1	PRODUCT ENVIRONMENTAL FOOTPRINT
2	CATEGORY RULES (PEFCR)
3	APPAREL AND FOOTWEAR
4	
5	
6	Version 3.0
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18	(European Footwear Confederation), CNMI (Camera Nazionale della Moda Italiana),
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THIRD PEFCR	INFORMATION
Title	Product Environmental Footprint Category Rules: Apparel and Footwear
Leading	Cascale (former Sustainable Apparel Coalition)
organization	
Liability	Information contained in this report has been compiled and/or
statement	computed from sources believed to be credible. Application of the
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mes	durability
	A&E DEECP Appay VII - Inventory modelling and default detector
	A&F PEFCR Annex XI - Calibration sheet for the pre-verification
	of the IDM calculation module in tools

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328	How to read this	s document
329	Notes addresse	d to the reader are presented in orange boxes, as shown below:
330		
221	Note	This document is based on the template provided in Annex II part B: PEFCR Template of the PEF method (2021) which shall be applied for all types of PEFCR.
331		

### 333 Acronyms and abbreviations

μm	Micrometre				
AWARE	Available WAter REmaining				
BOM	Bill Of Materials				
BSI	British Standards Institution				
CEC	European Footwear Confederation				
CFCs	Chlorofluorocarbons				
CELC	European Confederation of Flax and Hemp				
CFs	Characterization Factors				
CFF	Circular Footprint Formula				
CNMI	Camera Nazionale della Moda Italiana				
CMWG	Cattle Model Working Group				
CO <sub>2</sub>	Carbon Dioxide				
CPA	Classification of Products by Activity				
CTUe	Comparative Toxic Units for ecosystems				
CTUh	Comparative Toxic Units for human health				
DC	Distribution Centre				
DNM	Data Needs Matrix				
DoS	Duration of Service				
DOR	Data Quality Rating				
EC/DG-ENV	European Commission/Directorate-General for the Environment				
FCOS	Environmental Coalition on Standards				
FFR	European Environmental Bureau				
FF	Environmental Footprint				
EFTA	European Free Trade Association				
EV/A	Ethylene Vinyl Acetate				
FLCD	European Reference Life Cycle Database				
FOI	End Of Life				
FAO	Food and Agriculture Organization of the United Nations				
FESI	Federation of the European Sporting Goods Industry				
FHCM	Fédération de la Haute Couture et de la Mode				
F2C	Factory to Consumer				
FU	Functional Unit				
a	aram				
9 GHGs	Greenhouse asses				
GeR	Geographical Representativeness				
GeRep	Geographical Representativeness evaluated at the level of the secondary				
	dataset				
Higg PM	Higg Product Module				
IFF	International Fur Federation				
ILCD	International reference Life Cycle Data system				
IPCC	Intergovernmental Panel on Climate Change				
ISO	International Organization for Standardization				
IWTO	International Wool Textile Organisation				
JRC	Joint Research Centre				
kBq U <sup>235</sup> eq	kilobecquerel uranium-235 equivalent				
kcal	kilocalorie				
kg	kilogram				
kg CFC-11 eq	kilogram of trichlorofluoromethane or freon-11 equivalent				
kg CO <sub>2</sub> -eq	kilogram of carbon dioxide equivalent				

kg N eq	kilogram of nitrogen equivalent						
kg NMVOC eq	kilogram of non-methane volatile organic compounds equivalent						
kg P eq	kilogram of phosphorus equivalent						
kg Sb eq	kilogram of antimony equivalent						
km	kilometre						
kWh	kilowatt-hour						
LCA	Life Cycle Assessment						
LCI	Life Cycle Inventory						
LCIA	Life Cycle Inventory Assessment						
LCS	Life Cycle Stage						
LHVs	Lower Heating Values						
LUC	Land Use Change						
m	metre						
m <sup>2</sup>	metre squared						
m <sup>3</sup>	cubic metre						
ME	Metabolizable Energy						
MJ	Megajoule						
mol H <sup>+</sup>	mole of Hydrogen ion						
mol N ea	mole of Nitrogen equivalent						
NACE	Nomenclature Générale des Activités Economiques dans les						
	Communautés Européennes						
NOx	Nitrogen Oxides						
ODP	Ozone Depletion Potential						
P	Precision/uncertainty						
PAD	Precision evaluated at the level of the Activity Data						
PAF	Potentially Affected Fraction of Species						
PDF	Potentially Disappeared Eraction of Species						
PF	Polyethylene						
PEE	Product Environmental Footorint						
	Product Environmental Footprint Category Rules						
PET	Polyethylene Terenthalate						
PM	Particulate Matter						
DDD	Purchasing Power Parity						
Pt	Point for dimensionless values						
PTFF	Polytetrafluoroethylene						
RC	Renair Cost						
	"Pight to Renair" Communication						
DD	Representative Product						
RS	Representative Product						
SEID	Semi-finished and intermediate products						
SME	Small and Medium-sized Enterprise						
SMCD	Small and Medium-sized Enterprise						
	Single Market for Green Products						
5F +	toppo						
	Toobaical Advisory Board						
	rechnical Advisory Board						
	rechnological Representativeness						
IERSD	detect						
TiP	ualasel Time Penrosentativeness						
	Time Representativeness						
	Time Representativeness evaluated at the level of the according data						
tirsD	tonne kilometre						
ukifi							

