085 The prevalence of tumble dryers varies significantly even among Western countries, with the USA leading at  
 4086 approximately 80% of households owning one (Engelberg and Brassell, 2019), while the European average  
 4087 stands at around 32% of households (De Almeida et al., 2011).

4088 The data from surveys conducted by Laitala et al. (2020) and GINETEX (2017) provide insights into the  
 4089 prevalence of specific drying methods among participants from different countries and age groups.

4090 A summary of surveys related to drying of apparel is available in **Table 69**.

4091 **Table 69.** Summary of surveys related to drying of apparel

Publication	Sample details and characteristics of the study	Country	% of users per drying method <sup>(a)</sup>			
			Tumble-drier	Shared tumble-drier	Line dried indoors	Line dried outdoors (natural drying)
Laitala et al. (2020)	1 111 participants Age groups: 18-29 years, 30-49 years and 50-64 years	China, Germany, Japan, United Kingdom and USA	32.5	8	33	27
GINETEX (2017)	6 000 participants (aged 18-65)	Germany, United Kingdom, France, Italy, the Czech Republic and Sweden	NA	NA	NA	62

4092 (a) Whether the results per drying method depend on where the user lives in, is not reported by the studies

4093 *Source: own production based on references indicated in the first column of the table*

4094 **9.6.2.5 Ironing**

4095 The final stages of the laundry process involve employing techniques to shape, structure, and refine the  
 4096 appearance of freshly washed fabrics, a step commonly achieved through ironing (Klepp and Laitala, 2023b).  
 4097 In contemporary times, the amount of time dedicated to ironing has notably decreased, particularly over the  
 4098 past few decades. Ironing practices exhibit significant variations not only between countries and consumer  
 4099 demographics but also among different types of apparel. In Norway, the statistics indicate diverse ironing habits,  
 4100 with approximately 12% of adults ironing on a weekly basis, 40% opting for monthly ironing, 28% engaging in  
 4101 less frequent ironing, and 20% asserting that they never iron anything (Laitala, IG Klepp, et al., 2018b). Notably,  
 4102 a higher proportion of men and younger respondents tend to forgo ironing, in contrast to women and elderly  
 4103 respondents (Klepp and Laitala, 2023b).

4104 On a different note, the care labels on textiles often contain symbols indicating whether the apparel can be  
 4105 ironed and if so, the most appropriate ironing setting. In some cases, the ironing symbol may be accompanied  
 4106 by dots. The number of dots indicates the temperature ranges for ironing. Ironing at a hot setting can also  
 4107 contribute to the shrinkage of apparel (Chartered Textile Technologist interview as cited in Cooper and Claxton  
 4108 2022).

4109 **9.6.2.6 Storage after washing and drying**

4110 The folding and storage of apparel after being washed and dried may have influence on the lifespan of apparel.  
 4111 The way users store their apparel may affect the intrinsic quality they have. Nonetheless, no studies have been  
 4112 found that address the folding and storage of apparel after being washed and dried. Rather some studies on  
 4113 the user behaviour related to the storage of inactive or no-longer-worn-apparel have been identified and are  
 4114 presented in Section 6.3.4.

4115 **9.6.2.7 Following apparel care label instructions**

4116 Care labels may indicate the recommended washing temperature, cycles, detergent to be used, and the way  
 4117 apparel should be hanged while still damp, among other things (Cooper and Claxton, 2022b).

4118 Survey evidence ( **Table 70.**

4119

4120 **Table 70)** suggests that a significant percentage of users across various countries tend to follow care  
4121 instructions on apparel labels, often with reasons including avoiding washing problems and preserving apparel.  
4122 Both, GINETEX (2017) and GINETEX (2019) surveys report a similar percentage of users (70%) who always  
4123 follow textile care instructions, suggesting consistency in this behaviour across the two studies. Moreover, the  
4124 surveys from GINETEX (2017) and AB-REOC and BV-OECO (2019) indicate that around 58% of users follow  
4125 the care instructions often.

4126 Despite consumers recognizing the influence of care and laundering practices on the lifespan of their apparel,  
4127 adherence to care labels diminished after the initial wash, as indicated by McLaren et al. 2015. In the present  
4128 survey, 47% of participants acknowledged generally reading apparel care labels. However, when specifically  
4129 asked about reading care labels for T-shirts, 59% indicated doing so either at the point of purchase (10%) or  
4130 before cleaning/after use (49%). The percentage of participants who abstained from reading care labels entirely  
4131 decreased with an increase in T-shirt price. Moreover, survey results from Cotton Incorporated's Lifestyle  
4132 Monitor revealed a declining trend in the number of consumers who 'always' or 'usually' read care labels before  
4133 laundering apparel (2003—77%; 2007—64%; 2009—57%), with younger consumers (under 35 years)  
4134 displaying a reduced inclination to read care instructions.

4135 Furthermore, cutting care labels out is a common practice among users as reflected in the GINETEX (2017)  
4136 survey where 62% of the respondents would do so (GINETEX, 2017). The fact that there are consumers who  
4137 tend to cut the care labels is also observed in disposed textiles which are collected with missing labels. This  
4138 affects both, the reselling potential of apparel and their preparation for reuse (WRAP, 2017b; Cura et al., 2021;  
4139 European Commission. Directorate General for Internal Market, Industry, Entrepreneurship and SMEs, 2021).

4140 There are variations in behaviours and opinions, with some users finding care labels uncomfortable (when  
4141 wearing the apparel item) or too long. GINETEX (2017) report the behaviour of cutting out care labels, suggesting  
4142 that a portion of users across different countries may engage in this practice. In parallel, 39% of 6 000  
4143 consumers in Germany, United Kingdom, France, Italy, the Czech Republic and Sweden would never or rarely  
4144 buy a piece of apparel without a label, where French consumers may bring up the average with 67% of 1 000  
4145 users reporting so (COFREET, 2023).

4146 There is also a desire for more convenient access to care instructions, such as having them directly on the sewn  
4147 label or accessible through a QR code on a smartphone reported by 65% and 17% of 1 000 French survey  
4148 participants (COFREET, 2023).

4149 AB-REOC and BV-OECO (2019) and COFREET (2023) focus on specific regions (Belgium and France,  
4150 respectively), allowing for insights into localized behaviours. However, this limits the possibility to generalise  
4151 findings to a broader context.

4152 COFREET (2023) specifically highlights a preference for consulting care instructions on a smartphone via a QR  
4153 code by consumers, while this detail is not present in the GINETEX studies.

4154 The inclusion of multiple European countries in GINETEX (2017) and GINETEX (2019) contributes to a broader  
4155 representation. The representativeness may vary based on the scope of coverage. However, these sources offer  
4156 an overview of common specific behaviours, such as attention to labels, indicate low variability in user practices.  
4157 The representativeness is influenced by the extent to which these behaviours are widespread.

4158 While the data provides percentages of users following care instructions and engaging in specific behaviours  
4159 related to care labels, the reasons behind these behaviours are not extensively detailed. Understanding the  
4160 motivations behind user actions could enhance the representativeness of the findings. Nonetheless, the data  
4161 provide valuable insights into the way users follow care instructions and engage in specific behaviours related  
4162 to care labels.

4163 Further details on surveys about user behaviour interaction with apparel care labels can be found in **Table 70.**

4164

4165 **Table 70.** Summary of surveys on user behaviour interaction with apparel care labels

Publication	Sample details and characteristics of the study	Country	% of users who follow the textile care instructions			% of most repeated reasons to follow the care instructions according to users			Other behaviour and opinions related to apparel care labels expressed in % of users					
			Average for the EU population	Follow them 'Always'	Follow them 'Often'	To avoid washing problems such as shrinking	Follow the care label to preserve their apparel and keep them longer	Never or rarely buy a piece of apparel without a label	Find the care labels Useful	Cut the care labels out	Think that care labels itch and irritate the skin and for another	Think that care labels are often too long and uncomfortable	Want to find the maintenance instructions directly on the sewn label on the apparel	Want to consult them on smartphone via a QR code.
GINETEX (2017)	6 000 participants (aged 18-65)	Germany, United Kingdom, France, Italy, the Czech Republic and Sweden	70	13	57	38	31	39	NA	62	74	55	NA	NA
GINETEX (2019)	7 000 participants (aged 18-65)	France, Germany, the Czech Republic, the United Kingdom, Sweden, Italy and Spain	70	NA	NA	NA	NA	NA	82	NA	NA	NA	NA	NA
AB-REOC and BV-OECO (2019)	1 756 Belgian residents (aged 16-80)	Belgium	NA	NA	58	NA	NA	NA	NA	NA	NA	NA	NA	NA
COFREET (2023)	1 000 French residents (aged 18-65)	France	NA	NA	NA	NA	NA	67	NA	NA	NA	NA	65	17

4166 Source: own production based on references indicated in the first column of the table

4167 On a different note, in the investigation conducted by Wakes et al. in 2020, it was observed that the price of  
 4168 the T-shirt had an impact on individuals' attitudes towards care labels: a lower purchase price correlated with  
 4169 a lower likelihood of adhering to care instructions. For T-shirts priced above the lowest tier, over 40% of  
 4170 participants followed care instructions before cleaning or after use. Notably, purchasers of higher-priced T-  
 4171 shirts exhibited a greater tendency to read care labels at the point of sale compared to those who bought lower-  
 4172 priced T-shirts (Wakes et al., 2020). The Wakes et al., (2020) study was conducted in New Zealand, among  
 4173 females from 18–25 years.

4174 The extent to which users associate a care label symbol to its corresponding care instruction is collected in  
 4175 **Table 71**. Survey evidence indicates that there seems to be a consistent understanding across symbols among  
 4176 participants in both, the GINETEX (2017) and AB-REOC and BV-OECO (2019) surveys. There is a demonstrated  
 4177 high level of understanding for the ironing symbol, with almost all respondents in both surveys correctly  
 4178 associating it with the care instruction. The washing symbols also show a strong association, with 91% in  
 4179 GINETEX (2017) and 89% in AB-REOC and BV-OECO (2019) correctly connecting the symbol with the care  
 4180 instruction.

4181 **Table 71.** Summary of surveys indicating the extent to which users associate a care label symbol to its corresponding  
 4182 care instruction.

Publication	Sample details and characteristics of the study	Country	% of users who correctly associate the care label symbol with the care instruction				
			Ironing symbol	Washing symbols	Bleaching symbol	Drying symbol	Professional cleaning symbol
GINETEX (2017)	6000 participants (aged 18-65)	Germany, United Kingdom, France, Italy, the Czech Republic and Sweden	97	91	33	32	21
AB-REOC and BV-OECO (2019)	1756 Belgian residents aged between 16 and 80	Belgium	98	89	28	24	15

4183 *Source: own production based on references indicated in the first column of the table*

4184 However, there is a notable decrease in the correct interpretation and understanding of the bleaching, drying  
 4185 and professional cleaning symbols and their respective care instructions among the participants of the two  
 4186 surveys. This suggests that users may find the bleaching, drying and professional cleaning symbols less intuitive  
 4187 compared to other symbols.

4188 While both surveys provide insights into user associations, the GINETEX (2017) survey encompasses a broader  
 4189 international scope, involving participants from Germany, the United Kingdom, France, Italy, the Czech Republic,  
 4190 and Sweden. In contrast, AB-REOC and BV-OECO (2019) focuses specifically on Belgian residents. Despite this  
 4191 difference, the overall patterns in user understanding of care label symbols are comparable between the two  
 4192 surveys.

### 4193 **9.6.2.8 Repairing**

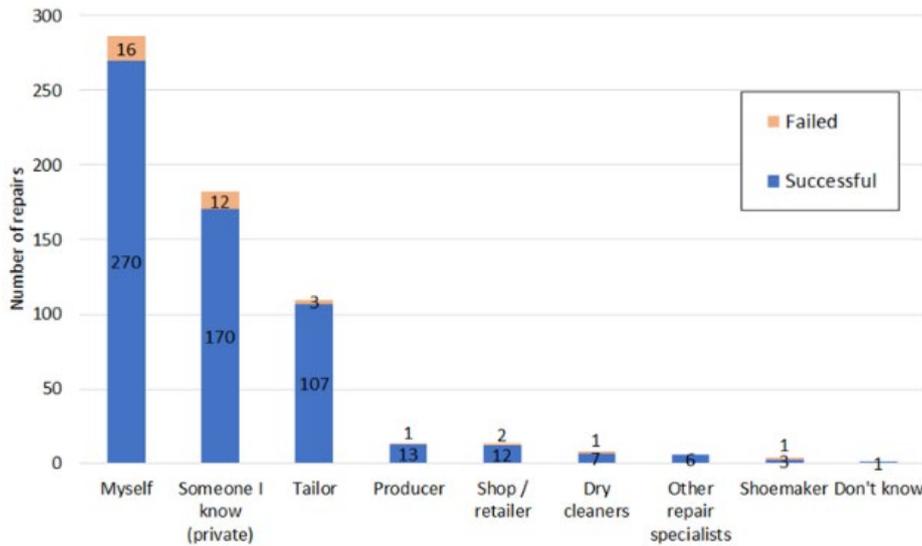
4194 Consumers nowadays have a quite transitory relationship with their apparel as they are often disposed before  
 4195 they are worn out or broken. Reasons for this may be related to overconsumption and the fact that it is easier  
 4196 and more convenient to replace the unwanted apparel for certain new items rather than repair or modify them  
 4197 (Harris et al., 2016). There seems to be a lack of emotional product-person attachment too (EEA, 2022a).

4198 Consumers can repair their apparel by themselves in private households or at a professional repair shop (EEA,  
 4199 2022a).

4200 The apparel repair industry appears to be predominantly comprised of independent repairers operating as small  
 4201 businesses, often with the owner and a few employees, if any. However, there is a lack of detailed information  
 4202 about the characteristics of this business sector, as European statistical data (Eurostat) on the professional  
 4203 repair of textiles is not available separately (EEA, 2022a).

4204 **Figure 45** reflects that most of the apparel repairs are carried by the user followed closely by somebody the  
 4205 user knows, e.g. family member. Bringing the apparel item to repair to a tailor comes as third option. It shall be  
 4206 noted that most repairs are successful in the three repair options users usually opt for.

4207 **Figure 45.** Number of successful and failed repairs done by different actors (total 625 repairs)  
 4208



Source: Laitala et al., 2021

4209  
 4210  
 4211 A survey in Ireland discovered that 45% of consumers pay to have their apparel repaired while 34% ask family  
 4212 or friends to help them with the repairs. The same survey revealed that around 48% of users would like to  
 4213 repair apparel but do not have the equipment to do it or do not know how to do it. Only 23% of people agree  
 4214 they are not interested in repairing. Interestingly, this behaviour tends to be more common among consumers  
 4215 who purchase apparel often and among young men (EPA Circular Economy Programme and B&A, 2021).

4216 69% of the over 1 000 respondents to a survey in Spain confirm to know where to bring their apparel and shoes  
 4217 for repair (CECU and Amigos de la Tierra, 2022). 67.4% of them add that, if apparel had a label indicating to  
 4218 what extent the product can be repaired, they would use this as a criterion to decide whether to purchase or  
 4219 not the apparel (CECU and Amigos de la Tierra, 2022). The consumer's trust in commercial repair shops could  
 4220 be promoted by improving the transparency of prices, quality and repair time for example. This would help  
 4221 overcoming the barriers to the repair of apparel (EEA, 2022a).

4222 Repair skills for apparel are ceasing to exist. Recent research on sewing skills shows that while different sewing  
 4223 instructions are readily available on the Internet, the main incentive for sewing is trust in one's own skills. A  
 4224 study focused on textile repair in the United Kingdom found that citizen's lack the skills needed to repair  
 4225 compared to previous generations. According to researchers, the decrease in skills is due to the fact that they  
 4226 are no longer taught in schools and the lack of time and equipment in everyday life (Finnish Ministry of the  
 4227 Environment, 2023).

4228 Laitala and Boks 2012 indicate that users decide to mend their apparel depending on whether they have sewing  
 4229 skills. A relevant number of consumers report to be able to sew a button on (**Table 73**), and have done so in  
 4230 the past year (**Table 72**). On the contrary, replacing the zipper is highlighted as a demanding repair which can  
 4231 be seen by the low rate of users who replaced it in the past year (**Table 72**) and who are confident about doing  
 4232 such work (**Table 73**). If the zipper breaks, the apparel is disposed unless a strong person-product attachment  
 4233 exists (Laitala and Boks, 2012). Nonetheless, the users who still may be able to adequately repair apparel may  
 4234 not feel the need to do so anymore (Harris et al., 2016). Moreover, a survey discovered an attitude-behaviour  
 4235 gap among 2 500 users as 58% of them declared to find apparel repair as important while only 23% of them  
 4236 engaged in repair activities (Heiny and Schneide, 2021). This is largely due to the reason indicated above: for  
 4237 some consumers it is more convenient and easier to replace undesired apparel with new items rather than  
 4238 opting for repair or modification (Harris et al., 2016).

4239  
4240

**Table 72.** Summary of surveys that provide the percentage of respondents who have made repairs to their apparel in the past year.

Publication	Sample details and characteristics of the study	Country	% of respondents who have made different repairs to their apparel in the past year						
			Has sewn a button	Fixed seams	Patched apparel	Repaired holes or worn areas in the apparel (darning)	Lengthen or shorten pants (take a hem up or down)	Adjusted size/fit	Changed zipper
Laitala and Boks (2012)	Survey year: 2010 268 participants (aged 15-60+) Survey selection is female dominated (83%)	Norway	73	55	31	27	26	16	10
Laitala and Boks (2012)	Survey year: 2011 1 124 participants (aged 18-60+) Gender of participants equally represented	Norway	64	52	34	NA	NA	NA	NA
Laitala and Klepp (2018)	Survey year: 2011 1 001 participants (aged 18-60+) Gender of participants equally represented	Norway	51	41	NA	25	NA	NA	NA

4241 *Source: own production based on references indicated in the first column of the table*

4242 The data collected regarding the respondents who have made repairs to their apparel in the past year (**Table**  
4243 **72**) refers to their own willingness to repair and is not always correlated with the user repairing capabilities.

4244 The data collected in **Table 73** regarding how confident users are to repair their apparel is related to their own  
4245 willingness to repair and is not always correlated with the user repairing capabilities or skills. Additionally, a  
4246 summary of surveys that showcase how confident users are to mending their apparel depending on the type  
4247 of repair needed may be found in **Table 74**.

4248 **Table 73.** Summary of surveys that showcase how confident users are to mending their apparel depending on the type of  
4249 repair needed.

Publication	Sample details and characteristics of the study	Country	% of respondents who are confident undertaking apparel repairs					
			Sew a button on	Repair holes or worn areas in the apparel (darning)	Lengthen or shorten pants (take a hem up or down)	Adjust size/fit	Changed zipper	Stain removal
WRAP (2019)	Two waves of online surveys: Wave 1 was conducted in November 2016 and Wave 2 in June 2019.	Denmark (DK), Germany (DE), The Netherlands (NL) and Italy (IT)	DK 75 DE 75 NL 70 IT 69	DK 52 DE 46 NL 40 IT 48	DK 46 DE 30 NL 35 IT 32	DK 27 DE 17 NL 25 IT 36	DK 25 DE 25 NL 25 IT 29	DK 72 DE 69 NL 71 IT 61

	The sample size in 2016 was 1 000 per country. In 2019 the samples were as follows: Denmark 1 046; Germany 1 113; The Netherlands; 1 117 and Italy 1 226							
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4250 *Source: own production based on references indicated in the first column of the table*

4251 **Table 74.** Summary of surveys that showcase overall declared frequency of apparel repairs.

Publication	Sample details and characteristics of the study	Country	Overall declared frequency of apparel repairs without specifying the type of repair				
			% of users who have repaired apparel in the past 6 months	% of users who have repaired apparel in the past year	% of users who repair apparel often	% of users who repair apparel sometimes	% of users who never mended apparel
Laitala and Boks (2012)	268 participants (aged 15-60+) Survey selection is female dominated (83%)	Norway	NA	NA	35	51	14
EPA Circular Economy Programme and B&A (2021)	Survey year: 2011 1 000 participants (aged +16) Gender of participants equally represented	Ireland	NA	43	NA	NA	NA
CECU and Amigos de la Tierra (2022)	1 011 participants (+25)	Spain	67.3* (the question included footwear too)	NA	NA	NA	NA

4252 *Source: own production based on references indicated in the first column of the table*

4253 The aptitude to repair is the same or very similar disregarding the country. Denmark and German consistently  
 4254 rank higher in repair confidence across various activities, while the Netherlands and Italy generally exhibit lower  
 4255 but still varied confidence levels. These variations may stem from cultural, educational, or societal factors  
 4256 influencing attitudes toward apparel repairs in each country. However, all countries seem to have high level of  
 4257 confidence in sewing a button and repairing holes or worn areas in the apparel.