TS	Technical Secretariat
UUID	Universally Unique Identifier
VOCs	Volatile Organic Compounds

#### 335 **Definitions**

336 This glossary defines key terms used in this document.

#### 337 Life Cycle Assessment definitions

338 Definitions with an asterisk (\*) come from the European Commission recommendation 339 C(2021) 9332 final, on the use of the Environmental Footprint methods to measure 340 and communicate the life cycle environmental performance of products and 341 organisations and is herein referred to as the PEF method. For further clarifications,

342 please refer to the PEF method<sup>1</sup>.

information\*

A factor of the Allocation factor of burdens and credits between supplier and user of recycled materials.

- Activity data\* Information which is associated with processes while modelling Life Cycle Inventories (LCI). The aggregated LCI results of the process chains, which represent the activities of a process, are each multiplied by the corresponding activity data and then combined to derive the environmental footprint associated with that process. Examples of activity data include quantity of kilowatt-hours of electricity used, quantity of fuel used, output of a process (e.g. waste), number of hours equipment is operated, distance travelled, floor area of a building, etc. Synonym of "non-elementary flow".
- Acidification\* EF impact category that addresses impacts due to acidifying substances in the environment. Emissions of NO<sub>x</sub>, NH<sub>3</sub> and SO<sub>x</sub> lead to releases of hydrogen ions (H<sup>+</sup>) when the gases are mineralised. The protons contribute to the acidification of soils and water when they are released in areas where the buffering capacity is low, resulting in forest decline and lake acidification.

Additional Environmental information outside the EF impact categories that is calculated and communicated alongside PEF results.

- Aggregated Complete or partial life cycle of a product system that next to the elementary flows (and possibly not relevant amounts of waste flows and radioactive wastes) itemises only the product(s) of the process as reference flow(s) in the input/output list, but no other goods or services. Aggregated datasets are also called "LCI results" datasets. The aggregated dataset may have been aggregated horizontally and/or vertically.
- Allocation\* An approach to solving multi-functionality problems. It refers to "partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems".

ApplicationGeneric aspect of the specific application in which a material is used. For<br/>example, the average recycling rate of PET in bottles.

B factor of the Allocation factor of energy recovery processes: it applies both to burdens and credits.

Background Refers to those processes in the product life cycle for which no direct access to information is possible. For example, most of the upstream life-cycle processes and generally all processes further downstream will be considered part of the background processes.

<sup>&</sup>lt;sup>1</sup>https://environment.ec.europa.eu/document/download/680503dc-5a19-4f6a-bb92-84d9bfc8f312\_en?filename=Annexes%201%20to%202.pdf

- Benchmark\* A standard or point of reference against which any comparison may be made. In the context of PEF, the term 'benchmark' refers to the average environmental performance of the representative product sold in the EU market.
- CFF Circular Footprint Formula. The CFF is an approach developed in the frame of the PEF to account for and allocate the impacts and benefits of the end-of-life of materials between different systems (the waste producer and the user of recycled or recovered products)
- Characterisation\* Calculation of the magnitude of the contribution of each classified input/output to their respective EF impact categories, and aggregation of contributions within each category. This requires a linear multiplication of the inventory data with characterisation factors for each substance and EF impact category of concern. For example, with respect to the EF impact category "climate change", the reference substance is CO<sub>2</sub> and the reference unit is kg CO<sub>2</sub>-equivalents.

Characterisation factor\* Factor derived from a characterisation model which is applied to convert an assigned life cycle inventory result to the common unit of the EF impact category indicator.

Climate change\* EF impact category considering all inputs or outputs that result in greenhouse gas (GHG) emissions. The consequences include increased average global temperatures and sudden regional climatic changes.

Company-specific data\* Refers to directly measured or collected data from one or multiple facilities (site-specific data) that are representative for the activities of the company (company is used as synonym for organisation). It is synonymous to "primary data". To determine the level of representativeness, a sampling procedure may be applied.

Company-specific dataset (disaggregated or aggregated) compiled with companyspecific data. In most cases the activity data is company-specific while the underlying sub-processes are datasets derived from background databases.

Comparative An environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function (including the benchmark of the product category).

- Comparison\* A comparison, not including a comparative assertion, (graphic or otherwise) of two or more products based on the results of a PEF study and supporting PEFCR.
- Consumer\* An individual member of the general public purchasing or using goods, property or services for private purposes.
- Cradle to grave \* A product's life cycle that includes raw material extraction, processing, distribution, storage, use, and disposal or recycling stages. All relevant inputs and outputs are considered for all of the stages of the life cycle.
- Critical review\* Process intended to ensure consistency between a PEFCR and the principles and requirements of the PEF method.

Cut-off\* Any cut-off shall be avoided, unless under the following rules:

Processes and elementary flows may be excluded up to 3.0%, based on material and energy flows and the level of environmental significance (single overall score). The processes subject to cut-off shall be made explicit and justified in the PEF report, in particular with reference to the environmental significance of the cut-off applied.

This cut-off has to be considered additionally to the cut-off already included in the background datasets. This rule is valid for both intermediate and final products.

	The processes that in total account less than 3.0% of the material and energy flow and environmental impact for each impact category may be excluded from PEF studies (starting from the less relevant).		
	A screening study is recommended to identify processes that may be subject to cut-off.		
Data Quality Rating*	Semi-quantitative assessment of the quality criteria of a dataset based on Technological representativeness, Geographical representativeness, Time-related representativeness, and Precision. The data quality shall be considered as the quality of the dataset as documented.		
Disaggregation*	The process that breaks down an aggregated dataset into smaller unit process datasets (horizontal or vertical). The disaggregation may help making data more specific. The process of disaggregation should never compromise or threaten to compromise the quality and consistency of the original aggregated dataset.		
Downstream*	Occurring along a product supply chain after the point of referral.		
Ecotoxicity, freshwater*	Environmental footprint impact category that addresses the toxic impacts on an ecosystem, which damage individual species and change the structure and function of the ecosystem. Ecotoxicity is a result of a variety of different toxicological mechanisms caused by the release of substances with a direct effect on the health of the ecosystem.		
ED factor of the CFF	specific emissions and resources consumed (per unit of analysis) arising from disposal of waste material at the EoL of the analysed product, without energy recovery.		
EER factor of the CFF	Specific emissions and resources consumed (per unit of analysis) arising from the energy recovery process (e.g. incineration with energy recovery, landfill with energy recovery, $\dots$ ).		
EF compliant dataset*	Dataset developed in compliance with the EF requirements, regularly updated by DG $\rm JRC^2.$		
Electricity tracking*	The process of assigning electricity generation attributes to electricity consumption $^{3}\!\!.$		
Elementary flows*	In the life cycle inventory, elementary flows include "material or energy entering the system being studied that has been drawn from the environment without previous human transformation, or material or energy leaving the system being studied that is released into the environment without subsequent human transformation". Elementary flows include, for example, resources taken from nature or emissions into air, water, soil that are directly linked to the characterisation factors of the EF impact categories.		
Erecycled (Erec) factor of the CFF formula	Specific emissions and resources consumed (per unit of analysis) arising from the recycling process of the recycled (reused) material, including collection, sorting and transportation process.		
$E_{recyclingEoL}$ ( $E_{recEoL}$ ) factor of the CFF	Specific emissions and resources consumed (per unit of analysis) arising from the recycling process at EoL, including collection, sorting and transportation process.		
$E_{SE,heat}$ and $E_{SE,elec}$ factor of the CFF	Specific emissions and resources consumed (per unit of analysis) that would have arisen from the specific substituted energy source, heat and electricity respectively.		

 <sup>&</sup>lt;sup>2</sup> https://eplca.jrc.ec.europa.eu/permalink/Guide\_EF\_DATA.pdf
 <sup>3</sup> https://ec.europa.eu/energy/intelligent/projects/en/projects/e-track-ii