4258 Bottom line is that the apparel's general quality, and consequently its value, influences the consumer's decision  
 4259 on whether to consider it worthwhile to invest time and money in repairing. Hence, the importance of a good  
 4260 design that may contribute to strengthen the emotional product-person attachment with the apparel.

4261 **9.6.2.9 The storage of apparel**

4262 The storage of apparel can be done for active or inactive apparel. Storing active apparel would be the action of  
 4263 placing inside wardrobes, for instance, all those apparel items that an individual wears regularly. In other words,  
 4264 the apparel that users move between use and storage frequently (Cluver, 2008). Inactive apparel items  
 4265 constitute the apparel kept at home without being used for an undetermined time. These are represented by  
 4266 the over 30% of apparel stored in Europeans closets that have not been used for a year or even more time  
 4267 (European Parliamentary Research Service, 2019).

4268 Inactive apparel may comprise apparel that do not fit. In fact, this seems to be generally the case among  
 4269 consumers (Bye and McKinney, 2007). Therefore, why would consumers store items that are not able to use  
 4270 due to their body size? The wishful thinking that the apparel will eventually fit again may trigger the storing of  
 4271 these apparel. In certain cases, this practice may also help some consumers to monitor their weight. This  
 4272 temporary storage of inactive apparel, can be understood as keeping apparel that are not worn for an unknown  
 4273 time period before doing something different with them. Temporary storage may be done while the users are

4274 considering the best way to dispose the apparel, when waiting for the apparel to be back in fashion, to repair  
4275 in the case of wear and tear or just because they want to make sure there was no longer a way to make use  
4276 of the apparel (Cluver, 2008). Interestingly enough is the fact that basic apparel that were once very necessary  
4277 for the user, even though no longer in fashion and/or suffered wear and tear, were stored until new apparel  
4278 were purchased to substitute them (Cluver, 2008).

4279 Bye and McKinney, (2007) carried out surveys in which respondents indicated that inactive apparel could be  
4280 linked to the past personality of the owner who no longer wants to be attached to, hence the reason not to wear  
4281 them, but still feels like a part of their lives (Guy et al., 2001; Bye and McKinney, 2007). The respondents  
4282 indicated that they hold onto apparel that were no longer used because they allowed them to recall important  
4283 people and past experiences they had while wearing them (sentimental value). In other cases, the consumer  
4284 keeps apparel that were purchased because of a wrong choice just to justify the price paid for them (investment  
4285 value). Finally, some consumers keep certain apparel because a perceived aesthetic value attached to them.

4286 Around 13% of 350 000 Vinted users who are engaged in the resale of apparel items report to store in the  
4287 closet the items that they do not manage to sell in the online platform Vinted, without the intention of using  
4288 them (Vinted, 2021).

4289 It can be concluded that the storage of apparel items, whether temporary or not, seem to be strongly linked to  
4290 a person-product attachment.

### 4291 **9.6.3 User behaviour regarding the disposal of apparel**

#### 4292 **9.6.3.1 Reasons for the disposal of apparel**

4293 Disposal of apparel happens when a user transfers its ownership to another person or entity (Cluver, 2008).

4294 Henninger et al., (2021) investigated 154 papers of which 32 touch upon the user behaviour related to the  
4295 disposal of apparel items. Moreover, most of the studies were published after 2015 which showcases that it  
4296 is a topic that is recently gaining more attention than the past (Henninger et al., 2021).

4297 The individual characteristics of the consumers, their habits, demographic context, product traits and quality  
4298 seem to influence the user's decision to get rid of a product (Cluver, 2008; Goworek et al., 2012, as cited in  
4299 Harris et al., 2016; Sandin et al., 2019).

4300 The perceived quality of a product is decisive when consumers decide to get rid of a piece of apparel, either  
4301 because it seems to be worn-out or no longer functional (Aakko and Niinimäki, 2022). Moreover, certain studies  
4302 document that low quality, may trigger an early disposal of apparel (Piippo et al., 2022). The fact that some  
4303 consumers often want to own new apparel shortens their time in use too (Piippo et al., 2022). Early disposal of  
4304 apparel may be also accentuated due to the loss of the symbolic perceived value of apparel for the consumer  
4305 (Gwozdz et al., 2017).

4306 The two most common reasons for the disposal of apparel for both, female and male German participants to a  
4307 survey were material defects due to wear and tear and an inappropriate size. For German men, the third most  
4308 common reason to dispose apparel is that it had fallen out of shape. This reason was also mentioned by the  
4309 female respondents, but it was more often stated that the apparel simply was not liked anymore. In this regard,  
4310 the female respondents from the youth group stand out. The percentage of those who disposed apparel because  
4311 they no longer liked it is significantly larger in this social segment than among female respondents from other  
4312 social environments and almost twice as much compared to the male respondents from the same social group.  
4313 Reasons related to taste, fashion or personal style are more commonly mentioned among the young people  
4314 (Kleinhüchelkotten et al., 2018).

4315 Similarly, in the case of a survey with Norwegian women, the fact that the product is worn or damaged comes  
4316 as first reason to dispose apparel. The second reason for disposal is that the owner may be tired of the product  
4317 and wants something new due to new consumer needs (Klepp and Grimstad, 2001).

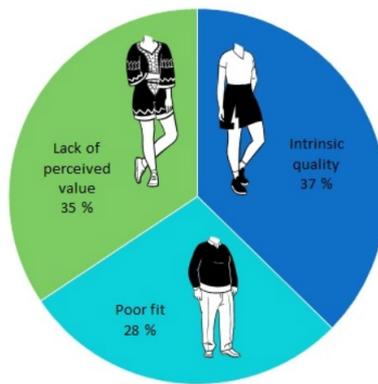
4318 The decision to dispose apparel, and how frequently it happens, is also influenced by the price of the apparel.  
4319 There is evidence that consumers see higher value in more pricey apparel items (Morgan and Birtwistle, 2009;  
4320 Joy et al., 2012). This means consumers tend to dispose more frequently the cheapest apparel as they  
4321 understand that the value proposition in terms of durability and quality is lower (Lewis, 2015).

4322 The intrinsic or physical durability can be defined as the ability of a product to withstand the tear and wear of  
4323 time without its functionality and aesthetics being compromised. This is envisaged during the design phase of

4324 the product when the selection of materials, modelling, etc. focused on improving the robustness of the article  
 4325 (Alliance of Commerce and Deloitte, 2022).

4326 The intrinsic durability of apparel may be lost due to abrasion, colour changes, broken zipper, soiling that cannot  
 4327 get cleaned, etc. (Laitala and Boks, 2012). However, Laitala and Boks (2012) reported that the examination of  
 4328 disposed apparel showed that there is a great difference in opinions regarding when the apparel is too worn  
 4329 out to be used. Some users did not mind pilling or small holes, whereas for others, these changes indicated the  
 4330 apparel was worn out and were important disposal reasons.

4331 **Figure 46.** Main reasons for disposal of apparel



Source: Kirsi Laitala and Ingun Grimstad Klepp, SIFO

4332  
 4333

4334 Across all countries reported in **Table 76**, a significant percentage of participants cite intrinsic quality as a  
 4335 primary reason for the disposal of apparel, indicating a shared concern for durability and material integrity.  
 4336 Additionally, fit problems are a consistent factor influencing apparel disposal, suggesting that comfort and  
 4337 suitability play a universal role in user behaviour. Participants in most countries mention perceived value,  
 4338 indicating that subjective judgments, such as taste-related unsuitability, impact their decision to dispose  
 4339 apparel. Changing fashion trends contribute to apparel disposal across various countries, emphasizing the  
 4340 influence of style preferences on user behaviour.

4341 Furthermore, the survey run by Cooper and Claxton in 2022 on 1 476 disposed apparel items unveiled various  
 4342 types of physical issues. The predominant problems were associated with colour fading, particularly in jersey  
 4343 and woven fabrics, and pilling in knitwear and jersey items. Fabric deterioration, characterized by fraying,  
 4344 especially around hems, as well as wear around the crotch of trousers and jeans, and accidental damage such  
 4345 as stains, tears, and rips, were also prevalent. Other forms of failure included the loss of dimensional stability,  
 4346 logo malfunction, discoloration, notably in the collar area of white shirts, holes in seams (including jacket  
 4347 linings), and trim failure. The percentages are calculated based on all apparel in the sample. Notably, 69% of  
 4348 all apparel exhibited either a colour-related or logo problem, while 75% experienced fabric-related issues,  
 4349 indicating that many apparel had multiple problems (Cooper and Claxton, 2022b). The physical failures found  
 4350 in disposed apparel are indicated in **Table 75**.

4351 **Table 75.** Recorded problems in apparel (% of all apparel items)

Type of Failure	%
Colour fading	53
Fabric breakdown	29
Accidental damage	29
Loss of dimensional stability	20
Logo failure	16
Discolouration	15
Hole(s) in seams	14
Trim failure	8

4352 Source: Cooper and Claxton (2022).

4353 The overall implication of the data reported above is that the reasons for the disposal of apparel exhibit a  
 4354 complex interplay of individual factors. Quality and fit are universal concerns, suggesting a global emphasis on  
 4355 durable and well-fitting apparel. Cultural differences emerge in the importance placed on perceived value, taste-  
 4356 related aspects, situational reasons, and responsiveness to fashion changes.

4357 While each study contributes valuable insights, the combined dataset offers a more comprehensive  
4358 understanding of global apparel disposal trends. Variations in sample characteristics and the scope of data  
4359 collection highlight the importance of considering multiple studies for a holistic perspective.

4360

4361 **Table 76.** Summary of apparel disposal reasons in recent consumer studies with high number of participants.

Publication	Sample details and characteristics of the study	Country	Main reasons for the disposal (expressed in % of respondents)						
			Intrinsic quality	Fit issues	Perceived value (e.g. taste-related unsuitability)	Fashion changes	Other (e.g. Situational reasons, functional shortcomings)		
Greenpeace (2015)	1 011 participants	Germany	92	72	64	40	NA		
Ungerth and Carlsson (2011)	1 014 participants (aged 16-74)	Sweden	60	8	21	NA	9		
Laitala and Boks (2012)	546 participants (adult population, age groups not defined) 77% of the subjects were women and the 25-39 age group is overrepresented in comparison to the rest age groups	Norway	49	19	11	NA	19		
YouGov (2019)	1 006 respondents representative of the Italian population aged 18+	Italy	31	24	20	NA	25		
Laitala and Klepp (2020)	1 111 participants (aged 18-65) Women and men are equally represented in all countries	China, Germany, Japan, United Kingdom, and USA	44	13	35	NA	9		
WRAP (2017b)	2 058 participants	United Kingdom	18	42	33	NA	NA	NA	NA
Lang, Armstrong, and Brannon (2013)	555 participants	USA	30	31	39	NA	NA	NA	NA

4362 *Source: own production based on references indicated in the first column of the table*

4363

4364

4365

4366 **9.6.3.2 Disposal channels for apparel**

4367 By 1 January 2025, mandatory separate collection of textiles will be set in the EU Member States as required  
 4368 by Article 11(1) of the Waste Framework Directive. Additionally, the Commission has proposed the  
 4369 establishment of mandatory extended producer responsibility (EPR) schemes designed to streamline and put in  
 4370 place collection, sorting, reuse, preparation for reuse, and recycling infrastructure required to address the  
 4371 material collected once the separate collection obligation takes effect<sup>146</sup>. Moreover, the on-going review of the  
 4372 Textile Labelling Regulation is exploring whether to introduce specifications for physical and digital labelling of  
 4373 textiles, including end-of-life disposal instructions and other circularity parameters based on requirements  
 4374 under the proposed Regulation on eco-design for sustainable products and on the implementation of EPR  
 4375 schemes across Member States.

4376 The person-product type of attachment plays a key role in how apparel may be disposed of. If there are positive  
 4377 associations with a piece of apparel, this might be gifted to relatives or friends while if there is a negative  
 4378 association the apparel may end up being donated, swapped or just disposed in the general waste bin (Joung  
 4379 and Park-Poaps, 2013; Lewis, 2015). Throwing away (usable) apparel is associated with bad conscience and  
 4380 moral aspects hence they are given to friends, family and charities as the preferred way to dispose of the  
 4381 apparel (Klepp and Grimstad, 2001).

4382 The surveys in **Table 77** show disposal trends in different countries. In both surveys, donating apparel to charity  
 4383 emerges as a popular choice among participants, indicating a shared inclination towards contributing to  
 4384 charitable causes through apparel. Also, both surveys highlight the significance of giving apparel to family and  
 4385 friends as a prevalent disposal method, suggesting a common practice of sharing apparel within one's social  
 4386 network.

4387 Koukouvinos (2012) emphasizes a higher inclination towards using apparel as cleaning cloths, while Laitala and  
 4388 Boks (2012) highlight a significant number opting to put apparel in the general waste bin. Both studies lack  
 4389 detailed insights into alternative methods such as selling or storing apparel for potential future use. The survey  
 4390 from Laitala and Boks (2012) with a larger, albeit undefined, adult population sample, likely captures a more  
 4391 diverse range of disposal behaviours, offering broader insights into apparel disposal patterns.

4392 By and large, the studies reported in **Table 77** provide valuable insights into apparel disposal practices. While  
 4393 there are some differences in terms of the represented countries, the similarities in identified disposal methods  
 4394 across the survey results suggest common trends in how individuals choose to handle apparel they no longer  
 4395 need or use. The prominence of charitable donations and sharing within social circles appear to be consistent  
 4396 behaviours, transcending geographical and cultural boundaries to some extent. The survey run by Vinted differs  
 4397 to some extent, as participants were asked what would they do with the apparel items that they did not manage  
 4398 to sell in the online platform Vinted.

4399 **Table 77.** Surveys responses on main types of alternative apparel disposal

Publication	Sample and characteristics of the study	Country	Main types of alternative apparel disposal (expressed in % of respondents)			
			Donate to charity	Give to family/friends <sup>147</sup>	Used as cleaning cloth <sup>147</sup>	Discarded in the general waste bin at home
Koukouvinos (2012)	201 participants (aged 18-35) 75% of the subjects were women	Greece	51	59	45	NA
Laitala and Boks (2012)	546 participants (adult population, age groups not defined)	Norway	36	12	8	27

<sup>146</sup> Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste (COM/2023/420 final). Available here: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52023PC0420>

<sup>147</sup> The quality of these products is unknown.

Vinted (2021)	350 000 participants	Belgium, Germany, Spain, France, Italy, The Netherlands, Poland and United Kingdom	19	19	NA	Less than 1
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4400 Source: own production based on references indicated in the first column of the table

4401 Finally, it is also important to note that the primary finding of the European Commission's Directorate General  
4402 Joint Research Centre (2021) study on the quality of clothing found in residual waste is the existence of a  
4403 correlation between the proportion of separately collected clothing and the average quality and value of clothing  
4404 discarded in residual waste. According to this study, this correlation is partly due to households making  
4405 discerning decisions based on the perceived monetary value of clothing, determining which items are suitable  
4406 for donation or resale for reuse and which have minimal potential for reuse. This idea is supported by a study  
4407 conducted in Denmark in 2018 (Watson et al., 2018), which strengthens this theory. The study suggests that  
4408 the 42 000 tonnes of clothing disposed of in Danish residual waste for incineration in 2017 had an estimated  
4409 value of 12-15 million euros before disposal. In contrast, the 36 000 tonnes of clothing separately collected  
4410 were sold on reuse markets for an estimated 65 million euros, indicating a value per tonne four to five times  
4411 higher. As a result, it appears to be commonly understood that textiles with the least potential for re-use are  
4412 more abundant in the textile portion of mixed municipal waste, but the limited existing research presents  
4413 inconclusive results according to [Huygens et al., 2023](#).

### 4414 9.6.3.3 Person-product attachment

4415 The emotional attachment formed between the apparel and the consumer is generally referred to as 'person-  
4416 product attachment'. This type of connection between a textile item and the user has an influence on how long  
4417 consumers own a textile and how often they make use of it. This person-product attachment is usually  
4418 embedded in the term 'emotional durability' which goes beyond just functionality. The Ellen MacArthur  
4419 Foundation report (Ellen MacArthur Foundation, 2021) defines emotional durability as: 'the product's relevance  
4420 and desirability to a user, or multiple users, over time'. A product that holds emotional durability tells a  
4421 compelling narrative, creates history with its users through bonding and aligns with their values.

4422 The ownership of apparel could be 'active' (i.e. use on a daily basis or several times a week), 'seldom' (use  
4423 several times a year) or 'inactive or in storage' (very rarely or never use the apparel) (Niinimäki and Armstrong,  
4424 2013).

4425 Niinimäki and Armstrong (2013) carried out a survey with over 400 participants from United States of America  
4426 (45.1% were men). The sample ranged in age from 18 to 67: 18-24 (7.5%), 25-34 (27.4%), 35-44 (23.5%),  
4427 45- 60 (28.1%), and over 60 (13.5%), most of whom were Caucasian/white (88.0%) and had completed a  
4428 college degree or higher (66.1%). **Table 78** collects the elements that generate person-product attachment  
4429 listed according to the number of times each of them were mentioned by the respondents to the questionnaire.

4430 **Table 78.** Elements that generate person-product attachment (Niinimäki and Armstrong, 2013).

Order of relevance	Element	Description (in order of most referenced by users)
1	Functionality	Comfortable Good fit Multi-function Functional (good for sports and hide body deformation) Easy to match Easy to put on
2	Memory	Memories (youth and childhood) Received from special person Family ties Remind of special person Represent membership to a group (e.g. team/band)
3	Emotional satisfaction	Look/feel good in it Receive compliments wearing the piece of apparel Love the brand
4	Design and style	Good design (e.g. cool looking) In style
5	Fabric and material	Nice colour

Order of relevance	Element	Description (in order of most referenced by users)
		Pleasant to touch (silky and soft) Fabric aesthetic (not thick, light weight, and sparky) Flexible (not stretched)
6	Personal values	Uniqueness Feel relaxed in it
7	Quality	Durable High quality in manufacturing High quality in material
8	Effort invested	Reward for self Hand made
9	Financial value	Price (good deal and very expensive)

4431 *Source: Niinimäki and Armstrong (2013).*

4432 The findings showed that apparel that were purchased brand-new turned out to have the highest emotional  
4433 attachment for the respondents. This is largely explained by the fact that there is a widespread idea of 'new'  
4434 apparel as something that has a value in itself. New apparel are clean canvas, both in the sense that they are  
4435 physically clean, i.e. free of spots, presentable and hygienic, but it is also 'mental clean' in the sense that it is  
4436 free from stories attached to the apparel in question (Forbrugerrådet Tænk, 2022).

4437 Moreover, it is the frequently used regular T-shirts, dresses and jeans the ones respondents indicated to be  
4438 more meaningful to them. Functionality, a special memory, emotional satisfaction were the most repeated  
4439 attributes by the respondents that help promoting emotional attachment to apparel.

4440 The value found in new apparel is a major barrier to reuse and is also reflected in the fact that apparel are  
4441 used more when they are brand new than when they have several years. In fact, apparel purchased as second  
4442 hand are used 30 per cent less than those purchased as brand new (Forbrugerrådet Tænk, 2022). On top of  
4443 that, it should be noted that reuse may increase the possession span of the apparel, but does not necessarily  
4444 increase the use of the apparel (Forbrugerrådet Tænk 2022; Laitala and Klepp 2021).

4445 The durability and active use of apparel depends on the robustness and longevity of its materials but also on  
4446 the changing trends, needs and wishes of consumers. Emotional durability remains a forward-looking issue,  
4447 which is difficult to measure because it is intrinsically linked to consumer perceptions and brand representations.  
4448 Its understanding is based on social sciences concepts and there is no evaluation methodology that has been  
4449 fully tested (Alliance of Commerce and Deloitte, 2022).