- Eutrophication\* EF impact category related to nutrients (mainly nitrogen and phosphorus) from sewage outfalls and fertilised farmland that accelerate the growth of algae and other vegetation in water. The degradation of organic material consumes oxygen, resulting in oxygen deficiency and, in some cases, fish death. Eutrophication translates the quantity of substances emitted into a common measure expressed as the oxygen required for the degradation of dead biomass. To assess the impacts due to eutrophication, three EF impact categories are used: Eutrophication, terrestrial; Eutrophication, freshwater; Eutrophication, marine.
- $E_v$  factor of the Specific emissions and resources consumed (per unit of analysis) arising from the acquisition and pre-processing of virgin material.
- E<sup>\*</sup><sub>v</sub> factor of the Specific emissions and resources consumed (per unit of analysis) arising from the acquisition and pre-processing of virgin material assumed to be substituted by recyclable materials.
- Foreground Those processes in the product life cycle for which direct access to information is available. For example, the producer's site and other processes operated by the producer or its contractors (e.g. goods transport, head-office services, etc.).
- Functional unit<sup>\*</sup> Defines the qualitative and quantitative aspects of the function(s) and/or service(s) provided by the product being evaluated. The functional unit definition answers the questions "what?", "how much?", "how well?", and "for how long?".
- Global warming potential\* An index measuring the radiative forcing of a unit mass of a given substance accumulated over a chosen time horizon. It is expressed in terms of a reference substance (for example, CO<sub>2</sub>-equivalent units) and specified time horizon (e.g. GWP 20, GWP 100, GWP 500 - for 20, 100, and 500 years respectively). By combining information on both radiative forcing (the energy flux caused by emission of the substance) and on the time it remains in the atmosphere, GWP gives a measure of a substance's capacity to influence the global average surface-air temperature and therefore subsequently influence various climate parameters and their effects, such as storm frequency and intensity, rainfall intensity and frequency of flooding, etc
- Human toxicity EF impact category that accounts for adverse health effects on human beings caused by the intake of toxic substances through inhalation of air, food/water ingestion, penetration through the skin insofar as they are related to cancer.
- Human toxicity non cancer\* EF impact category that accounts for the adverse health effects on human beings caused by the intake of toxic substances through inhalation of air, food/water ingestion, penetration through the skin insofar as they are related to non-cancer effects that are not caused by particulate matter/respiratory inorganics or ionising radiation.
- Input flows\* Product, material or energy flow that enters a unit process. Products and materials include raw materials, intermediate products and co-products.

lonising radiations, EF impact category that accounts for the adverse health effects on human health\* health caused by radioactive releases.

- Land use\* EF impact category related to use (occupation) and conversion (transformation) of land area by activities such as agriculture, forestry, roads, housing, mining, etc. Land occupation considers the effects of the land use, the amount of area involved and the duration of its occupation (changes in soil quality multiplied by area and duration). Land transformation considers the extent of changes in land properties and the area affected (changes in soil quality multiplied by the area).
- Life cycle\* Consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal.

Life cycle Takes into consideration the spectrum of resource flows and environmental interventions associated with a product from a supply-chain perspective, including all stages from raw material acquisition through processing, distribution, use, and end of life processes, and all relevant related environmental impacts (instead of focusing on a single issue).

Life cycle Compilation and evaluation of the inputs, outputs and the potential assessment\* environmental impacts of a product system throughout its life cycle.

Life cycle The combined set of exchanges of elementary, waste and product flows in a LCI dataset.

Life cycle A document or file with life cycle information of a specified product or other reference (e.g., site, process), covering descriptive metadata and quantitative life cycle inventory. A LCI dataset could be a unit process dataset, partially aggregated or an aggregated dataset.

LHV Lower Heating Value of the material in the product that is used for energy recovery.

- Normalisation\* After the characterisation step, normalisation is the step in which the life cycle impact assessment results are multiplied by normalisation factors that represent the overall inventory of a reference unit (e.g. a whole country or an average citizen). Normalised life cycle impact assessment results express the relative shares of the impacts of the analysed system in terms of the total contributions to each impact category per reference unit. When displaying the normalised life cycle impact assessment results of the different impact topics next to each other, it becomes evident which impact categories are affected most and least by the analysed system. Normalised life cycle impact assessment results reflect only the contribution of the analysed system to the total impact potential, not the severity/relevance of the respective total impact. Normalised results are dimensionless, but not additive.
- Output flows\* Product, material or energy flow that leaves a unit process. Products and materials include raw materials, intermediate products, co-products and releases. Output flows are also considered to cover elementary flows.
- Ozone depletion\* EF impact category that accounts for the degradation of stratospheric ozone due to emissions of ozone-depleting substances, for example long-lived chlorine and bromine containing gases (e.g. chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), Halons).

Partially A dataset with a LCI that contains elementary flows and activity data, and that disaggregated dataset\* A dataset with a LCI that contains elementary flows and activity data, and that yields a complete aggregated LCI data set when combined with its complementing underlying datasets.