4450 However, apparel may have a certain initial physical or functional lifetime that may be extended if a strong  
4451 product-user relationship is promoted by retailers. For instance, retailers can maximise the value of the apparel  
4452 they sold by ensuring that the design meets real long-term needs and that incorporates a particular added  
4453 value which prevents the user from an early disposal of the textile product (Niinimäki and Armstrong, 2013;  
4454 Alliance of Commerce and Deloitte, 2022). The aim would be to create articles that can be adapted to the  
4455 different stages of consumer life, integrating more modularity (multi-seasonality, reversibility, extensibility, etc.)  
4456 and facilitating alterations, or offering timeless products whose colours and shapes are resistant to changes in  
4457 trends. To enhance the perceived value of their articles, brands can rely on personalisation levers or marketing  
4458 methods such as co-creation, tailor-made manufacturing or limited series, which make it possible to create an  
4459 emotional attachment of the customer to their apparel, while limiting promotions and the continuous inflow of  
4460 novelties (Alliance of Commerce and Deloitte, 2022). Bottom line is the role of the quality of the apparel. Laitala  
4461 et al., (2021) asked a number of consumers what aspects would incentivise them to wear their apparel longer.  
4462 The most repeated answer both for men and women was if the apparel were of better quality. In this line, 92%  
4463 of 101 visitors to a dress exchange at Greenpeace Hamburg declared that they would wear apparel for more  
4464 than a year if they were of good quality. 89% of participants to the same survey indicated that if apparel  
4465 maintained their shape and colour for a longer period would also incentivise them to wear apparel for longer.  
4466 The third most commented reason for wearing apparel for longer was if there was a bonding with the apparel  
4467 (product-person attachment) (Kleinhüchelkotten et al., 2019).

4468 All in all, the consumers deal with objects in different ways. This is the main reason why the product-user textile  
4469 attachment is quite subjective and difficult to draw conclusions from. However, it seems clear that the lifespan  
4470 of a product can be increased by triggering consumer's emotional attachment towards apparel. On this note,  
4471 the designers may play an important role in stimulating the length of ownership and use of apparel when  
4472 choosing the fabrics, the type of confectionary work and durable design. Through each design decision, the long-  
4473 term customer satisfaction may be increased, resulting in a higher emotional user-product attachment.

#### 4474 **9.6.3.4 Returns of apparel**

4475 Convenience seem to be the main reason for buying online as reflected by half of the usual online customers  
4476 in the survey run by AK Wienn and Greenpeace (2023). However, if the consumer lacks the time to return a  
4477 parcel to a retailer with a non-flexible returns policy, he or she may be more selective when choosing what to  
4478 buy to avoid having to keep the purchased items because the time to return the items is up. This may be one  
4479 of the reasons why longer periods for free returning allow for ordering more apparel as the customer has a  
4480 more relaxed approach to the potential returns. At the same time, it can happen that for some consumers  
4481 returning online buy-outs is deemed a barrier because it becomes cumbersome to send it back, despite the type  
4482 of return policy that the retailer may offer. This means that apparel that do not fit, or apparel that are not up  
4483 to the customer's preference, end up stored in the cabinet (Forbrugerrådet Tænk, 2022).

4484 An on-going study from the European Environment agency retrieved that casual dresses and jackets have the  
4485 highest return rate followed closely by jeans and vests. Interestingly, the same EEA study found that expensive  
4486 products have more probability of being returned. An explanation for this behaviour has not been found.

4487 When it comes to demographics, it is not widely analysed in the scientific literature whether it is females or  
4488 males who are more prompt to return apparel. A study pinpointed that women return more online purchases  
4489 than men (AK Wienn and Greenpeace, 2023). This seems to be supported by the fact that womenswear is the  
4490 winner category of apparel when it comes to returns (British Fashion Council's Institute of Positive and Roland  
4491 Berger, 2023). Moreover, young consumers are more likely to order online and return apparel more frequently  
4492 as they tend to buy more apparel and order several sizes compared to other age groups (AK Wienn and  
4493 Greenpeace, 2023).

4494 According to the results of the Foresight Factory survey fit issues is the first reason for returns by consumers  
4495 (Foresight Factory, 2021; Zimmermann et al., 2021). The second most popular reason to return apparel is taste-  
4496 related unsuitability of an item and/or its product details for the consumer. In this category, the share of total  
4497 returns in Zimmermann et al. (2021) corresponds to the dislike of the shape or cut of the apparel (16%), a  
4498 dislike for the material (8%) and colour or pattern (6%).

4499 Online shopping often leads to mis-buying (Forbrugerrådet Tænk, 2022). The main reasons found in the  
4500 literature for returning apparel are problems fitting the item and the dislike of the apparel by the consumer.  
4501 These two reasons are closely followed almost equally by lack of quality of the apparel and receiving a faulty  
4502 item. A survey run by Foresight Factory in 2021 with over 20 000 respondents, reports the same main reasons  
4503 for returning apparel by consumers; 38% of them reported that the items did not fit well while 15% of  
4504 respondents indicated that the apparel did not suit them. Quality was not enough for 14% of the survey  
4505 participants and 13% of them received faulty items (Foresight Factory, 2021).

4506 It is interesting to see that in the study from Zimmermann 2021, returning items because the order included  
4507 several apparel of the same kind in different sizes, is not among the main reasons for returning goods  
4508 (Zimmermann et al., 2021). The same thing is reported by the survey from Foresight Factory, in which only 6 %  
4509 of the respondents explicitly indicated that they bought multiple sizes but did not intend to keep all the ordered  
4510 items. The same percentage of users reported that they purchased multiple styles without the intention to keep  
4511 everything (Foresight Factory 2021).

4512 The fitting issues that usually come with ordering apparel online are often linked to the inability of consumers  
4513 to interpret correctly the sizing scales offered in some online sites but there may be also cases of inconsistent  
4514 and not correct sizing (Vladimirova et al., 2022).

4515 Products with perceived low quality, less durability and the remorse of the consumer due to buying apparel are  
4516 also highlighted as potential reasons for returning apparel (Bernon et al., 2011).

4517 A lot of consumers have a look at the return policies before purchasing items online (Asdecker and Sucky, 2019;  
4518 Makov, 2023). In fact, 70% of consumers indicate that whether they repeat a purchase on a site or not, depends  
4519 on their return experience (Asdecker and Sucky, 2019). Nonetheless, it seems that most users assume that the  
4520 returned items are always put back into sale when this is not necessarily the case due to the complex reverse  
4521 logistics of the supply chain (Makov, 2023).

4522 In summary, with the data available, it is not possible to clearly distinguish between the behaviour regarding  
4523 apparel returns of men and women. Nonetheless, some studies stress that younger generations return more  
4524 items given their tendency to buy apparel more often. The influence different demographic aspects play when  
4525 returning products have not been possible to analyse.

4526 Reasons for returning items purchased online tend to have a common root: the difficulties users have choosing  
 4527 the appropriate size and the right product based on the online descriptions. Furthermore, studies exploring the  
 4528 reasons for returning products at physical stores have not been found. This may be because online returns are  
 4529 comparatively much higher than those at physical stores. The impossibility for consumers to try the apparel on  
 4530 the spot and have a tactile experience contributes to this difference in number of returns between the online  
 4531 and physical store shopping.

4532 **Table 79.** Reasons for returning apparel to e-commerce

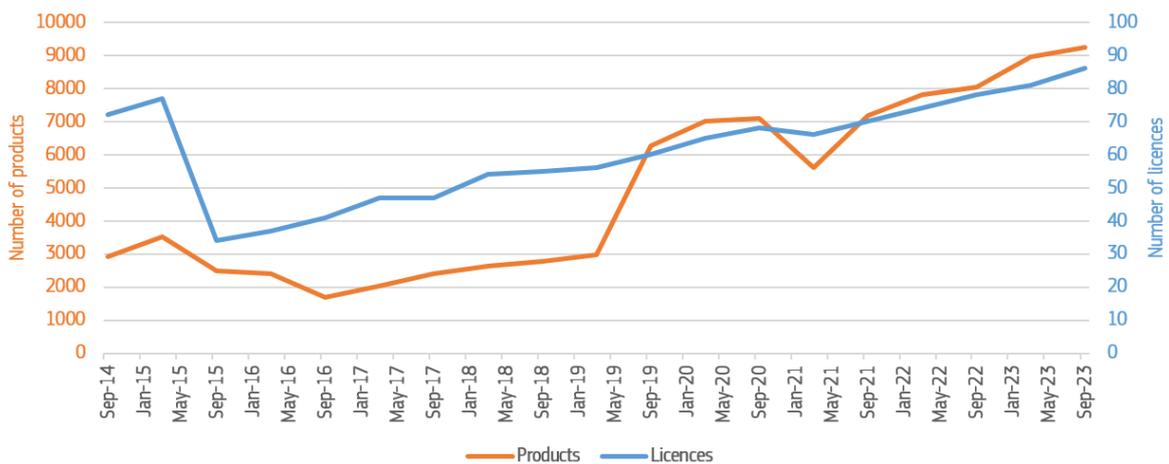
Publication	Sample details and characteristics of the study	Country	Reason for returning (expressed in % of respondents)				
			Fit issues	Taste-related unsuitability	Insufficient perceived quality	Faulty items	Change of mind
Foresight Factory (2021)	20 000 participants	United Kingdom, United States, Canada, Australia, France, Germany, Italy, Netherland, Norway, Japan, Saudi Arabia and UAE	38	15	14	13	8

4533 *Source: own production based on references indicated in the first column of the table*

4534 **9.7 Supporting information about environmental labels and current EU Ecolabel**  
 4535 **criteria**

4536 **9.7.1 Figures of EU Ecolabel for textile products**

4537 **Figure 47.** Evolution of licences and products awarded with EU Ecolabel for textile products



4538 *Source: own elaboration based on EU Ecolabel facts and figures (148)*  
 4539

<sup>148</sup> EU Ecolabel facts and figures. Available at [this link](#). Last accessed on 12 January 2024.

4540 **Table 80.** Figures of EU Ecolabel for textile products in September 2023

Licences			Products		
Competent body	Number	Percentage compared to the total number (%)	Competent body	Number	Percentage compared to the total number (%)
Denmark	24	28	Portugal	3854	42
Italy	18	21	Italy	3359	36
Norway	11	13	Denmark	1338	14
Austria	6	7	Sweden	172	2
Germany	5	6	Netherlands	164	2
Netherlands	5	6	Norway	161	2
Sweden	5	6	Poland	89	1
Czechia	3	3	Austria	50	1
Bulgaria	2	2	Czechia	31	0
Spain	2	2	Germany	14	0
Poland	2	2	Spain	9	0
Belgium	1	1	Bulgaria	7	0
Portugal	1	1	Belgium	1	0
Romania	1	1	Romania	1	0
Cyprus	0	0	Cyprus	0	0
Estonia	0	0	Estonia	0	0
Greece	0	0	Greece	0	0
Finland	0	0	Finland	0	0
France	0	0	France	0	0
Croatia	0	0	Croatia	0	0
Hungary	0	0	Hungary	0	0
Ireland	0	0	Ireland	0	0
Iceland	0	0	Iceland	0	0
Lithuania	0	0	Lithuania	0	0
Luxemburg	0	0	Luxemburg	0	0
Latvia	0	0	Latvia	0	0
Malta	0	0	Malta	0	0
Slovenia	0	0	Slovenia	0	0
Slovakia	0	0	Slovakia	0	0

4541 The licence is awarded to a company by a competent body. A licence can include the award of the EU Ecolabel to one or more products.  
 4542 The expression 'number of products' does not refer to the number of items related to a specific product.

4543 *Source: Own elaboration after consultation with EU Ecolabel Helpdesk*

## 4544 9.7.2 Contributions to the initial questionnaire

4545 **Table 81.** Type of respondents that contributed to the section on EU Ecolabel during the initial questionnaire

Type of respondent	Number	Percentage compared to the total (%)
University or research institute	2	6
Certified laboratory	0	0
Government (local, regional, or national)	6	18
Non-governmental organisation – Environment	2	6
Non-governmental organisation – Consumers	2	6
Industry – manufacturing	10	29
Industry – manufacturing - association	1	3
Industry – waste collection, sorting and treatment	0	0
Industry – waste collection, sorting and treatment - association	1	3
Distributor/Retailer	2	6
Distributor/Retailer association	1	3
Other	7	21
TOTAL	34	100

4546 Among the respondents of the questionnaire, 7 declared to be licence holders of the EU Ecolabel for textile products, and 4 declared to be  
 4547 competent bodies of the EU Ecolabel.

4548 *Source: own elaboration*

4549 **Table 82.** Suggestions received by respondents to the initial questionnaire on EU ecolabel criteria 1-9, which focus on  
 4550 fibres

Criterion	Suggestions
Criterion 1. Cotton and other cellulosic seed fibres	<ul style="list-style-type: none"> <li>- Make sure that only fibre-to-fibre from post-consumer waste is accepted;</li> <li>- Analyse the real traceability of fibres;</li> <li>- Investigate regenerative farming;</li> <li>- Focus only on organic cotton, disregarding the Integrated Pest Management cotton;</li> <li>- Establish a clear distinction between organic cotton and transitional organic cotton;</li> <li>- Investigate the implications of different minimum percentages of organic cotton;</li> <li>- Extend the analysis of restricted pesticides to recycled cotton;</li> <li>- Consider the expansion of the restricted pesticides following Blue Angel and Oeko-Tex 100.</li> </ul>
Criterion 2. Flax and other bast fibres	<ul style="list-style-type: none"> <li>- Investigate the possible use of the European Flax standards developed by the Alliance for the European Flax-Linen and Hemp;</li> <li>- Revise the COD and TOC limits as absolute values.</li> </ul>
Criterion 3. Wool and other keratin fibres	<ul style="list-style-type: none"> <li>- Assess the possible inclusion of organic fibres;</li> <li>- Consider the inclusion of biological husbandry control;</li> <li>- Specify that also recycled fibres should be checked for ectoparasiticide;</li> <li>- Ban mulesing;</li> <li>- Investigate the possible inclusion of specific certified wool, e.g. recycled, responsible and regenerated wool;</li> <li>- Question the ambition of pH, COD and temperature limit values.</li> </ul>
Criterion 4. Acrylic	Limit the residual acrylonitrile in raw fibres to 1.5 mg/kg.
Criterion 5. Elastane	Investigate the possibility to accept 5% of elastane if the current production of elastane does not involve a large use of organotin.
Criterion 6. Polyamide	<ul style="list-style-type: none"> <li>- Extend the traceability along the entire value chain of any feedstock material: recycled or virgin;</li> <li>- Investigate the effectiveness of verification methods if production occurs outside EU;</li> <li>- Include thresholds of CO<sub>2</sub> emissions.</li> </ul>
Criterion 7. Polyester	<ul style="list-style-type: none"> <li>- Remove the distinction between consumers and commercial or public sector customers;</li> <li>- Allow only fibre-to-fibre recycling;</li> <li>- Analyse the traceability of fibres: virgin and recycled.</li> <li>- Decrease the limit of antimony and accept its verification via a test.</li> <li>- Investigate the feasibility of verification of VOC emissions.</li> </ul>
Criterion 8. Polypropylene	Investigate the relevance of VOC emissions
Criterion 9. Man-made cellulose fibres	<ul style="list-style-type: none"> <li>- Increase the percentage of fibre coming from sustainable forestry management;</li> <li>- Include the regenerated fibres based on the FAO principles on sustainable forestry management;</li> <li>- Align the ambition of this criterion to the latest EU Ecolabel criteria for absorbent hygiene products;</li> <li>- Investigate how to better support applicants and CBs to check compliance with criterion 9(a);</li> <li>- Consider potential updates of the criterion 9(a) due to latest European Regulation;</li> <li>- Allow only use of organic cotton;</li> <li>- Question the ambition level of AOX emissions;</li> <li>- Investigate the use of the latest learnings about the Roadmap for cleaner viscose by Changing Market Foundation;</li> <li>- Investigate inclusion of other environmental impacts caused by the production of MMCF.</li> </ul>

4551 *Source: own elaboration*

4552 **Table 83.** Suggestions received by respondents to the initial questionnaire on EU Ecolabel criteria 10-12, which focus on  
 4553 components and accessories

Criterion	Suggestion
Criterion 10. Filling	Include specific sub-criteria addressing: <ul style="list-style-type: none"> <li>- animal welfare (e.g. prohibition of live plucking),</li> <li>- wastewater production,</li> <li>- hygiene requirements when downs and feathers are used.</li> </ul>
Criterion 11. Coating, laminates and membrane	<ul style="list-style-type: none"> <li>- Include limits about adhesives, organic solvents, and minimum recycled content;</li> <li>- Forbid the use of CFCs as foaming agents;</li> <li>- Include assessment of polyamide in criterion 11(b).</li> </ul>
Criterion 12. Accessories	Extend the scope of accessories as done in the criteria of Blue Angel.

4554 *Source: own elaboration*

4555 **Table 84.** Suggestions received by respondents to the initial questionnaire on EU ecolabel criteria 13-16 and annexes,  
 4556 which focus on chemicals

Topic	Suggestion
General points	<ul style="list-style-type: none"> <li>- Cover the entire supply chain;</li> <li>- Simplify requirements revising their proportionality;</li> <li>- Explicitly report the chemicals that should be analysed;</li> <li>- Improve the comprehension of the criteria.</li> </ul>
Criterion 13. Restricted Substances List (RSL)	<ul style="list-style-type: none"> <li>- Provide directions about the random sampling;</li> <li>- Investigate the use of ZDHC Gateway;</li> <li>- Assess aspects related to Hercosett method on wool;</li> <li>- Transparently report intentionally added chemicals;</li> <li>- Forbid any ingoing SVHC regardless of their concentration;</li> <li>- Use other certification schemes, such as Oeko-Text Standard 100 and Bluesign, as criterion verification.</li> </ul>
Criterion 14. Substitution of hazardous substances in dyeing, printing and finishing	<ul style="list-style-type: none"> <li>- Include restriction to substances that hinder recyclability, and reassess those currently derogated;</li> <li>- Ban substances classified as H400;</li> <li>- Consider the expansion of the following hazard classes: Persistent, bioaccumulative, Toxic (PBTs), very Persistent very Bioaccumulative (vPvBs); Persistent, Mobile and Toxic (PMT), Very Persistent very Mobile (vPvM), endocrine disruption;</li> <li>- Investigate the possibility to completely exclude flame retardants, biocides and optical brighteners.</li> </ul>
Criterion 15. Washing, drying and curing energy efficiency	Update the criterion considering the latest evolution of best available technologies.
Criterion 16. Treatment of emissions to air and water	<ul style="list-style-type: none"> <li>- Update the criterion considering the requirements set by the latest EU-BREF;</li> <li>- Include emission parameters set by the latest version of the Blue Angel criteria;</li> <li>- Investigate verification methods which would facilitate the process when a facility is located outside EU.</li> </ul>
Appendix 1. EU Ecolabel textile restricted substance list	<ul style="list-style-type: none"> <li>- Analyse the possible ways to verify chemical requirements when the supply chain is outside EU.</li> <li>- Assess the possibility to include in the RSL:               <ul style="list-style-type: none"> <li>• All per and polyfluoroalkyl substances (some exemptions remain for outdoor use)</li> <li>• Flame retardants</li> <li>• SVHC regardless of concentration</li> <li>• Biocides (currently allowed for transportation and storage)</li> <li>• Nanomaterials</li> <li>• Phthalates</li> <li>• Elemental chlorine or hypochlorite</li> <li>• Metal complex dyes</li> <li>• APEOS also in end products</li> <li>• PFAS</li> <li>• Chlorinated solvents</li> <li>• Organotin compounds</li> <li>• Azo dyes</li> </ul> </li> <li>- In (f), (ii) the term surfactant is redundant and the 95% is hard to interpret and calculate.</li> <li>- In verification column of (g), (ii) it can be more clear that non-use means no use of easy-care finish.</li> <li>- The term SDS could always be written as "SDS (updated REACH/GHS)" to prevent many outdated incomplete SDS.</li> </ul>
Appendix 2. Dye restrictions	<ul style="list-style-type: none"> <li>- Investigate latest updates adopted by other ISO Type I environmental labels and Oeko-Tex;</li> <li>- Consider inclusion of ZDHC MRSL v.3.0 or higher;</li> <li>- Analyse the possible ways to verify dye requirements when the supply chain is outside EU.</li> </ul>
Appendix 3. Best available techniques in the field of washing, drying and curing energy efficiency	<ul style="list-style-type: none"> <li>- Update the criterion considering the latest evolution of best available technologies;</li> <li>- For washing, assess formulations including surfactants (anionic and nonionic) together with polymers and enzymes with good cleaning performance at low temperatures.</li> </ul>

4557 *Source: own elaboration*

4558 **Table 85.** Suggestions received by respondents to the initial questionnaire on EU Ecolabel criteria 17-25, which focus on  
4559 fitness for use

Criterion/topic	Suggestion
Criterion 17. Dimensional changes during washing and drying	- Investigate latest updates adopted by other ISO Type I environmental labels; - Include examples of fabrics with interlock and chunky knit; - Include specific fibre groups that are missing; - Reassess the ambition level of the criterion.
Criterion 18. Colour fastness to washing	Investigate to include restriction to dry cleaning.
Criterion 19. Colour fastness to perspiration (acid, alkaline)	Verify if the depth method is still up to date; Investigate latest updates adopted by other ISO Type I environmental labels.
Criterion 20. Colour fastness to wet rubbing	Investigate latest updates adopted by other ISO Type I environmental labels.
Criterion 21. Colour fastness to dry rubbing	Investigate latest updates adopted by other ISO Type I environmental labels.
Criterion 22. Colour fastness to light	- Verify if the standard depth method is still up to date; - Investigate latest updates adopted by other ISO Type I environmental labels.
Criterion 23. Wash resistance of cleaning products	Investigate latest updates adopted by other ISO Type I environmental labels.
Criterion 24. Fabric resistance to pilling and abrasion	- Extend the possibility to verify the requirement using ISO 12945-3 (RTPT - random tumble); - Include more fibre groups. - Investigate latest updates adopted by other ISO Type I environmental labels.
Criterion 25. Durability of function	- Consider the possibility to include further durability aspects, as reported by latest publications; - Investigate aspects related to oil and stain repellence, which are connected to the use of PFAS; - Assess the exclusion of flame retardants.
Other	Include requirements on tear strength and zipper quality.

4560 *Source: own elaboration*

4561 **Table 86.** Suggestions received by respondents to the initial questionnaire on EU ecolabel criteria 26-28, which focus on  
4562 Corporate Social Responsibility and supporting information

Criterion	Suggestion
Criterion 26. Fundamental principles and rights at work	- Investigate the possibility to use the OECD Guidelines for Multinational Enterprises and the application to the entire value chain; - Assess the latest legislative developments reported in the proposal for the Corporate Sustainability Due Diligence Directive; - Change the headline to better reflects social aspects; - Include the ILO convention 190 and ILO Convention 185, or even going beyond the ILO core criteria; - Investigate the possibility to use other certifications, such as BSCI/Amfori, SMETA, to verify compliancy; - Align with the latest EU Ecolabel requirements for electronic displays and absorbent hygiene products.
Criterion 27. Restriction on the sandblasting of denim	- Investigate the possibility to use the OECD Guidelines for Multinational Enterprises and the application to the entire value chain; - Restrict potassium permanganate.
Criterion 28. Information appearing on the Ecolabel	- Investigate the possibility to include: <ul style="list-style-type: none"> <li>• a sentence about social aspects;</li> <li>• a specific recycled material content, with its traceability;</li> <li>• Information that sums up the requirements that the product meets;</li> <li>• the specific chain of custody model used for the traceability of virgin and recycled materials;</li> </ul> - Consider the latest proposal for Green Claims Directive.

4563 *Source: own elaboration*

4564

4565 **9.7.3 Comparison among Ecolabels**

4566 **Table 87.** Textile fibres - comparison among Ecolabels

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel	
<b>Organic cotton</b>	<b>Requirement</b>	Minimum quantity of organic cotton used to manufacture the final product to be labelled: 95%	Minimum quantity of organic cotton used to manufacture the final product to be labelled: 100%	Must be sourced from controlled organic cultivation or fibres from the conversion phase and comply with requirements of regulations and certificates.	
		N.A		At all stages of the processing chain, it must be ensured that controlled biological fibres and products are not mixed with conventional fibres and products and controlled biological fibres are not contaminated due to contact with prohibited substances.	
	<b>Verification</b>	Common regulation to certify organic cotton: American National Organic Programme (NOP)			
		Council Regulation (EC) No 834/2007	Regulation (EU) 2018/848		
		Traceability of organic cotton	N.A		Implied in the requirement text
Certification annually for each country or origin: Regulation (EC) No 834/2007; The US National Organic Programme (NOP), Set by other trade partners. Cotton volume or blend requirements require records, invoices, and documentation from the spinning or fabric production stages.	Fulfilling requirements, emphasising the cultivation of organic cotton in line with the standards. Transaction certificates for suppliers with Global Organic Textile Standard certification are needed.		Compliance verification of requirements. Fibres labelled with the German organic logo (Bio-Siegel), the EU organic logo ("Euro leaf"), or the American National Organic Program (NOP), IFOAM or DIN EN ISO/IEC 17065. For products in the conversion phase, certification of Fibre production is required, and in the case of RAL GmbH, a shipping or transaction certificate is necessary if relevant.		
<b>Other cotton production</b>	<b>Requirement</b>	Minimum content of 20% of cotton grown according to IPM principles, and 60% is the minimum content of cotton grown according to IPM principles for the following products: T-shirts, woman's tops, casual shirts, jeans, pyjamas, and nightwear, underwear, and socks.	Only applicable to clothing (uniforms and workwear) and bed linen, towels, bathrobes, tablecloths, tea towels, cloths, and napkins for, e.g., hotels, hospitals, and other institutions. Cotton cultivated according to different IPM standards (BCI, CmiA, and FairTrade cotton) and not GMO (genetically modified organisms according to EU Directive 2001/18)	Applicable to: the fibres used in the products must not be sourced from genetically modified organisms (GMO). In the case of fine yarns (fineness range > NM100), where the required fibre lengths cannot currently be sourced from the controlled organic cultivation of cotton	
		Traceability requirements.			
	List of forbidden pesticides for conventional cotton production	N.A		N.A	

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
		N.A	N.A	At all stages of the processing chain, it must be ensured that controlled biological fibres and products are not mixed with conventional fibres and products and controlled biological fibres are not contaminated due to contact with prohibited substances.
	<b>Verification</b>	<ul style="list-style-type: none"> <li>•Need for proper documentation or certification to demonstrate compliance with standards concerning cotton production.</li> <li>•Certified Integrated Pest Management (IPM) schemes during the cotton cultivation process: BCI, CmiA, and Fair Trade cotton.</li> <li>•Emphasis on the absence of genetically modified cotton and the traceability of the supply chain.</li> </ul>		The German Environment Agency can inspect to decide whether the cotton used in the product has been certified by a different certification system (e.g., Cotton Made in Africa (CmiA) and Fairtrade Cotton) can also be approved.
		Pesticide restrictions. Necessity for testing or declarations of non-use from farmers or producer groups. Comprehensive testing methodologies for pesticides such as US EPA 8081 B, 8151 A, 8141 B, and 8270 D for different types of pesticides.	N.A	N.A
<b>Recycled cotton (fibres or materials)</b>	<b>Requirement</b>	Same as the general recycling requirement	Pre-consumer or post-consumer raw materials, according to ISP 14021 standard Mechanically and chemically recycled fibres are included	The same requirements as the recycled Fibres
	<b>Verification</b>	Same as the general recycling requirement	Global Recycled Standard certificate 4.0 (or later versions), Recycled Claim Standards (RCS) or other certification approved by Nordic Swan Ecolabelling, AND/OR Documentation indicating the fibre was purchased 100% recycled and indicates the supplier	The same requirements as the recycled Fibres
<b>Flax, linen and other bast fibres</b>	<b>Requirement</b>	N.A	N.A.	Must be sourced from controlled organic cultivation or fibres from the conversion phase and comply with requirements of regulations and certificates. At all stages of the processing chain, it must be ensured that controlled biological fibres and products are not mixed with conventional fibres and products and controlled biological fibres are not contaminated due to contact with prohibited substances.
		Retted under ambient conditions and without thermal energy inputs.	Retting only allowed if the wastewater from the retting ponds is treated to reduce the COD or TOC	If the Fibres are produced using water retting, the water has to be treated to reduce the chemical oxygen demand (COD) or the total organic carbon
		Percentage by which COD or TOC in wastewater from retting should be reduced (at least 75% for hemp and at least 95% for flax and other bast Fibres)		

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
		N.A	Only cultivated using pesticides permitted according to Regulation (EC) No 1107/2009	N.A
		N.A	N.A	The fibres used in the products must not be sourced from genetically modified organisms (GMOs).
	Verification	For water retting: Test report showing compliance and using the test method: ISO 6060 (COD) Declaration of the retting method used by the farmers and/or other suppliers.	For water retting: Test method for measuring COD and TOC: ISO 6060. Test report from the producer or Proof of a valid EU Ecolabel licence in line with the Commission Decision of July 2014.	For water retting: Test of the COD will be carried out in accordance with ISO 6060 or DIN 38409-41 or DIN 38409-44 or DIN-ISO 15705.
		N.A	For pesticides: Valid certificate from European Flax Standard or equivalent.	Compliance verification Compliance with requirements: Fibres labelled with German organic logo (Bio-Siegel) or Euorganic logo ("Euro leaf") or American National Organic Programme (NOP), IFOAM or DIN EN ISO/IEC 17065. For products "in conversion" only if fibre production can be certificated. In the case of RAL GmbH --> a shipping or transaction certificate (if relevant), Regulation (EC) No 834/2007 2018/848 (EC Organic Regulation) Declaration of compliance with requirements and verification submission for using residues from the agricultural, timber and food industries.
Wool and other keratin fibres	Requirement	The <b>same restrictions on a group of ectoparasiticides</b> with a maximum of 0.5 ppm or a maximum of 2 ppm. The requirement does not apply if specific documentary evidence is presented, together with an independent verification of specific details.		N.A
		Derogation for Wool scourers operating closed-loop water systems that break down the ectoparasiticides above must comply with at least two treatments indicated in EUEL.	N.A	N.A
		<b>COD</b> values restrictions for wool scouring operations. Limits (same as the Nordic Swan) •45 g/kg for fine wool •25 g/kg for coarse wool	<b>COD</b> emissions from wool scouring plants. Limits (same as the EUEL) • 45 g/kg for fine wool • 25 g/kg for coarse wool Wastewater sent to local/regional treatment works is exempted. Measurement of PCOD, TOC or BOD may also be used if a correlation to COD is evident.	Requirements for wastewater from wool scouring before mixing (indirect discharge) The <b>COD</b> limit is 45 g/kg of greasy wool before mixing with other wastewater (it does not apply to recycled fibres) Requirements for wastewater from wool scouring at the discharge point (direct discharge) The COD limit is 150 mg/l (qualified random sample) or 1.5 mg/l (2-hour mixed sample) of greasy wool.

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
		N.A	<b>pH value and temperature</b> of wastewater from wool scouring The pH value of the wastewater released to the surface water must be 6-9 (same as Blue Angel), and the temperature must be lower than 40°C (higher temperature than Blue Angel's requirement)	<b>pH value of the wastewater</b> discharged to surface waters must be between 6 and 9 (same as the Nordic Swan) (unless the pH value of the receiving waters is outside this range), and the <b>temperature</b> must be below 35°C (lower temperature than Nordic Swan's requirement) (unless the temperature of the receiving waters is already above this limit). The requirement does not apply to recycled fibres.
		<b>Scouring:</b> Measures to recover value from either oxidised grease, fibre, suint or sludge arising from the scouring site used for the ecolabelled wool products •Recovery for sale as a chemical feedstock; •Production of compost or liquid fertiliser; •Manufacturing of products such as building materials; •Treatment and energy recovery by anaerobic digestion or incineration	<b>Scouring agents</b> Must be either readily aerobically biodegradable or inherently aerobically biodegradable by test method: OECD 301 A-F (60% degradability), OECD 310 (60% degradability), OECD 302 A-C (70% degradability) or equivalent.	<b>Scouring:</b> Exclusion of washing agents containing alkylphenol ethoxylates Washing agents containing alkylphenol ethoxylates (APEO) are prohibited. Direct and indirect discharge limits may not exceed 5µg/l APEO (NPEO, OPEO, NP, and OP).
		<b>Ectoparasiticides:</b> Provide the documentation or the following test methods: IWTO draft test method 59 (same as the Nordic Swan). In case of derogation, applicants must provide evidence confirming the scouring plant configuration and laboratory test reports.	<b>Ectoparasiticides:</b> Tests must be performed in accordance with IWTO Draft Test Method 59 (same as EU Ecolabel). Verify through the wool supplier's declaration that no mulesing has been used. Test report showing that the pesticide requirement has been fulfilled.	N.A
		<b>COD</b> same test for all: Test method ISO 6060 and the following compliance/verification methods		
	<b>Verification</b>	<b>COD:</b> Compliance with this criterion shall be based on monthly averages for the six months preceding the application.	<b>COD:</b> Test report or a valid GOTS or EU Ecolabel certificate	<b>COD:</b> Declaration of compliance with the requirements and confirmation from the operator of the wool scouring plant+ method treatment Test of the COD: DIN 38409-41 or, DIN 38409-44 or DIN-ISO 15705. If discharged to an urban wastewater treatment plant, the applicant shall also enclose a notice of approval verifying compliance with Directive (EEC) 91/271.

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
		<b>Scouring:</b> Provide a report and waste transfer notes confirming the type and proportion of waste recovered and the method used.	<b>Scouring:</b> Declaration from the chemical supplier and safety data sheet for the scouring agents used and/or OECD or ISO test results showing compliance with the requirement.	<b>Scouring:</b> declaration of conformity - Annex 57 of the German Wastewater Ordinance or equivalent international test reports. The following test methods can be used here (based on a qualified random sample or a 2-hour mixed sample): NPEO, OPEO, NP, and OP: ISO 18857-1, ISO 18857-2, ISO 18254-1 or ASTM D7742-17.
Organic wool	Requirement	N.A	Certified organic wool: wool fibre certified as organic according to a standard approved in the IFOAM.	Wool, alpaca and cashmere must be sourced from controlled organic cultivation, controlled biological animal husbandry, or fibres from the conversion phase (transition from non-organic to organic farming) and comply with the requirements indicated in "verification". At all stages of the processing chain, it must be ensured that controlled biological fibres and products are not mixed with conventional fibres and products and controlled biological fibres are not contaminated due to contact with prohibited substances.
	Verification	N.A	Certification required: standards approved in the IFOAM, such as Regulation (EU) 2018/848, ISO 17065), USDA National Organic Program (NOP) (same as Blue Angel)  APEDA's National Programme for Organic Production (NPOP), China Organic Standard GB/T19630, GOTS certification. Also approved are GOTS and DEMETER and certification as "transitioning to organic cultivation". The certification body must have the accreditation required for the standard, such as IFOAM (same as Blue Angel).	The applicant shall declare compliance with the requirement. Fibres labels accepted: German organic logo (Bio-Siegel), the EU organic logo ("Euro leaf") In the case of alpaca, certification according to the Responsible Alpaca Standard 1.0 © 2021 Textile Exchange. The certification of products" in conversion" is possible. In the case of cashmere, certification according to the Good Cashmere Standard® (GCS) by AbTF can be submitted as an alternative to certification of controlled biological animal husbandry.
	Requirement	Same as the general recycling requirement.	Recycled wool: As per the definition in the ISO 14021 standard. Both mechanically and chemically recycled fibres are included.	Same as the requirements for the recycled fibres.

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
Recycled wool	Verification	Same as the general recycling requirement.	Fulfilment with either a) or b): a) Global Recycled Standard certificate 4.0, Recycled Claim Standard certificate, or equivalent certification. b) Present documentation demonstrating that the recycled fibre was purchased as recycled and state the supplier.	Same as the requirements for the recycled fibres.
Acrylic	Requirement	The emissions to air of <b>acrylonitrile</b> (during polymerisation and up to the solution ready for spinning) shall be less than 1g/kg of fibre produced (same limit as Blue Angel) as an annual average.	<i>If bio-based origin:</i> Must contain at least 90% bio-based raw material. Palm oil, soybean oil, and soy flour must not be used. They must meet either a) or b): a) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001. b) If sugar cane is used, it must be certified to Bonsucro standard, version 5.1 or later version or certified to a standard that meets the requirements. The producer must have a CoC certification according to the standard by which the raw material is certified. Traceability must at least be ensured by mass balance. Book and claim systems are not accepted. The producer of the bio-based polymer must document its purchase of certified raw materials for polymer production. The raw materials must meet either c) or d): c) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001. d) Primary raw materials not genetically modified.	The emissions to air of <b>acrylonitrile</b> (during polymerisation and up to the solution ready for spinning), expressed as an annual average, must be less than 1 g/kg of fibre produced (same limit as EUEL) (this requirement does not apply to recycled fibres unless the recycling process breaks down the materials to the monomer level. If this is the case, this requirement also applies to recycled fibres) The <b>residual acrylonitrile content</b> in raw fibres leaving the fibre production plant must be less than 1.5 mg/kg (this requirement does not apply to recycled fibres unless the recycling process breaks down the materials to the monomer level. If this is the case, this requirement also applies to recycled fibres)
		The workplace emissions to air of <b>N, N-dimethylacetamide</b> (127-19-5) during polymerisation and spinning shall not exceed an Indicative Occupational Exposure Limit Value of 10.0 ppm.	<i>If fossil origin:</i> 100% recycled material. This must not include recycled plastic from EFSA plants or FDA-approved food contact material or be marketed as compatible with these.	N.A

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	Verification	<p><b>Acrylonitrile:</b> Detailed documentation and/or test reports showing compliance with this criterion and a Declaration of Compliance from the fibre manufacturer.</p>	<p><i>If bio-based origin:</i></p> <ul style="list-style-type: none"> <li>- Test according to ISO 16620, ASTM D6866, or equivalent standards showing the content of bio-based raw material.</li> <li>- Declaration by the producer that palm oil, soybean oil and soy flour are not used.</li> <li>- For waste and residual products: Documentation that shows the requirement's definition of waste or residual products and traceability is met.</li> <li>- Sugar cane: Certification system sugar cane is certified for. CoC certificate or a certificate number. Documentation from the producer of the bio-based polymer showing the purchase of bio-based polymer from certified raw material in at least the same annual quantity as is used in the production of the bio-based polymer. Declaration stating that it has not been genetically modified.</li> <li>- For primary raw materials: Declaration stating that they have not been genetically modified. Name and geographical origin of the primary raw materials used.</li> </ul>	<p><b>Acrylonitrile</b> Compliance with the requirement and submission of confirmation from the suppliers of the fibres, as well as a test (according to specified methods) report from the suppliers of the fibres verifying compliance with this requirement.</p>
		<p><b>N, N-dimethylacetamide:</b> Emissions values measured at those process stages in which the substances are used, expressed as an 8-hour average value. Test reports and monitoring data from the fibre manufacturer showing compliance with this criterion.</p>	<p><i>If fossil origin:</i></p> <ul style="list-style-type: none"> <li>- Declaration from the producer of the recycled raw material that it is not EFSA or FDA-approved.</li> <li>- Certificate from an independent certifier of the supply chain.</li> <li>- Documentation from the producer showing that the raw material is 100% recycled.</li> </ul>	N.A

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Elastane</b>	<b>Requirement</b>	<p>Bans organotin compounds.</p> <p>Limits exposure to 3 specific aromatic diisocyanates:</p> <ul style="list-style-type: none"> <li>(i) diphenylmethane-4,4'-diisocyanate (101-68-8) 0.005 ppm</li> <li>(ii) toluene-2,4-diisocyanate (584-84-9) 0.005 ppm</li> <li>(iii) N, N-dimethylacetamide (127-19-5) 10.0 ppm</li> </ul>	<p><i>If bio-based origin:</i></p> <p>Must contain at least 90% bio-based raw material. Palm oil, soybean oil, and soy flour must not be used. They must meet either a) or b):</p> <ul style="list-style-type: none"> <li>a) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001.</li> <li>b) If sugar cane is used, it must be certified to Bonsucro standard, version 5.1 or later version or certified to a standard that meets the requirements.</li> </ul> <p>The producer must have a CoC certification according to the standard by which the raw material is certified. Traceability must at least be ensured by mass balance. Book and claim systems are not accepted. The producer of the bio-based polymer must document its purchase of certified raw materials for polymer production. The raw materials must meet either c) or d)</p> <ul style="list-style-type: none"> <li>c) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001.</li> <li>d) Primary raw materials not genetically modified.</li> </ul> <p><i>If fossil origin:</i></p> <p>100% recycled material. This must not include recycled plastic from EFSA plants or FDA-approved food contact material or be marketed as compatible with these.</p> <p>Synthetic fibre of fossil origin 100% recycled material in line with ISO 14021, EXCEPTION:</p> <ul style="list-style-type: none"> <li>• For elastane fibres that are STANDARD 100 by OEKO-TEX certified</li> </ul>	<p>Bans organotin compounds.</p> <p>Limits exposure to aromatic diisocyanates a 0.05 mg/m<sup>3</sup> value expressed as an 8-hour average. It applies to recycled fibres, only if the recycling process breaks down the materials to the monomer level.</p>

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	Verification	Declaration of non-use from the Fibre manufacturer and measurement of emissions values, provided as an 8-hour average value. Test reports and monitoring data from the fibre manufacturer(s) demonstrating compliance are necessary.	<p><i>If bio-based origin:</i></p> <ul style="list-style-type: none"> <li>- Test according to ISO 16620, ASTM D6866 or equivalent standards showing the content of bio-based raw material.</li> <li>- Declaration by the producer that palm oil, soybean oil and soy flour are not used.</li> <li>- For waste and residual products: Documentation which shows that the requirement's definition of waste or residual products is met, as well as traceability.</li> <li>- Sugar cane: Certification system sugar cane is certified for. CoC certificate or a certificate number. Documentation from the producer of the bio-based polymer showing the purchase of bio-based polymer from certified raw material in at least the same annual quantity as is used in the production of the bio-based polymer. Declaration stating that it has not been genetically modified.</li> <li>- For primary raw materials: Declaration stating that they have not been genetically modified. Name and geographical origin of the primary raw materials used.</li> </ul> <p><i>If fossil origin:</i></p> <ul style="list-style-type: none"> <li>- Declaration from the producer of the recycled raw material that it is not EFSA or FDA-approved.</li> <li>- Certificate from an independent certifier of the supply chain.</li> <li>- Documentation from the producer showing that the raw material is 100% recycled.</li> </ul>	Declaration of the non-use of specific compounds and submit confirmation from the fibre suppliers, with the option to use suitable HPLC test methods recognised testing laboratories.

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
Polyester	Requirement	<p>a) The level of antimony present in the polyester fibres shall not exceed 260 ppm (same limit as Blue Angel). Polyester fibres manufactured from recycled PET bottles are derogated (same requirement as Blue Angel).</p> <p>b) Staple fibres shall contain a minimum content of 50 % and filament fibres 20 % of recycled PET (same requirement as Blue Angel). Micro-fibres are derogated from this requirement and shall comply with (c).</p> <p>c) Emissions of VOCs during the production of polyester limit 1.2 g/kg for PET chips (same limit as Blue Angel) and 10.3 g/kg for filament fibre (same limit as Blue Angel).</p>	<p><i>If bio-based origin:</i> Must contain at least 90% bio-based raw material. Palm oil, soybean oil, and soy flour must not be used. They must meet either a) or b): a) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001. b) If sugar cane is used, it must be certified to Bonsucro standard, version 5.1 or later version, or certified to a standard that meets the requirements. The producer must have a CoC certification according to the standard by which the raw material is certified. Traceability must at least be ensured by mass balance. Book and claim systems are not accepted. The producer of the bio-based polymer must document its purchase of certified raw materials for polymer production. The raw materials must meet either c) or d): c) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001. d) Primary raw materials not genetically modified. <i>If fossil origin:</i> 100% recycled material. This must not include recycled plastic from EFSA plants or FDA-approved food contact material or be marketed as compatible with these. Synthetic fibre of fossil origin 100% recycled material in line with ISO 14021, EXCEPTION: • For white polyester (200-220 GG, Tint 0-3 or equivalent according to the CIE Whiteness Index) for professional textiles, an exception is given until June 30th, 2024. When using the exception, it is required that the fibres be STANDARD 100 by OEKO-TEX certified.</p>	<p>a) Limit the amount of antimony present in the polyester fibres 260 ppm (same limit as EUEL) or an elutable amount of 30 mg/kg. This requirement also applies to recycled fibres.</p> <p>b) The use of PET beverage packaging in the production of recycled fibres is permitted for a transitional period of two years (after this period, PET from beverage packaging is not permitted). Staple fibres shall contain a minimum content of 50 % and filament fibres 20 % of recycled PET (same requirement as EUEL)</p> <p>c) VOC emissions must not exceed 1.2 g/kg for PET chips (same limit as EUEL), 10.3 g/kg for filament fibres (same limit as EUEL) or 0.2 g/kg for produced polyester resin. This requirement does not apply to recycled polyester fibres unless the recycling process breaks down the materials to the monomer level. If this is the case, this requirement also applies to recycled polyester fibres.</p>

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	Verification	<p>a) Declaration of non-use or a test report using the test methods indicated in the criterion. A declaration shall be provided for fibres manufactured from recycled PET bottles.</p> <p>b) Recycled content shall be traceable back to the reprocessing of the feedstock.</p> <p>c) The applicant shall provide monitoring data and/or test reports demonstrating compliance with EN 12619 (same standard as Blue Angel) or standards with an equivalent test method.</p>	<p><i>If bio-based origin:</i></p> <ul style="list-style-type: none"> <li>- Test according to ISO 16620, ASTM D6866, or equivalent standards showing the content of bio-based raw material.</li> <li>- Declaration by the producer that palm oil, soybean oil and soy flour are not used.</li> <li>- For waste and residual products: Documentation that shows the requirement's definition of waste or residual products and traceability is met.</li> <li>- Sugar cane: Certification system sugar cane is certified for. CoC certificate or a certificate number. Documentation from the producer of the bio-based polymer showing the purchase of bio-based polymer from certified raw material in at least the same annual quantity as is used in the production of the bio-based polymer. Declaration stating that it has not been genetically modified.</li> <li>- For primary raw materials: Declaration stating that they have not been genetically modified. Name and geographical origin of the primary raw materials used.</li> </ul> <p><i>If fossil origin:</i></p> <ul style="list-style-type: none"> <li>- Declaration from the producer of the recycled raw material that it is not EFSA or FDA-approved.</li> <li>- Certificate from an independent certifier of the supply chain.</li> <li>- Documentation from the producer showing that the raw material is 100% recycled.</li> </ul>	<p>a) Declaration of antimony-free polyester fibres and the corresponding declaration or a test report from the fibre suppliers to verify compliance. Leaching according to DIN EN ISO 105-E04 / determined according to ISO 17294-2 (ICP/MS). The recycling process must be described if recycled fibres are used</p> <p>a) and c) a Declaration of compliance with the requirement and submission of a declaration of conformity from the fibre suppliers, as well as a test report by DIN EN 12619 (same standard as EU Ecolabel). The recycling process must be described if recycled fibres are used.</p>

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Polyp ropyl ene</b>	<b>Require ment</b>	Bans the use of lead based pigments.	<p><i>If bio-based origin:</i>            Must contain at least 90% bio-based raw material.            Palm oil, soybean oil, and soy flour must not be used.            They must meet either a) or b):            a) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001.            b) If sugar cane is used, it must be certified to Bonsucro standard, version 5.1 or later version or certified to a standard that meets the requirements.            The producer must have a CoC certification according to the standard by which the raw material is certified.            Traceability must at least be ensured by mass balance. Book and claim systems are not accepted.            The producer of the bio-based polymer must document its purchase of certified raw materials for polymer production.            The raw materials must meet either c) or d):            c) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001.            d) Primary raw materials not genetically modified.</p> <p><i>If fossil origin:</i>            100% recycled material. This must not include recycled plastic from EFSA plants, FDA-approved as food contact material, or marketed as compatible with these.            Synthetic fibre of fossil origin 100% recycled material in line with ISO 14021,</p>	Bans the use of lead based pigments.

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	Verification	Declaration of non-use.	<p><i>If bio-based origin:</i></p> <ul style="list-style-type: none"> <li>-Test according to ISO 16620, ASTM D6866, or equivalent standards showing the content of bio-based raw material.</li> <li>- Declaration by the producer that palm oil, soybean oil and soy flour are not used.</li> <li>- For waste and residual products: Documentation that shows the requirement's definition of waste or residual products and traceability is met.</li> <li>- Sugar cane: Certification system sugar cane is certified for. CoC certificate or a certificate number. Documentation from the producer of the bio-based polymer showing the purchase of bio-based polymer from certified raw material in at least the same annual quantity as is used in the production of the bio-based polymer. Declaration stating that it has not been genetically modified.</li> <li>- For primary raw materials: Declaration stating that they have not been genetically modified. Name and geographical origin of the primary raw materials used.</li> </ul> <p><i>If fossil origin:</i></p> <ul style="list-style-type: none"> <li>- Declaration from the producer of the recycled raw material that it is not EFSA or FDA-approved.</li> <li>- Certificate from an independent certifier of the supply chain.</li> <li>- Documentation from the producer showing that the raw material is 100% recycled.</li> </ul>	Declaration of non-use and confirmation from the fibre suppliers. The recycling process must be described if recycled fibres are used.
Man-made cellulose fibres	Requirement	<p>Sustainable Forestry Management: A minimum of 25% of pulp Fibres must be manufactured from wood grown according to sustainable forestry management principles. The remaining proportion of pulp Fibres should be from legal forestry and plantations.</p> <p>Pulp from Cotton Linters: Pulp produced from cotton linters must meet the requirements of either cotton criterion 1a or 1b.</p> <p>Bleaching Process: Requirement (9c): The pulp used for fibre manufacturing must be bleached without elemental chlorine. Total chlorine and organically bound chlorine (OX) in finished Fibres must not exceed 150</p>	<p><i>If bio-based origin:</i></p> <p>Must contain at least 90% bio-based raw material. Palm oil, soybean oil, and soy flour must not be used. They must meet either a) or b):</p> <p>a) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001.</p> <p>b) If sugar cane is used, it must be certified to Bonsucro standard, version 5.1 or later version or certified to a standard that meets the requirements.</p> <p>The producer must have a CoC certification according to the standard by which the raw material is certified. Traceability must at least be ensured by mass balance. Book and claim systems are not accepted. The producer of the bio-based polymer must document its purchase of certified raw materials for polymer production.</p>	N.A

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
		<p>ppm. AOX in wastewater from pulp manufacturing must not exceed 0.170 kg/ADt pulp.</p> <p>Value Recovery from Spent Process Liquors: Requirement (9d): A minimum of 50% of the pulp used for Fibre manufacturing must be purchased from dissolving pulp mills that recover value from spent process liquors through on-site electricity and steam generation or manufacturing chemical co-products.</p> <p>Sulphur Content in Emissions (for Viscose and Modal Fibres): Requirement (9e): The sulphur content of emissions of sulphur compounds to air from Fibre production processes must not exceed specified performance values.</p>	<p>The raw materials must meet either c) or d):</p> <p>c) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001.</p> <p>d) Primary raw materials not genetically modified.</p>	
	<b>Verification</b>	<p>Sustainable Forestry Management: The applicant needs to obtain valid, independently certified chain of custody certificates from the Fibre manufacturer(s) demonstrating compliance with sustainable forestry management principles. Certifications from FSC, PEFC, or equivalent schemes are accepted.</p> <p>Pulp from Cotton Linters: Cotton must be certified by an independent control body, complying with regulations and standards. Non-genetically modified varieties of cotton should be verified according to specified regulations.</p> <p>Bleaching Process: The applicant needs to provide a test report showing compliance with OX or AOX requirements using the appropriate test methods (OX: ISO 11480, AOX: ISO 9562).</p> <p>Value Recovery from Spent Process Liquors: The applicant must provide a list of pulp suppliers, documentation, and evidence of energy generation and co-product recovery systems.</p>	<p>If bio-based origin:</p> <ul style="list-style-type: none"> <li>- Test according to ISO 16620, ASTM D6866, or equivalent standards showing the content of bio-based raw material.</li> <li>- Declaration by the producer that palm oil, soybean oil and soy flour are not used.</li> <li>- For waste and residual products: Documentation that shows the requirement's definition of waste or residual products and traceability is met.</li> <li>- Sugar cane: Certification system sugar cane is certified for. CoC certificate or a certificate number. Documentation from the producer of the bio-based polymer showing the purchase of bio-based polymer from certified raw material in at least the same annual quantity as is used in the production of the bio-based polymer. Declaration stating that it has not been genetically modified.</li> <li>- For primary raw materials: Declaration stating that they have not been genetically modified. Name and geographical origin of the primary raw materials used.</li> </ul>	N.A

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
		Sulphur Content in Emissions (for Viscose and Modal Fibres): The applicant needs to provide detailed documentation and/or test reports showing compliance with this criterion, along with a declaration of compliance		
<b>Regenerated Cellulose fibres</b>	<b>Requirement</b>	N.A	Recycled Content: Recycled raw materials for producing new regenerated cellulose fibres must be pre-consumer or post-consumer* cellulosic material. It must be documented that 100% is recycled material.	Recycled Content: Allows the use of recycled materials.
			Chain of Custody Certification: Chain of Custody certification (FSC or PEFC). Manufacturers using only recycled material are exempt from the Chain of Custody requirement	Chain of Custody Certification: Requires certain certifications for cellulose origin.
			Bleaching Restrictions: Prohibits the use of chlorine gas in bleaching.	Bleaching Restrictions: Restricts the use of elementary chlorine. Additional Bleaching Process Restrictions Place restrictions on using hypochlorite and set limits on chlorine dioxide consumption and AOX emissions to wastewater during bleaching
			Emission Limits: Imposes emission limits for specific substances in the production process.	Emission Limits: Sets limits on emissions to wastewater and air, including COD, nitrogen, phosphorus, sulphur compounds, and dust.
			Tree Species Limitation: Restrictions on using virgin wood Fibres from specific tree species.	N.A
			Origin: Requires traceability of regenerated cellulose fibre or recycled textile fibre	Cellulose Origin: Requires cellulose from wood or bamboo cultivated according to sustainable forestry principles. It also allows using recycled materials and residues from the agricultural, timber, and food industries.
			N.A	Emission Limits Specific to Fibre Types: Sets specific emission limits for viscose and modal fibres, including sulphur content in emissions.
			N.A	Energy Consumption Limits: specifies limits on specific electrical and heating energy consumption in cellulose production.
			N.A	Halogen Content: Specifies a maximum halogen content for fibres.
				Traceability: Requires traceability of regenerated cellulose fibre or recycled textile fibre

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	<b>Verification</b>	N.A	Recycled Content: Certificate from either Global Recycled Standard or Recycled Claim Standard	Recycled Content: Certificate from either Global Recycled Standard or Recycled Claim Standard or submission of purchasing and procurement receipts for waste material.
Chain of Custody Certification: Verification with valid FSC/PEFC Chain of Custody certificates.			Chain of Custody Certification: Verification through valid, independently issued certificates from Fibre producers confirming sustainable forestry management for wood or bamboo Fibres.	
Bleaching Restrictions: Declaration from the cellulose mass and regenerated cellulose manufacturers or a valid EU Ecolabel License.			Bleaching Restrictions: Manufacturers to submit test reports and documentation showing adherence to the specified limits	
Emission Limits: Documentation of closed-loop processes and test reports for emission requirements			Emission Limits: compliance declarations, emission values, and test reports for various aspects of production, including emissions to air and water.	
Cellulose Origin: Declaration from the cellulose mass and regenerated cellulose manufacturers or a valid EU Ecolabel License.			Cellulose Origin: For cellulose sourced from bamboo, a transaction certificate must be submitted	
Tree Species Limitation: Documented with a certificate from either the Global Recycled Standard or the Recycled Claim Standard.			N.A	
N.A			Emission Limits Specific to Fibre Types: Compliance with emission limits for specific fibre types	
N.A			Energy Consumption Limits: Manufacturers need to ensure that the specific electrical and heating energy consumption in cellulose production meets the defined limits	
N.A			Halogen Content: Manufacturers must ensure that the halogen content of fibres does not exceed the specified maximum limit.	
Traceability: documented with a certificate from either the Global Recycled Standard or the Recycled Claim Standard.			N.A	

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Polyamide</b>	<b>Requirement</b>	<p>Polyamide products shall comply with at least one of the following:</p> <ul style="list-style-type: none"> <li>- Fibres shall be manufactured using a minimum content of 20 % recycled from pre and/or post-consumer waste.</li> <li>- The emissions to air of N<sub>2</sub>O from nylon monomer production, expressed as an annual average, shall not exceed 9.0 g N<sub>2</sub>O/kg of caprolactam or adipic acid.</li> </ul>	<p><i>If bio-based origin:</i></p> <p>Must contain at least 90% bio-based raw material. Palm oil, soybean oil, and soy flour must not be used. They must meet either a) or b):</p> <p>a) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001.</p> <p>b) If sugar cane is used, it must be certified to Bonsucro standard, version 5.1 or later version or certified to a standard that meets the requirements.</p> <p>The producer must have a CoC certification according to the standard by which the raw material is certified. Traceability must at least be ensured by mass balance. Book and claim systems are not accepted.</p> <p>The producer of the bio-based polymer must document its purchase of certified raw materials for polymer production. The raw materials must meet either c) or d):</p> <p>c) Waste or residual products defined by (EU) Renewable Energy Directive 2018/2001.</p> <p>d) Primary raw materials not genetically modified.</p> <p><i>If fossil origin:</i></p> <p>100% recycled material. This must not include recycled plastic from EFSA plants or FDA-approved food contact material or be marketed as compatible with these.</p>	<p>Polyamide products shall comply with at least one of the following:</p> <ul style="list-style-type: none"> <li>- Fibres shall be manufactured using a minimum content of 20 % recycled from pre and/or post-consumer waste.</li> <li>- The N<sub>2</sub>O emissions to air during the monomer production, expressed as an annual average, must not exceed 9 g/kg of caprolactam or adipic acid. In addition, reduction technologies must be used to produce caprolactam and adipic acid. It must be ensured that the degree of reduction in the N<sub>2</sub>O emissions during adipic acid production is at least 95%.</li> </ul>

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
	Verification	<p>Recycled content shall be traceable back to the reprocessing of the feedstock. This shall be verified by independent certification of the chain of custody or by documentation provided by suppliers and processors.</p> <p>The applicant shall provide documentation or test reports showing compliance based on monitoring data and a Declaration of Compliance from the fibre manufacturer and their feedstock providers.</p>	<p><i>If bio-based origin:</i></p> <ul style="list-style-type: none"> <li>- Test according to ISO 16620, ASTM D6866 or equivalent standard showing the content of bio-based raw material.</li> <li>- Declaration by the producer that palm oil, soybean oil and soy flour are not used.</li> <li>- For waste and residual products: Documentation that shows the requirement's definition of waste or residual products and traceability is met.</li> <li>- Sugar cane: Certification system sugar cane is certified for. CoC certificate or a certificate number. Documentation from the producer of the bio-based polymer showing the purchase of bio-based polymer from certified raw material in at least the same annual quantity as is used in the production of the bio-based polymer. Declaration stating that it has not been genetically modified.</li> <li>- For primary raw materials: Declaration stating that they have not been genetically modified. Name and geographical origin of the primary raw materials used.</li> </ul> <p><i>If fossil origin:</i></p> <ul style="list-style-type: none"> <li>- Declaration from the producer of the recycled raw material that it is not EFSA or FDA-approved.</li> <li>- Certificate from an independent certifier of the supply chain.</li> <li>- Documentation from the producer showing that the raw material is 100% recycled.</li> </ul>	<p>Declare compliance with the requirement and submit a DoC from the monomer producer and test reports for the raw and clean gas, verifying that a reduction of at least 95% has been achieved.</p>
Recycled textile fibre	Requirement	<p>Recycled content shall meet the requirements of the Criterion 13 Restricted Substance List.</p>	<p>An extensive list of substances and limits indicated Extractable metals, Organic tin compounds, Chlorophenols, Per- and polyfluorinated compounds, Phthalates, Surfactants, wetting agent residues, Dyes,</p>	<p>Provision of information on the recycled content, the type and composition of the recycled fibre, the origins and composition of the materials fed into the recycling process, and a description of the recycling process.</p>
	Verification	<p>Recycled content shall be traceable back to the reprocessing of the feedstock. This shall be verified by independent third party certification of the chain of custody or by documentation provided by feedstock suppliers and reprocessors.</p> <p>Annually</p>	<p>a) an Oeko-Tex standard 100 class I certificate or b) test report showing that the requirement is complied with.</p> <p>And a description of the procedure confirming an annual test.</p>	<p>Declaration from the manufacturer about the recycled content and origins, accompanied by one of the following certificates:</p> <ul style="list-style-type: none"> <li>• RCS (Recycled Claim Standard),</li> <li>• GRS (Global Recycled Standard),</li> <li>• International Sustainability and Carbon Certification (ISCC+),</li> <li>• Roundtable on Sustainable Biomaterials (RSB),</li> <li>• RedCert (only in Europe)</li> </ul> <p>• or a comparable certification system whose scope and requirement standards is equivalent to one of the named certification systems. An</p>

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
				independent environmental verifier must confirm the equivalence of the certification system.

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4568 **Table 88.** Components and accessories – comparison among Ecolabels

Topic	Requirement/Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Fillings</b>	<b>Requirement</b>	Fibre Restrictions: defined fibre restrictions for fillings in alignment with their respective standards		Fibre restrictions: Not explicitly mentioned
		Chemical Substances: emphasis on the chemical substances used in fillings and their laundering processes. The criteria include biocides, formaldehyde emissions, fabric softeners, and other relevant chemicals.	Chemical Substances: restricts chemical substances used in additives and treatments applied to fillings. It does not mention the laundering process.	Chemical Substances: references substance restrictions from the REACH "list of candidates," the CLP Regulation (EC/1272/2008), and limits from the ZDHC MRSL, provided they are stricter than REACH. It does not mention the laundering process.
		Polyurethane and Latex: not specifically address polyurethane and latex fillings.	Polyurethane and Latex: focuses on restrictions related to blowing agents	Polyurethane and Latex: concentration limits and VOC (Volatile Organic Compounds) emissions for polyurethane and latex. The concentration of aromatic diisocyanates and blowing agents are also restricted in PUR.
		Foamed Synthetic Materials: Formaldehyde emissions restrictions resulting from the laundering process.	Foamed Synthetic Materials: Limits on emissions from substances used in foamed synthetic materials, including formaldehyde and others.	Foamed Synthetic Materials: Latex foam and specifies restrictions regarding its concentration and volatile organic compounds (VOC) emissions.
		Polycyclic Aromatic Hydrocarbons (PAHs): Not referenced	Polycyclic Aromatic Hydrocarbons (PAHs): For foamed synthetic materials such as polyurethane, latex, and expanded polystyrene, the content of each PAH stated in the requirement shall be below 0.5 mg/kg.	Polycyclic Aromatic Hydrocarbons (PAHs): Not mentioned

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	<b>Verification</b>	Fibres: follow their fibre verification methods		Fibres: Not explicitly mentioned
		Emissions from PUR and latex foams: not mentioned	Emissions from PUR and latex foams: same standard for verification, but different verification methods.	
		Polyurethane: not mentioned	Polyurethane: Declaration of Conformity (DoC) regarding blowing agents	Polyurethane: Declaration of Conformity (DoC) and test reports on limit values for additives and emissions (CFCs and VOCs).
		PAHs: not mentioned	PAHs: tested by ISO 18287 or ZEK 01.2-08 (GC/MS)	PAHs: not mentioned
<b>Feathers and downs</b>	<b>Requirement</b>	N.A	Ethical requirements: prohibit using feathers and down plucked from live birds or forced feeding birds	
			Includes recycled down and feather	N.A
			Microbial cleanliness: must document microbial purity and comply with the oxygen index number of max. 10 and fat content	Microbial cleanliness: requirements for down and feathers regarding oxygen index, microbiological state, mesophil aerobic bacteria count, faecal streptococci count, sulphite reducing clostridium count, presence of salmonella, oil and grease content, turbidity, pH
			Labelling: requires labelling feathers and down-filling materials; Blue Angel Ecolabel does not mention it.	Labelling: Does not mention it.
			Wastewater: The given text does not provide specific wastewater discharge standards.	Wastewater: detailed wastewater discharge standards, including limits for various parameters and pH and temperature requirements.
	<b>Verification</b>	N.A	Adherence to the Down Standard or an equivalent.	Submission of audit reports from testing institutions.
			For recycled materials, either a Recycled Global Standard certificate or supplier documentation is required.	N.A
			N.A	For wastewater: compliance with the requirements. A declaration of conformity from the processing plant operator and test reports.

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel	
<b>Coating, laminates and membranes</b>	<b>Requirement</b>	Focuses on specific criteria for polyurethane and polyester, including workplace emissions, antimony content, and VOC emissions. Addresses restrictions on phthalates in polymers. Allows the use of fluoropolymer membranes and laminates but with restrictions on PFOA. Does not mention adhesives.	It covers requirements for textiles used as substrates, including materials for coatings, laminates, and membranes. Specifies criteria for recycled and biobased raw materials, including palm oil, soybean oil, and soy flour restrictions. Specifically, if a polymer constitutes more than 5% by weight of the finished fabric, it must be either 100% recycled or composed of at least 90% bio-based raw material. Prohibits halogenated polymers and sets requirements for additives (CLP Regulation 1272/2008) in polymers. Lists various prohibited substances and materials, such as siloxanes, flame retardants, PFCs, and heavy metals. Covers adhesives used in the laminating process.	Focuses on requirements for laminates and membranes used in products. Addresses textile and membrane materials. Requires compliance with recycled materials (at least 30%) or avoiding organic solvents for polyurethane membranes. Allows only specific types of adhesives (thermoplastic or reactive hot melt) and prohibits solvent-based adhesives. Using reactive polyurethane-based hot melt adhesives sets limits for aromatic diisocyanates in workplaces. Includes criteria for functional products, with exclusion criteria for certain substances and materials, such as biocides, flame retardants, PFCs, and VOCs.	
	<b>Verification</b>	For polyester components, compliance involves meeting standard fibre criteria. There are specific requirements related to antimony content and VOC emissions.	Verification procedures align with specified fibre criteria. A Declaration of Conformity confirms the absence of blowing agents for polyurethane components.	Verifies textiles against fibre criteria. They have specific requirements related to recycled materials and antimony content. Verification relies on the Declaration of Conformity (DoC) process.	
<b>Accessories</b>	<b>Requirement</b>	N.A	Zippers, buttons, and non-textile accessories are limited if they do not have a practical purpose.	N.A	
		Concentration of metals: Nickel migration 0.5 µg/cm <sup>2</sup> /week Lead 90 mg/kg Cadmium -> Intended for children under 3 y -> 50 mg/kg Others 100 mg/kg Chrome 60 mg/kg Mercury 60 mg/kg	Concentration of metals: Lead (Pb): 90 mg/kg. Cadmium (Cd): 40 mg/kg Nickel (Ni): migration limit must be less than 0.5 micrograms/cm <sup>2</sup> /week	Concentration of metals: Lead 90mg/kg; Cadmium: 50 mg/kg; Chromium: 60 mg/kg. Nickel: migration value for metal alloys is 0.5 ug/cm <sup>2</sup> /week.	
		Plastic accessories cannot have phthalates			
		N.A	Restrictions on chlorinated plastics	N.A	

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	Verification	Nickel test migration and testing for other metals.		
		Phthalate Testing	Declaration from the manufacturer of the plastic material that the plastic meets the requirement.	Phthalate Testing
		N.A	Declaration from the Licensee that no details or accessories are used without a practical function.	N.A

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4570 **Table 89.** Fitness for use - comparison among Ecolabels

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
Dimensional changes during washing and drying	Requirement	<p>This does not apply to fibres or yarn labelled "dry clean only." or equivalent, and furniture fabrics that are not removable and washable.</p> <p>Knitted products +-4.0%            Chunky knit +-6%            Interlock +-5%            Woven fabrics: cotton, cotton mix +-3%, wool mix and synthetic fibres +-2%            Socks and hosiery, bathroom linen +-8%</p> <p>Washable and removable woven upholstery +-2%            Woven Mattress ticking +-3%            Non-woven mattress ticking +5%            All other non-woven fabric +6%</p>	<p>Not apply to fibres or yarn, products labelled "dry clean only", and upholstery fabrics not removable and washable.</p> <p>Knitted products and hosiery +-5.0%            100% Wool knitwear +-10%            Curtains and upholstery cover removable and washable +-2%            Woven fabrics for duvets and pillows +-5%            Woven textiles of wool blend and synthetic fibres +-2%            Woven textiles not covered by the categories above +-3%            Bedding, tablecloths and napkins +-5%            Terry towels and washcloths +-7%</p>	<p>Not apply to fibres or yarn, products labelled "dry clean only", not removable and washable furniture fabrics.</p> <p>Knitted products +-5.0%            Chunky knit +-6%            House and home textiles +-8%            Woven fabrics: cotton, cotton mix, linen, flax and silk +-3%, cotton and cotton mix for bedding and wool mix +-5%, and synthetic fibres +-2%            Socks and hosiery +-5%            Bathroom linen, including terry towelling and fine rib fabrics +-8%            Regenerated and synthetic woven fabrics +-3%            Regenerated and synthetic knitted fabrics +-5%</p>
	Verification	<p>For domestic washing, EN ISO 6330 combined with EN ISO 5077.            For commercial washings, ISO 15797 combined with EN ISO 5077.</p>	<p>For domestic washing, EN ISO 6330 combined with EN ISO 5077.            For commercial washings, ISO 15797 combined with EN ISO 5077.            Woven products for duvets and pillows with feathers and down filling tested with EN 13186</p>	<p>DIN EN ISO 6330 combined with EN ISO 5077.</p>

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Tear Strength</b>	<b>Requirement</b>	N.A	Trousers, shorts, skirts 1.5daN Jackets and coats 1.2daN Sportswear, ski clothing, and other outdoor wear 1.2daN Lingerie, pyjamas, and other nightwear 0.8daN T-shirts, blouses, shirts, and dresses 0.8daN Swimwear 1.0 daN Bed linen and sheets 0.8daN Towels 0.8daN	N.A
	<b>Verification</b>	N.A	ISO 13937	N.A
<b>Tensile Strength</b>	<b>Requirement</b>	N.A	Trousers, shorts, skirts 18daN Jackets and coats 15daN Sportswear, ski clothing, and other outdoor wear 18daN Lingerie, pyjamas, and other nightwear 12daN T-shirts, blouses, shirts, and dresses 12daN Swimwear 15 daN Bed linen and sheets 12daN Towels 12daN	N.A
	<b>Verification</b>	N.A	ISO 13934-2	N.A
<b>Seam Strength</b>	<b>Requirement</b>	N.A	Woven fabrics The seam in the lining 80N Textile with fabric weight <220g/m2 150N Textile with fabric weight >220g/m2 200N Backpacks and bags 200N	N.A
	<b>Verification</b>	N.A	ISO 13935-2	N.A

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Seam Slippage resistance</b>	<b>Requirement</b>	N.A	<p><i>If testing with EN-ISO 13936-1</i> Trousers, shorts, skirts 4mm at 14 daN load Jackets and coats 4mm at 14 daN load Sportswear, ski clothing, and other outdoor wear 4mm at 14 daN load Lingerie, pyjamas, and other nightwear 4mm at 10 daN load T-shirts, blouses, shirts, and dresses 4mm at 11 daN load Swimwear 4mm at 14 daN load Bed linen and sheets 4mm at 10 daN load</p> <p><i>If testing with EN-ISO 13936-2</i> Trousers, shorts, skirts 12 daN load at 3mm Jackets and coats 12 daN load at 4mm Sportswear, ski clothing, and other outdoor wear 12 daN load at 4mm Lingerie, pyjamas, and other nightwear 6 daN load at 3mm T-shirts, blouses, shirts, and dresses 6 daN load Swimwear 4mm at 14 daN load at 3mm Bed linen and sheets 6 daN load at 3mm</p>	N.A
	<b>Verification</b>	N.A	ISO 13936-1 or ISO 13936-2	N.A
<b>Colour fastness to washing</b>	<b>Requirement</b>	At least 3-4 for colour change and staining It does not apply to products labelled “dry clean only”, to white products or products that are neither dyed nor printed or to non-washable furniture fabrics.	Level 3-4 for colour change and discolouration It does not apply to white products, products that are neither dyed nor printed or non-washable furniture fabrics.	At least levels 3-4 according to ISO 105-A03 or A04 and A02 or A05. It does not apply to products labelled “dry clean only,” indigo-dyed denim, or end products that are neither dyed, printed nor non-washable furniture fabrics.
	<b>Verification</b>	For domestic washing, ISO 105 C06. For industrial washing, ISO 15797 combined with ISO 105 C06.	Test method for wash: ISO 105 C06. Test method for dry cleaning: ISO 105 D01	ISO 105-C06
<b>Colour fastness to perspiration</b>	<b>Requirement</b>	At least levels 3-4 according to ISO 105. It does not apply to white products, products neither printed or dyed, furniture fabrics, curtains, and similar textiles intended for interior decoration	Underwear, sportswear, and t-shirts must meet: For discolouration: level 4 -For staining: level 4	At least levels 3-4 according to ISO 105-A03 or A04 and A02 or A05. It does not apply to printed or dyed products, curtains, and similar textiles intended for interior decoration except cushions.

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>(acid alkaline)</b>			Level 3 is permitted for textiles that are dark in colour and/or made from recycled wool. It does not apply to white products or end products that are neither dyed nor printed.	
	<b>Verification</b>	ISO 105 E04		
<b>Colour fastness to saliva</b>	<b>Requirement</b>	N.A	Baby clothes must meet the following standards: -For discolouration: level 4 -For staining: level 4 Level 3 is permitted for textiles that are dark in colour and/or made from recycled wool. This requirement does not apply to white products or end products that are neither dyed nor printed.	Colour fast level 5 for baby and children products according to DIN 53160-1. This requirement does not apply to end products that are neither dyed nor printed.
	<b>Verification</b>	N.A	ISO 105-A06	§64 of the LFGB, B 82. 92-3 and BVL B 82.92-13 in combination with DIN 53160-1
<b>Colour fastness to wet rubbing</b>	<b>Requirement</b>	At least level 2-3. Level 2 allowed for dark-dyed denim. Level of 1 for all other denim colour shades It does not apply to white products, products neither printed nor dyed.	At least level 3-4 It does not apply to white products, products neither printed nor dyed Dark coloured denim level 1-2 Medium-coloured denim level 2-3	At least levels 2-3. For dark colours level 2, according to DIN EN ISO 105-A03 or A04 and A02 or A05. It does not apply to dyed or printed.
	<b>Verification</b>	ISO105 X12		
<b>Colour fastness to dry rubbing</b>	<b>Requirement</b>	At least level 4. Levels 3-4 are allowed for dark-dyed denim. Level of 2-3 for all other denim colour shades It does not apply to white products, products neither printed nor dyed, curtains, and similar textiles intended for interior decoration.	At least level 4. It does not apply to white products, products neither printed nor dyed, curtains, and similar textiles intended for home furnishing textiles. Dark-coloured denim level 3	At least levels 3-4 for dark colours and level 3 for denim. It does not apply to dyed or printed interior decoration.
	<b>Verification</b>	ISO105 X12		
<b>Colour fastness to light</b>	<b>Requirement</b>	At least level 5 for furniture, curtains, or drapes. At least level 4 for all other products. It does not apply to mattress ticking, mattress protection, or underwear.	At least level 5 for outdoor wear, swimwear, UV-protecting clothing, furniture, curtains, and drapery. The requirement does not apply to white textiles, mattress covers, and mattress protectors.	At least level 5 for furniture, curtains, or drapes. At least level 4 for all other products, This requirement does not apply to mattress ticking, protection, or underwear.

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	<b>Verification</b>	ISO105 B02		
<b>Wash resistance and absorbency of cleaning products</b>	<b>Requirement</b>	Woven and non-woven products for wet cleaning 80 washes, 40°C Microfibre products for dusting 200 washes, 40°C Products deriving from recycled textile fibres 20 washes, 30°C Mop for washing floors 200 washes, 60°C Cloths for washing floors 5 washes 30°C  Absorbency of cleaning products Products deriving from recycled textile fibres, Microfibre products for surface and floor cleaning, woven and non-woven products for wet cleaning, and products for washing floors <= 10 seconds	N.A	N.A
	<b>Verification</b>	EN ISO 6630	N.A	N.A
<b>Resistance to abrasion</b>	<b>Requirement</b>	N.A	Number of rubs/abrasions (Martindale) 50.000 cycles for commercial upholstery 30.000 cycles for workwear for outdoor use and domestic upholstery 20.000 cycles for workwear for indoor use, trousers, shorts and skirts, sportswear, ski clothing and other outdoor wear, swimwear 16.000 cycles for jackets and coats 12.000 cycles for T-shirts, blouses, shirts and dresses 10.000 cycles for lingerie, pyjamas, and other nightwear, bed linen, and sheets 8.000 cycles for knitting	N.A
	<b>Verification</b>	N.A	EN ISO 12947-2	N.A
<b>Resistance to pilling</b>	<b>Requirement</b>	Minimum of 3 for non-woven fabrics and knitted garments, accessories, and blankets made of wool, wool blends, and polyester woven cotton. Minimum of 2 for polyamide tights and leggings.	Minimum of 4 for clothing woven fabric, fleece, and upholstery for professional use. Minimum of 3-4 for upholstery for private use and upholstery of wool or wool blends for professional use. Minimum of 2-3 for clothing woven fabric with raised surface and knitting.	Non-woven fabrics and knitted garments, accessories, and blankets made of wool, wool mixes, and polyester must resist pilling up to a minimum rating of 3. Woven cotton fabrics used for garments must also resist pilling up to a minimum rating of 3. Polyamide tights and leggings must resist pilling up to a minimum rating of 2.
	<b>Verification</b>	-Knitted and non-woven: ISO 12945-1 Pill box method -Woven: ISO 12945-2 Martindale method	ISO 12945-2	-Knitted and non-woven: ISO 12945-1 Pill box method -Woven: ISO 12945-2 Martindale method

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Durability of function</b>	<b>Requirement</b>	<p>Oil repellents shall retain the functionality of 3.5 out of 4 Stain repellents shall retain functionality of 3.0 out of 5.0</p> <p>Washable products shall retain functionality after 50 industrial wash and tumble dry cycles at a minimum of 75°C. Non-washable products shall retain their functionality after a soak test.</p> <p>Natural fibres shall achieve an SA-3 fabric smoothness grade. Blended natural and synthetic fibres with an SA-4 fabric smoothness grade after 10 domestic wash and tumble-drying cycles at 40°C.</p>	N.A	<p>Water repellents shall retain the functionality of 80 out of 90 after 5 domestic wash and tumble dry cycles at 40°C or after 5 industrial washing and drying cycles at a minimum of 75°C. Industrial washing temperatures may be reduced to 60°C for garments with taped seams. Care instructions on the reimpregnation of the product must be supplied with the textile.</p> <p>Washable products shall retain functionality after 25 industrial wash and tumble dry cycles by care instructions. Non-washable products shall retain their functionality after a soak test.</p> <p>Natural fibre products shall achieve an SA-3 fabric smoothness grade. Blended natural and synthetic fibres with an SA-4 fabric smoothness grade after 10 domestic wash and tumble-drying cycles at 40°C.</p>
	<b>Verification</b>	<p>Water repellent function Domestic washing ISO 6330 in combination with ISO 4920 Industrial washing ISO15797 in combination with ISO 4920</p> <p>Oil repellent function Domestic washing ISO 6330 in combination with ISO 14419 Industrial washing ISO 15797 in combination with ISO 14419</p> <p>Stain repellent function Domestic washing ISO 6330 in combination with ISO 22958 Industrial washing ISO 15797 in combination with ISO 22958</p> <p>Flame retardant Domestic washing ISO 6330 in combination with ISO 12138 Industrial washing ISO10528 in combination with ISO 12138</p> <p>Easy care function ISO 7768</p>	N.A	<p>Water repellent function Domestic washing ISO 6330 in combination with ISO 4920 Industrial washing ISO15797 in combination with ISO 4920</p> <p>Flame retardant Domestic washing ISO 6330 in combination with ISO 12138 Industrial washing ISO10528 in combination with ISO 12138</p> <p>Easy care function ISO 7768</p>

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4572 **Table 90.** Chemicals and processes - comparison among Ecolabels

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Substance restrictions or specific chemical requirements</b>	<b>Requirement restricted substances</b>	The 3 labels refer to restrictions imposed by REACH (1907/2006/EC), the Candidate List of substances of very high concern for Authorisation with reference to ECHA, and CLP Regulation (EC/1272/2008) and Restricted Substances List (RSL by REACH), with the following indications: *EUEL and BA approach per process/service; meanwhile, NS focuses on categorising ingoing substances. *at the general level, EUEL lists products included in product categories. Meanwhile, NS and BA highlight the general substance category, except where lists are also indicated. *most substances with requirements indicated in the 3 ecolabels coincide, including most of the testing methods, with some exceptions, and are presented in different manners that could be different naming and quantification (as units of measurement).		
		Halogenated carriers (referred to in Nordic Ecolabel and Blue Angel as chlorinated agents) for bleaching and dyeing	Chlorinated solvents as carriers agents (referred to as Halogenated carriers in EUEL)	Chlorinated solvents and carriers agents (Halogenated carriers in EUEL) for bleaching. The only label indicating limits for chlorinated benzenes and toluenes.
		Azo dyes (25 azo dyes listed)	Azo dyes (35 azo dyes listed): additional from EUEL and Blue Angel are the 10 following: 2-amino-4-nitrophenol 99-57-0 m-phenylenediamine 108-45-2 2-amino-5-nitrothiazole 121-66-4 2-amino-5-nitrophenol 121-88-0 p-aminophenol 123-30-80 p-phenetidine 156-43-4 2-methyl-phenylenediamine,2,5diaminotoluene 615-50-9 2-methyl-phenylenediamine,2,5diaminotoluene 95-70-5 2-methyl-phenylenediamine, 2,5 diaminotolunene 25376-45-8 6-chloro-2,4-dinitroaniline 3531-19-9	Azo dyes (25 azo dyes listed)
		CMR dyes and Potentially sensitising dyes	Not specifically mentioned	CMR dyes and potentially sensitising dyes
		Chrome mordant dyes are not permitted.	Mention of chromium in metal dyes	Chrome mordant dyes are not permitted
		Metal complex dyes based on copper, chrome, and nickel shall only be permitted for dyeing: wool, polyamide, and blends of wool and/or polyamide with man-made cellulose fibres.	Only metal complex dyes and pigments based on copper that comprise a maximum of 5% by weight may be used to dye wool, polyamide, a blend of wool, and/or polyamide with regenerated cellulose fibre.	No specific mention (but testing measures for direct and indirect discharge of wastewater)
		Plastisol binders banned	mentioned just in Re-used textiles, hides/skins, leather	restriction less than 1,000mg/Kg
		Biocide finishes banned	Biocides and antibacterial banned	Biocides are banned, but in-con preservatives are permitted
		Anti-felting and shrink resistance restricted	not specifically mentioned	Anti-felting and shrink resistance restricted

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
		Water, stain and oil repellent treatments	not specifically mentioned	Water, stain and oil repellent treatments
		Flame retardants (list of banned substances included)	Flame retardants (general term) banned	Flame retardants (general term) banned
		not specifically mentioned	not specifically mentioned	Cerium compounds restricted
		Biodegradability: 95% (additional indication: eliminable in wastewater treatment plants)	Biodegradability: similar requirements 95% indicated	Biodegradability: 90% (additional indication: eliminable in wastewater treatment plants)
		APEO generally indicated		APEO specified in the treatment of wool and water discharges
		EDTA, DTPA, and more are generally prohibited substances	EDTA and DTPA in generally prohibited substances	EDTA and DTPA are mentioned only in bleaching processes in regenerated fibres
		N,N-Dimethylacetamide % limits of 0.001%w/w for babies and children under 3 products, 0.005% w/w for products in direct contact with skin and garments with limited contact and interior textiles	not specifically mentioned	N, N-dimethylacetamide, dimethylformamide, and N-methyl pyrrolidone are restricted to 0.1% by mass.
		Formaldehyde residues measured in ppm (16 ppm), but the same verification tests		Formaldehyde residues are measured in mg/kg (20 mg/kg), but the same verification tests.
		Organotin compounds and Chlorophenols are generally indicated and listed	Organotin compounds and Chlorophenols generally indicated	Organotin compounds and Chlorophenols (limits indicated) extended list compared to EUEL and NS
		Prohibited phthalates listed	Prohibited phthalates generally mentioned	Prohibited phthalates listed
		Extractable metals (mg/kg) apply to products intended for babies and children under 3 years old and accessories; the list does not coincide.	Extractable metals - Referred to as Heavy metals measured in ppm, the list does not coincide.	Extractable metals (mg/kg), the same list as EUEL, are also included in accessories.
		Carcinogenic substances referred to in Article 57 of REACH	Carcinogenic substances indicated in the document	Carcinogenic substances referred to in Article 57 of REACH
		Endocrine disruptors in Article 57 of REACH	Endocrine disruptors referencing the EU ED LISTS	Endocrine disruptors in Chapter 1 of the ZDHC MRSL
		Substances referred to in Article 59 of REACH	not specifically mentioned	Substances referred to in Article 59 of REACH
		not specifically mentioned		refers to ZDHC MRSL
		not specifically mentioned	Nanomaterial generally approached	Nanomaterials with H (hazard) phrases
		not specifically mentioned	Silicones, Linear alkylbenzene sulphonates (LAS)	not specifically mentioned
		not specifically mentioned	Polycyclic aromatic hydrocarbons are not comparable with Blue Angel	Polycyclic aromatic hydrocarbons are not similar with Nordic Swan
		not specifically mentioned		Mineral oil defoamers, enzymatic processes, content of soluble proteins from natural rubber, Free aniline in jeans products,

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
				Perfluorinated and polyfluorinated chemicals (PFCs) in hydrophobised textiles, Chinoline/quinoline
	<b>Requirement hazardous substances</b>	Additional hazards are indicated in comparison to Nordic Swan and Blue Angel. Below are the differentiating elements: Acute toxicity: H304 (R65) and EUH070 (R39/41) -different than Nordic Swan Specific target organ toxicity: H371 (R68/20, R68/21, R68/22) and H373 (R48/20, R48/21, R48/22) -different than Nordic Swan Respiratory and skin sensitisation, carcinogenic, mutagenic or toxic for reproduction (divided in Nordic Swan: Germ cell mutagenicity*, Carcinogenicity*, Reproductive toxicity*), Hazardous to the aquatic environment, (H412 (R52/ 53) and H413 (R53)-different than Nordic Swan)Respiratory and skin sensitisation, carcinogenic, mutagenic or toxic for reproduction (divided in Nordic Swan: Germ cell mutagenicity, Carcinogenicity, Reproductive toxicity), Hazardous to the aquatic environment, (H412 (R52/ 53) and H413 (R53)-different than Nordic Swan) Hazardous to the ozone layer (EUH059 (R59)-different than Nordic Swan).	Less than EUEL and Blue Angel. Below are missing hazard phrases: Acute toxicity: H304 (R65) and EUH070 (R39/41)-different than EUEL and Blue Angel Acute toxicity: H304 (R65) and EUH070 (R39/41)-different than EUEL and Blue Angel Specific target organ toxicity: H371 (R68/20, R68/21, R68/22) and H373 (R48/20, R48/21, R48/22)-different than EUEL and Blue Angel Respiratory and skin sensitisation, carcinogenic, mutagenic or toxic for reproduction (divided in Nordic Swan: Germ cell mutagenicity*, Carcinogenicity*, Reproductive toxicity*) -different than EUEL and Blue Angel Respiratory and skin sensitisation, carcinogenic, mutagenic or toxic for reproduction (divided in Nordic Swan: Germ cell mutagenicity, Carcinogenicity, Reproductive toxicity) -different than EUEL and Blue Angel Hazardous to the aquatic environment: H412 (R52/ 53) and H413 (R53)-different than EUEL and Blue Angel Hazardous to the ozone layer (EUH059 (R59)- different than EU EL but identical with Blue Angel due to H420).	Less than EUEL. Below are missing hazard phrases: Acute toxicity: EUH070 (R39/41) -different than EU EL Specific target organ toxicity: no difference with EU EL Respiratory and skin sensitisation, carcinogenic, mutagenic, or toxic for reproduction (referred to in Blue Angel as Carcinogenic, mutagenic, and reprotoxic substances)-no difference with EU EL Hazardous to the aquatic environment (referred to in Blue Angel as Water-hazardous substances)-no difference with EU EL Hazardous to the ozone layer (EUH059 (R59)-different than EU EL but identical with Nordic Swan due to H420).
	<b>Verification</b>	Mainly, the provision of declarations of compliance with the requirements is supported by evidence such as technical datasheets or test reports showing fulfilment of the requirement. Manufacturing facilities, associated chemical providers, and analytical labs must adhere to the outlined testing procedures. Where required, product analysis tests shall be conducted yearly throughout the licensing term, and the results must be forwarded to the relevant authoritative organisation for confirmation.		
<b>Washing, drying and curing energy efficiency</b>		Similar general BAT themes: 1. general energy management, 2. washing and rinsing, and 3. drying and curing using stretchers		
	<b>Requirement</b>	Similar 15 techniques among the 3 ecolabels	2 additional techniques are almost identical to Blue Angel: 1) Combining multiple wet treatments into one process. 2) Using solar thermal panels, solar photovoltaic panels, or a heat recovery system for hot water, aiming to generate energy amounting to 30% of what the process requires.	Almost identically presented techniques with Nordic Swan
	<b>Verification</b>	The same testing: I SO 50001 or equivalent systems for energy or carbon dioxide emissions		

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Treatment of emissions to water</b>	<b>Requirement</b>	<p>Emissions to water:  <u>TREATED:</u> 20 g COD/kg textiles processed: applied to weaving, dyeing, printing, and finishing processes used to manufacture the product(s). Measured downstream of on-site wastewater treatment plant and/or off-site wastewater treatment plant receiving wastewater from these processing sites.  <u>DIRECT DISCHARGE:</u> IF Effluent is treated on-site and discharged directly to surface waters: 1) pH between 6,0 and 9,0 (unless the pH of the receiving water is outside this range)  2) temperature of less than 35C (unless the temperature of the receiving water is above this value)  If colour removal is required:436 nm (yellow sector) 7 m-1, (ii) 525 nm (red sector) 5 m-1, (iii) 620 nm (blue sector) 3 m-1- with BA</p>	<p>Emissions to water:  <u>TREATED:</u> COD (chemical oxygen demand) in wastewater from wet processes which is discharged to surface water after treatment shall not exceed 150 mg/L  <u>DIRECT DISCHARGE:</u> The pH value of the wastewater released to the surface water shall be between 6 and 9 (unless the pH value in the recipient lies outside this interval).  The wastewater released to the surface water shall be lower than 40°C (unless the temperature in the recipient is higher).</p>	<p>Emissions to water:  •COD: 100 mg/l (expressed as an average yearly value),  • BOD5: 30 mg/l,  • Sulphite: 1 mg/l,  • Ammonium nitrogen: 10 mg/l,  • Total nitrogen: 15 mg/l,  • Total phosphorous: 2 mg/l,  The dye must comply with the following values:  Spectral absorption coefficient at with EUEL  *436 nm (yellow spectral region) 7 m-1  *525 nm (red spectral region) 5 m-1  *620 nm (blue spectral region) 3 m-1  • Toxicity to fish eggs GEI: 2  • The pH value of the wastewater discharged to surface waters must be between 6 and 9 (unless the pH value of the receiving waters is outside this range), and the temperature must be below 35 °C (unless the temperature of the receiving waters is already above this limit).  Before mixing (direct and indirect discharge)  • AOX: 0.5 mg/l,  • Sulphide: &lt;=1 mg/l,  • Copper: 0.4 mg/l,  • Nickel: 0.2 mg/l,  • Total chromium: 0.3 mg/l,  • Tin: 2 mg/l,  • Zinc: 0.8 mg/l,  • Antimony: 1.2 mg/l</p>

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	<b>Verification</b>	Detailed documentation and test reports, using ISO 6060 and ISO 7887 as relevant+ compliance with this criterion based on monthly averages for the six months preceding the application	COD content shall be tested by ISO 6060 or equivalent. test report+ procedure in place for annual testing in line with the requirement and for ensuring compliance with the requirement Report showing average monthly calculations of COD, pH, and temperature for at least three of the past 12 months	Declare compliance, declaration of conformity from the operator of the textile finishing plant and test reports verifying compliance TEST METHODS: COD: ISO 6060 or DIN 38409-41 or DIN 38409-44 or DIN ISO 15705, BOD: DIN EN 1899-2 or ISO 5815-1, Copper and nickel: ISO 8288, Total chromium: ISO 9174 or DIN EN 1233, Sulphide: DIN 38405-27 or ISO 10530, Sulphite: DIN EN ISO 10304-3, Toxicity to fish eggs: DIN EN ISO 15088, AOX (chloride content < 5g/l): DIN EN ISO 9562, Spectral absorption coefficient: DIN 38404-3, Ammonium nitrogen: DIN EN ISO 11732, Total nitrogen: DIN EN ISO 12260, Total phosphorus: DIN EN ISO 11885, Tin: DIN EN ISO 11885, Zinc: DIN EN ISO 11885, Antimony: DIN EN ISO 11885 The wastewater treatment plant must be regularly monitored(at least every six months)
<b>Treatment of emissions to air</b>	<b>Requirement</b>	Emissions to air: Emission of organic compounds (not comparable with the other eco-labels) from thermosetting, thermosoling, coating, and impregnating textiles, including their respective drying (centre) facilities.	Emissions to air: Emissions from printing pastes and foamed synthetic materials indicating different substances (not comparable with other ecolabels)	Emissions to air: Emission of organic compounds to air in the textile finishing process in thermosetting, thermosoling, coating, impregnating, or finishing of textiles (not comparable with the other ecolabels) Additional emission from firing systems in the textile finishing process in thermosetting, thermosoling, coating, impregnating, or finishing of textiles with a strict list of limitations

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
	<b>Verification</b>	Compliance according to EN 12619 or other equivalent standards. Monthly averages for the total emissions of organic compounds from production sites shall be provided for the six months preceding the application.	Declaration from the producer or supplier and emission testing according to the ISO 16000 standard, parts 3, 6, 9, & 11	Compliance by DIN EN 12619 (total gaseous organic carbon), DIN CEN/TS 17638 (formaldehyde) and DIN EN ISO 21877 (ammonia).  For firing systems: testing: Depending on the heating capacity, the heating boilers must be tested as follows: - 0.3 MW to 2 MW every 3 years - > 2 MW at least yearly - > 5 MW continuously

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4574 **Table 91.** Corporate social responsibility - comparison among Ecolabels

Topic	Requirement / Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Fundamental principles and rights at work</b>	<b>Requirement</b>	Worker principles based on ILO Conventions. UN Global Compact and OECD Guidelines for Manufacturing Principles.	Must comply with the relevant national laws and regulations and the ILO Conventions. Some extra requirements were added for product licenses.	Must comply with the social and human rights requirements for the Green Button 2.0
	<b>Verification</b>	Third-party verification, including site visits by auditors.  In countries where the ILO Labour Inspection Convention, 1947 (No 81) has been ratified, ILO supervision indicates that the national labour inspection system is effective and verification by labour inspector(s) appointed by a public authority shall be accepted.	Third-party verification (BSCI audit report) or SA8000 certificate for manufacturing. Description of code of conduct, policy and routine for produce licence.	Test report from an auditing body or SA8000 certificate.
<b>Restriction on the sandblasting of denim</b>	<b>Requirement</b>	Manual and mechanical sandblasting is prohibited.	Manual and mechanical sandblasting is prohibited. The use of potassium permanganate is not permitted.	
	<b>Verification</b>	The applicant must provide details of all production sites—evidence of the alternative processes to achieve distressed denim finishes.	Declaration stating the method used and that the requirement is fulfilled.	The applicant must provide details of all production sites. Evidence of the alternative processes used to achieve distressed denim finishes. Confirmation that no mechanical sandblasting or potassium permanganate is used.

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**Table 92.** Miscellaneous criteria - comparison among Ecolabels

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Information appearing on the Ecolabel</b>	<b>Requirement</b>	The label may optionally contain text like:  - More sustainable fibre production or a text defined in ECOLABEL, depending on product content. -Less polluting production processes -Restrictions on hazardous substances -Tested for durability	Mandatory information: - Product Type - Name and the fibre composition -All fabrics, their name, and % by weight -Membranes/coatings, impregnations or laminates -Details/accessories with information on the material type -Fillings and stuffing with information of the material type -Information on all recycled or biobased materials -If reused	Fibres are used by Regulation EC 1007/2011. Care and cleaning information (textile care symbols) by GINETEX or ISO EN DIN3758 and ISO10023 for industrial washing textiles. Information on repairable or replaceable parts of the textile.
	<b>Verification</b>	Label sample + DoC	Schematic overview	Label sample + DoC
<b>Packaging</b>	<b>Requirement</b>	N.A	PVC must not be used -It shall be possible to recycle the main material - Only monomaterials shall be used. Multi-material hangers are allowed if reused in a textile manufacturer's take-back system. - Plastic packaging shall be made from PE, PP, or PET. - Coloured plastic cannot be used for virgin plastic feedstock. Only if at least 50% by weight of the plastic is recycled material is colouring permitted. - Information on how it can be sorted for recycling - Chlorophenols and their salts, PCB, and organotin compounds shall not be used in transport or storage.	Mandatory description. Unnecessary packaging must be avoided. Composite packaging is not permitted and may not contain any dimethyl fumarate. The requirements apply to repackaging and transport, sales, and delivery of packaging directly used by the applicant. Clothes hangers are exempt.
	<b>Verification</b>	N.A	Declaration of Compliance about who is responsible for the product's primary packaging. Declaration of Compliance about PVC from the manufacturer of plastic material. Description of the main material and how it can be recycled. Description of primary packaging documenting compliance. Multi-material hangers: textile manufacturer's procedure describing the take-back system for hangers. Product labels or artwork providing information on recycling. Suppliers must declare that chlorophenols are not used in the yarn, fabric, or end product or have a valid license certificate for the EU Ecolabel.	DoC and a description of the intended packaging solution, designation and composition, raw materials and their origin, and a sample of the product packaging where relevant.
<b>Unsold textiles</b>	<b>Requirement</b>	N.A	Unsold textiles must not be sent for incineration or dumped in landfills. The brand owner must inform Nordic Swan Ecolabelling and state how they deal with unsold products on their website.	N.A

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
			Products with contaminations that are harmful to the environment or health are exempt. Military and police uniforms are exempt.	
	<b>Verification</b>	N.A	Description of how unsold products are dealt with and its procedure.	N.A
<b>Reused textiles</b>	<b>Requirement</b>	N.A	The material shall not come from workwear and other textiles used in the chemical and oil industry -The material must not contain plastisol print - Textiles from the health care sector must be washed, inactivating microorganisms. - Material originally eco-labelled with the Nordic Swan Ecolabel, the EU Ecolabel, GORS, or Bra Miljöval or have Oeko-Tex 100 or only be used for furnishing fabrics such as rugs, tablecloths If re-designed for professional use, the product must fulfil the expected function. If processed with chemical products, the requirements for chemicals must be accomplished.	N.A
	<b>Verification</b>	N.A	Invoice or label on the textile -Documentation showing that the textile used is reused - Declaration that the textile has been washed in an industrial laundry in a microbiological wash - Declaration that The material does not contain PVC	N.A
<b>Reduced washing</b>	<b>Requirement</b>	N.A	The text "Reduce the number of washes and help save energy and reduce climate impact" must be included.	N.A
	<b>Verification</b>	N.A	Photo	N.A
<b>Production Chain</b>	<b>Requirement</b>	N.A	Description of all the production methods/treatment techniques, including production by suppliers. -Name of the fibres, yarns, and fabrics -Information of all the actors in the production chain	N.A
	<b>Verification</b>	N.A	Schematic overview	N.A

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Materials limitations</b>	<b>Requirement</b>	N.A	<p>The sewing thread is not covered</p> <ul style="list-style-type: none"> <li>-Embroidery thread applies chemical requirements</li> <li>-Belt buckles of metals must not exceed 25% by weight</li> <li>-Fibre types with less than 5% by weight are exempt.</li> <li>-Small textile elements present between 5% to 10% by weight may be exempted from the requirements of the textile element has an EU-Ecolabel or GOTS or Oeko Tex 100 class I certificate</li> <li>- For elastic bands, up to a total of 25% of the product's weight may be exempted from the requirements if GOTS or Oeko-Tex 100 class I certification</li> <li>- Information printed directly on the textile product must meet the requirements of prohibited substances</li> </ul>	N.A
	<b>Verification</b>	N.A	Declaration of Compliance and certificate where applicable. If Oeko Tex 100: Statement regarding fluorinated organic compounds	N.A
<b>Quality and regulatory requirements</b>	<b>Requirement</b>	N.A	<p>Written documentation obtained annually showing that suppliers are familiar with Nordic Swan Ecolabel's requirements. Supplier changes must be approved. An individual responsible for ensuring the fulfilment should be appointed.</p> <p>The licence must guarantee the quality of the labelled product during the validity period.</p> <p>Written notice must be given in case of changes.</p> <p>Nonconformities must be reported.</p> <p>Traceable product.</p>	N.A
	<b>Verification</b>	N.A	Documentation, operational chart and procedures description.	N.A
<b>Traceability of the Nordic Swan Ecolabelled product</b>	<b>Requirement</b>	N.A	The brand owner is responsible for ensuring that a Nordic Swan Ecolabelled product can be traced back to a production licence.	N.A
	<b>Verification</b>	N.A	<ul style="list-style-type: none"> <li>-The brand owner must submit the information specified in the requirement.</li> <li>- A description of the procedure, which shows how it is ensured that the information held by Nordic Ecolabelling is kept updated.</li> </ul>	N.A

4578 **Table 93.** Dyes restriction - comparison among Ecolabels

Topic	Requirement/ Verification	EU Ecolabel	Nordic Swan	Blue Angel
<b>Carcinogenic aromatic amines</b>	<b>Requirement</b>	The same 25 dyes listed, limitation: 30 mg/kg for each amine	Prohibited: the same 25 dyes listed + 10 additional dyes	The same 25 dyes listed limitation: 20 mg/kg for each amine
	<b>Verification</b>	Test results: EN 14362-1 and 3.	Prohibited: Declaration from the chemical manufacturer or chemical supplier that the requirement is fulfilled	Test results: EN 14362-1 and 3.
<b>List of dyes that may cleave to carcinogenic aromatic amines</b>	<b>Requirement</b>	An extended list of prohibited disperse, basic, acid and direct dyes limitation: 30 mg/kg for each amine	There is no specific dyes list, but in the section addressed to recycled fibres, there are limitations for cleavable dyes according to Oeko-Tex 100 Annex 5	Azo dyes that may cleave to one of the aromatic amines must not exceed a limit value of 20 mg/kg.
	<b>Verification</b>	Test results: EN 14362-1 and 3.	Cleavable, classified as carcinogenic in Oeko-Tex Annex 5: Total 20 mg/kg Cleavable aniline as listed in Oeko-Tex Annex 5: Total 100 mg/kg Test reports or Oeko-Tex 100 class I certificate showing fulfilment of the requirement	20 mg/kg for each dye Test results by the test method DIN EN 14362-1 and, DIN EN 14362-3 (for arylamine), and DIN 54231 (for dispersion dyes).
<b>Dyes that are carcinogenic, mutagenic or toxic to reproduction</b>	<b>Requirement</b>	List of prohibited dyes	There is no specific dyes list but criterion 034. Prohibition of CMR substances refers to carcinogenic, mutagenic or toxic to reproduction substances in general.	Extended list of prohibited dyes
	<b>Verification</b>	Prohibited. Declaration of non-use from the chemical supplier supported by SDS.	Declaration from the chemical producer that the requirement has been fulfilled.	Declaration from the chemical producer that the requirement is fulfilled and test results by the test method DIN EN 14362-1 and DIN EN 14362-3 (for arylamine)
<b>Disperse dyes that are potentially sensitising</b>	<b>Requirement</b>	List of prohibited dyes	There is no specific dyes list but criterion 033. Classification of chemical products refers to sensitising on inhalation or skin contact substances.	Extended list of prohibited dyes
	<b>Verification</b>	Prohibited. Declaration of non-use from the chemical supplier supported by SDS.	Declaration from the chemical producer that the requirement has been fulfilled.	Declaration from the chemical producer that the requirement is fulfilled and test results by the test method DIN EN 14362-1 and DIN EN 14362-3 (for arylamine)+

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4584 **9.8 Supporting information about public procurement**4585 **9.8.1 The Common Procurement Vocabulary (CPV) codes for products in the scope**4586 **Table 94.** The Common Procurement Vocabulary (CPV) codes for products in the scope

Product category	Common Procurement Vocabulary (CPV) code
T-shirts	18000000-9*: Clothing, footwear, luggage articles and accessories 18300000-2*: Garments 18318400-5: Vests 18330000-1*: T-shirts and shirts 18331000-8: T-shirts 18235400-9: Waistcoats 18400000-3*: Special clothing and accessories 18410000-6*: Special clothing 18411000-3*: Baby clothing
Shirts and blouses	18000000-9*: Clothing, footwear, luggage articles and accessories 18300000-2*: Garments 18318000-1*: Nightwear 18318100-2: Nightshirts 18318200-3: Dressing gowns 18318300-4*: Pyjamas 18318500-6: Nightdresses 18330000-1*: T-shirts and shirts 18332000-5: Shirts 18333000-2: Polo shirts 18400000-3*: Special clothing and accessories 18410000-6*: Special clothing 18411000-3*: Baby clothing
Sweaters and mid-layers	18000000-9*: Clothing, footwear, luggage articles and accessories 18235000-5: Pullovers, cardigans and similar articles 18235100-6: Pullovers 18235200-7: Cardigans 18235300-8: Sweatshirts 18300000-2*: Garments 18400000-3*: Special clothing and accessories 18410000-6*: Special clothing 18411000-3*: Baby clothing
Jackets and coats	18000000-9*: Clothing, footwear, luggage articles and accessories 18200000-1: Outerwear 18210000-4: Coats 18211000-1: Capes 18212000-8: Cloaks 18213000-5: Wind jackets 18220000-7: Weatherproof clothing 18221000-4: Waterproof clothing 18221100-5: Waterproof capes 18221200-6: Anoraks 18221300-7: Raincoat 18223000-8: Jackets and blazers 18223100-9: Blazers 18223200-0: Jackets 18224000-5: Clothing made of coated or impregnated textile fabrics 18230000-0: Miscellaneous outerwear 18300000-2*: Garments 18400000-3*: Special clothing and accessories 18410000-6*: Special clothing 18411000-3*: Baby clothing

Product category	Common Procurement Vocabulary (CPV) code
Pants and shorts	18000000-9*: Clothing, footwear, luggage articles and accessories 18233000-1: Shorts 18234000-8: Trousers 18300000-2*: Garments 18318000-1*: Nightwear 18318300-4*: Pyjamas 18400000-3*: Special clothing and accessories 18410000-6*: Special clothing 18411000-3*: Baby clothing
Dresses: Skirts and jumpsuits	18000000-9*: Clothing, footwear, luggage articles and accessories 18222100-2: Suits 18222200-3: Ensembles 18231000-7: Dresses 18232000-4: Skirts 18300000-2*: Garments 18400000-3*: Special clothing and accessories 18410000-6*: Special clothing 18411000-3*: Baby clothing
Leggings: Stockings: Tights and socks	18315000-0: Stockings 18316000-7: Tights 18317000-4: Socks
Underwear	18310000-5: Underwear 18311000-2: Slips 18312000-9: Underpants 18313000-6: Panties 18320000-8: Brassieres, corsets, suspenders and similar articles 18321000-5: Brassieres 18322000-2: Corsets 18323000-9: Suspenders
Swimwear	18412800-8: Swimwear
Accessories	18421000: Handkerchiefs 18422000: Scarves 18423000: Ties 18424000: Gloves 18425000: Belts

4587 \* These CPV codes were assigned to more than one product category

4588 Source: own elaboration based on CPV description provided by BIP Solutions <sup>(149)</sup>

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<sup>149</sup> BIP Solutions. CPV codes. Available at [this link](#). Last accessed on 12 January 2024.

4590 **9.8.2 Number of Contract Award procuring apparel in EU**

4591 **Figure 48.** Number of Contracts Award procuring apparel in EU Member States

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4593 *Source: own elaboration based on Tenders Electronic Daily (TED) (csv subset) – public procurement notices <sup>(108)</sup>.*

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4595 **Table 95.** Number of Contracts Award procuring apparel in EU Member States in 2015

Country	CPV 181	CPV 182	CPV 183	CPV 184	CPV 351	CPV 358	CPV 374	Total in the country
Austria	2	NA	NA	3	NA	NA	NA	5
Belgium	10	1	9	4	NA	1	NA	25
Bulgaria	31	1	NA	NA	NA	4	NA	36
Croatia	2	4	1	2	NA	7	NA	16
Cyprus	NA	1	NA	NA	NA	1	NA	2
Czechia	5	5	2	11	1	5	1	30
Denmark	4	NA	NA	6	NA	NA	NA	10
Estonia	NA	2	1	3	1	NA	1	8
Finland	3	NA	4	4	NA	NA	NA	11
France	93	6	11	11	3	5	2	131
Germany	17	10	11	19	3	17	1	78
Greece	1	NA	NA	NA	NA	NA	NA	1
Hungary	1	NA	NA	NA	NA	NA	NA	1
Ireland	NA	0						
Italy	8	7	2	3	NA	3	NA	23
Latvia	3	NA	NA	2	NA	NA	NA	5
Lithuania	8	1	3	5	2	5	NA	24
Luxembourg	NA	0						
Malta	NA	1	NA	NA	NA	NA	NA	1
Netherlands	3	4	1	4	1	1	NA	14
Poland	18	13	9	21	3	11	NA	75
Portugal	7	1	NA	NA	NA	NA	NA	8
Romania		1	1	4	NA	2	NA	8
Slovakia	2	1	NA	5	NA	NA	NA	8
Slovenia	5	2	NA	NA	NA	3	NA	10
Spain	5	NA	NA	1	NA	1	NA	7
Sweden	13	NA	2	2	NA	NA	2	19
Total per CPV code	241	61	57	110	14	66	7	556

4596 CPV 181: CPV 181XXXXX-X Occupational clothing, special workwear and accessories;

4597 CPV 182: CPV 182XXXXX-X Outerwear;

4598 CPV 183: CPV 183XXXXX-X Garments;

4599 CPV 184: CPV 184XXXXX-X Special clothing and accessories;

4600 CPV 351: CPV 351134XX-X Protective and safety clothing;

4601 CPV 358: CPV 3581XXXXX-X Individual and support equipment;

4602 CPV 374: CPV 3741XXXX-X Sport goods and equipment.

4603 *Source: own elaboration based on Tenders Electronic Daily (TED) (csv subset) – public procurement notices <sup>(108)</sup>.*

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4605 **Table 96.** Number of Contracts Award procuring apparel in EU Member States in 2016

Country	CPV 181	CPV 182	CPV 183	CPV 184	CPV 351	CPV 358	CPV 374	Total in the country
Austria	6	NA	4	1	NA	1	1	13
Belgium	11	4	2	3	NA	3	NA	23
Bulgaria	23	1	NA	1	NA	16	NA	41
Croatia	4	1	1	NA	1	4	NA	11
Cyprus	NA	NA	1	NA	NA	1	NA	2
Czechia	5	9	2	6	2	7	NA	31
Denmark	4	NA	3	1	1	2	1	12
Estonia	2	NA	1	1	NA	1	NA	5

Country	CPV 181	CPV 182	CPV 183	CPV 184	CPV 351	CPV 358	CPV 374	Total in the country
Finland	7	NA	2	1	NA	1	NA	11
France	106	9	11	7	11	10	3	157
Germany	25	10	10	4	6	17	NA	72
Greece	1	NA	NA	NA	NA	NA	NA	1
Hungary	1	NA	NA	1	NA	4	1	7
Ireland	NA	NA	NA	2	NA	NA	NA	2
Italy	5	6	6	1	2	10	NA	30
Latvia	1	NA	1	NA	NA	2	NA	4
Lithuania	3	2	4	9	2	5	1	26
Luxembourg	1	NA	NA	NA	NA	NA	NA	1
Malta	1	NA	NA	NA	NA	NA	NA	1
Netherlands	9	6	1	1	1	1	NA	19
Poland	14	11	4	7	9	12	1	58
Portugal	9	NA	NA	NA	NA	1	NA	10
Romania	2	NA	2	NA	NA	2	NA	6
Slovakia	2	6	2	1	NA	NA	NA	11
Slovenia	11	3	NA	NA	1	7	NA	22
Spain	NA	NA	NA	NA	NA	1	NA	1
Sweden	32	NA	3	NA	1	NA	3	39
Total per CPV code	285	68	60	47	37	108	11	616

4606 CPV 181: CPV 181XXXXX-X Occupational clothing, special workwear and accessories;

4607 CPV 182: CPV 182XXXXX-X Outerwear;

4608 CPV 183: CPV 183XXXXX-X Garments;

4609 CPV 184: CPV 184XXXXX-X Special clothing and accessories;

4610 CPV 351: CPV 351134XX-X Protective and safety clothing;

4611 CPV 358: CPV 3581XXXX-X Individual and support equipment;

4612 CPV 374: CPV 3741XXXX-X Sport goods and equipment.

4613 Source: own elaboration based on Tenders Electronic Daily (TED) (csv subset) – public procurement notices <sup>(108)</sup>.

4614

4615 **Table 97.** Number of Contracts Award procuring apparel in EU Member States in 2017

Country	CPV 181	CPV 182	CPV 183	CPV 184	CPV 351	CPV 358	CPV 374	Total in the country
Austria	5	1	1	2	1	1	1	12
Belgium	13	1	NA	NA	1	3	NA	18
Bulgaria	25	1	2	5	2	22	NA	57
Croatia	5	4	NA	2	NA	5	NA	16
Cyprus	NA	NA	NA	1	NA	NA	NA	1
Czechia	16	32	24	12	2	21	1	108
Denmark	6	1	2	4	NA	1	1	15
Estonia	2	NA	3	2	NA	NA	NA	7
Finland	9	NA	1	NA	NA	1	NA	11
France	126	7	14	12	12	6	2	179
Germany	37	16	8	5	4	16	2	88
Greece	NA	NA	1	NA	NA	1	NA	2
Hungary	5	NA	NA	2	1	4	NA	12
Ireland	1	NA	NA	NA	NA	NA	NA	1
Italy	9	4	2	3	4	8	NA	30
Latvia	3	NA	NA	4	NA	5	NA	12
Lithuania	5	NA	2	8	2	3	NA	20
Luxembourg	NA	0						
Malta	1	1	2	NA	NA	1	NA	5
Netherlands	10	4	2	3	2	4	NA	25
Poland	19	16	16	19	13	18	1	102
Portugal	NA	NA	NA	NA	1	NA	NA	1
Romania	1	NA	1	3	NA	2	NA	7
Slovakia	5	3	4	2	1	1	NA	16
Slovenia	23	2	NA	8	2	6	NA	41
Spain	5	NA	NA	NA	NA	NA	NA	5
Sweden	29	NA	3	NA	2	4	NA	38
Total per CPV code	360	93	88	97	50	133	8	829

4616 CPV 181: CPV 181XXXXX-X Occupational clothing, special workwear and accessories;  
 4617 CPV 182: CPV 182XXXXX-X Outerwear;  
 4618 CPV 183: CPV 183XXXXX-X Garments;  
 4619 CPV 184: CPV 184XXXXX-X Special clothing and accessories;  
 4620 CPV 351: CPV 351134XX-X Protective and safety clothing;  
 4621 CPV 358: CPV 3581XXXX-X Individual and support equipment;  
 4622 CPV 374: CPV 3741XXXX-X Sport goods and equipment.  
 4623 Source: own elaboration based on Tenders Electronic Daily (TED) (csv subset) – public procurement notices <sup>(108)</sup>.

4624

4625 **Table 98.** Number of Contracts Award procuring apparel in EU Member States in 2018

Country	CPV 181	CPV 182	CPV 183	CPV 184	CPV 351	CPV 358	CPV 374	Total in the country
Austria	5	5	4	NA	NA	NA	NA	14
Belgium	26	NA	4	2	1	NA	NA	33
Bulgaria	28	5	3	2	4	25	NA	67
Croatia	3	3	2	1	NA	4	NA	13
Cyprus	NA							
Czechia	17	31	20	18	10	22	2	120
Denmark	13	1	NA	6	2	2	NA	24
Estonia	4	3	6	4	1	4	NA	22
Finland	3	3	NA	2	NA	1	NA	9
France	108	4	14	7	15	9	3	160
Germany	33	10	10	4	7	6	NA	70
Greece	2	1	NA	NA	NA	1	NA	4
Hungary	10	NA	NA	1	NA	9	NA	20
Ireland	NA	NA	NA	1	NA	NA	NA	1
Italy	22	2	4	4	2	6	NA	40
Latvia	3	NA	4	9	NA	18	NA	34
Lithuania	12	2	4	4	2	6	2	32
Luxembourg	1	NA	NA	NA	NA	NA	NA	1
Malta	1	1	NA	NA	NA	2	NA	4
Netherlands	8	5	1	3	5	1	NA	23
Poland	39	10	15	26	12	22	NA	124
Portugal	NA	NA	NA	NA	1	NA	NA	1
Romania	21	2	4	NA	NA	9	NA	36
Slovakia	5	2	2	4	1	NA	NA	14
Slovenia	21	1	NA	10	5	10	NA	47
Spain	1	NA	NA	NA	1	NA	NA	2
Sweden	45	2	2	3	NA	1	3	56
Total per CPV code	431	93	99	111	69	158	10	971

4626 CPV 181: CPV 181XXXXX-X Occupational clothing, special workwear and accessories;  
 4627 CPV 182: CPV 182XXXXX-X Outerwear;  
 4628 CPV 183: CPV 183XXXXX-X Garments;  
 4629 CPV 184: CPV 184XXXXX-X Special clothing and accessories;  
 4630 CPV 351: CPV 351134XX-X Protective and safety clothing;  
 4631 CPV 358: CPV 3581XXXX-X Individual and support equipment;  
 4632 CPV 374: CPV 3741XXXX-X Sport goods and equipment.  
 4633 Source: own elaboration based on Tenders Electronic Daily (TED) (csv subset) – public procurement notices <sup>(108)</sup>.

4634

4635 **Table 99.** Number of Contracts Award procuring apparel in EU Member States in 2019

Country	CPV 181	CPV 182	CPV 183	CPV 184	CPV 351	CPV 358	CPV 374	Total in the country
Austria	4	NA	6	NA	NA	1	NA	11
Belgium	13	2	NA	1	5	2	1	24
Bulgaria	20	4	2	3	4	38	NA	71
Croatia	2	4	NA	NA	NA	3	NA	9
Cyprus	NA	1	NA	1	NA	1	NA	3
Czechia	26	35	41	22	16	34	NA	174
Denmark	9	1	4	1	1	1	NA	17
Estonia	3	3	5	2	NA	1	NA	14
Finland	6	NA	3	1	NA	2	NA	12
France	156	11	10	14	15	6	8	220

Country	CPV 181	CPV 182	CPV 183	CPV 184	CPV 351	CPV 358	CPV 374	Total in the country
Germany	50	14	18	12	8	18	NA	120
Greece	6	1	2	1	2	2	1	15
Hungary	8	NA	NA	1	2	2	NA	13
Ireland	NA	1	NA	NA	1	NA	NA	2
Italy	15	7	7	5	4	10	NA	48
Latvia	6	1	NA	20	1	3	NA	31
Lithuania	23	2	6	13	2	7	NA	53
Luxembourg	NA	0						
Malta	NA	NA	1	NA	NA	NA	NA	1
Netherlands	7	10	1	2	3	3	NA	26
Poland	62	15	16	17	27	28	NA	165
Portugal	1	NA	NA	NA	NA	NA	NA	1
Romania	48	11	6	9	1	36	1	112
Slovakia	2	NA	4	4	NA	NA	NA	10
Slovenia	18	NA	2	8	5	8	NA	41
Spain	3	NA	NA	NA	NA	NA	NA	3
Sweden	45	1	4	5	6	NA	4	65
Total per CPV code	533	124	138	142	103	206	15	1261

4636 CPV 181: CPV 181XXXXX-X Occupational clothing, special workwear and accessories;

4637 CPV 182: CPV 182XXXXX-X Outerwear;

4638 CPV 183: CPV 183XXXXX-X Garments;

4639 CPV 184: CPV 184XXXXX-X Special clothing and accessories;

4640 CPV 351: CPV 351134XX-X Protective and safety clothing;

4641 CPV 358: CPV 3581XXXX-X Individual and support equipment;

4642 CPV 374: CPV 3741XXXX-X Sport goods and equipment.

4643 Source: own elaboration based on Tenders Electronic Daily (TED) (csv subset) – public procurement notices <sup>(108)</sup>.

4644

### 4645 9.8.3 Contributions to the initial questionnaire

4646 **Table 100.** Type of respondents that contributed to the section on EU GPP during the initial questionnaire

Type of respondent	Number	Percentage compared to the total (%)
University or research institute	1	3
Certified laboratory	1	3
Government (local, regional, or national)	12	35
Non-governmental organisation – Environment	3	9
Non-governmental organisation – Consumers	0	0
Industry – manufacturing	6	18
Industry – manufacturing - association	2	6
Industry – waste collection, sorting and treatment	1	3
Industry – waste collection, sorting and treatment - association	1	3
Distributor/Retailer	0	0
Distributor/Retailer association	1	3
Other	6	18
TOTAL	34	100

4647 Source: own elaboration

4648