Partially A partially disaggregated dataset at level-1 contains elementary flows and activity data for one level down in the supply chain, while all complementing underlying datasets are in their aggregated form.

- Particulate matter\* EF impact category that accounts for the adverse health effects on human health caused by emissions of Particulate Matter (PM) and its precursors (NO<sub>x</sub>, SO<sub>x</sub>, NH<sub>3</sub>).
- PEF profile\* The quantified results of a PEF study. It includes the quantification of the impacts for the various impact categories and the additional environmental information considered necessary to report.
- PEF study\* Term used to identify the totality of actions needed to calculate the PEF results. It includes the modelling, the data collection, and the analysis of the results. PEF study results are the basis for drafting PEF reports.
- Photochemical ozone formation\* EF impact category that accounts for the formation of ozone at the ground level of the troposphere caused by photochemical oxidation of volatile organic compounds (VOCs) and carbon monoxide (CO) in the presence of nitrogen

oxides  $(NO_x)$  and sunlight. High concentrations of ground-level tropospheric ozone damage vegetation, human respiratory tracts and manmade materials through reaction with organic materials.

- Primary data or site-specific data\* Data from specific processes within the supply chain of the user of the PEF method or user of the PEFCR. Such data may take the form of activity data, or foreground elementary flows (life cycle inventory). Primary data are sitespecific, company-specific (if multiple sites for the same product) or supply chain specific. Primary data may be obtained through meter readings, purchase records, utility bills, engineering models, direct monitoring, material/product balances, stoichiometry, or other methods for obtaining data from specific processes in the value chain of the user of the PEF method or user of the PEFCR. In this method, primary data is a synonym of "companyspecific data" or "supply-chain specific data".
- Purchasing Power Parity (PPP) Parity (PPP) Parity (PPP) Purchasing Power Parities (PPPs) are the rates of currency conversion that equalize the purchasing power of different currencies by eliminating the differences in price levels between countries. In their simplest form, PPPs are simply price relatives that show the ratio of the prices in national currencies of the same good or service in different countries. PPPs are also calculated for product groups and for each of the various levels of aggregation up to and including Gross Domestic Product (source: OECD).

Q<sub>p</sub> factor of the Quality of the primary material, i.e. quality of the virgin material.

CFF

Qs<sub>in</sub> factor of the Quality of the ingoing secondary material, i.e. the quality of the recycled material at the point of substitution.

Qs<sub>out</sub> factor of the Quality of the outgoing secondary material, i.e. the quality of the recyclable material at the point of substitution.

R<sub>1</sub> factor of the It is the proportion of material in the input to the production that has been recycled from a previous system.

R<sub>2</sub> factor of the It is the proportion of the material in the product that will be recycled (or reused) in a subsequent system. R2 shall therefore take into account the inefficiencies in the collection and recycling (or reuse) processes. R2 shall be measured at the output of the recycling plant.

R<sub>3</sub> factor of the lt is the proportion of the material in the product that is used for energy recovery at EoL.

Reference flow\* Measure of the outputs from processes in a given product system required to fulfil the function expressed by the functional unit.

Renewable energy Renewable energy is defined as the contribution of renewables to total primary energy supply (TPES). Renewables include the primary energy equivalent of hydro (excluding pumped storage), geothermal, solar, wind, tide and wave sources. Energy derived from solid biofuels, biogasoline, biodiesels, other liquid biofuels, biogases and the renewable fraction of municipal waste are also included. Biofuels are defined as fuels derived directly or indirectly from biomass (material obtained from living or recently living organisms). This includes wood, vegetal waste (including wood waste and crops used for energy production), ethanol, animal materials/wastes and sulphite lyes. Municipal waste comprises wastes produced by the residential, commercial and public service sectors that are collected by local authorities for disposal in a central location for the production of heat and/or power. This indicator is measured in thousand toe (tonne of oil equivalent) as well as in percentage of total primary energy supply. (OECD)

Representative product (model)\* The RP may be a real or a virtual (non-existing) product. The virtual product should be calculated based on average European market sales-weighted characteristics of all existing technologies/materials covered by the product category or sub-category. Other weighting sets may be used, if justified, for

	example weighted average based on mass (ton of material) or weighted average based on product units (pieces).
Resource use, fossil*	EF impact category that addresses the use of non-renewable fossil natural resources (e.g. natural gas, coal, oil).
Resource use, minerals and metals*	EF impact category that addresses the use of non-renewable abiotic natural resources (minerals and metals).
Secondary data*	Data that is not from a specific process within the supply chain of the company performing a PEF study. This refers to data that is not directly collected, measured, or estimated by the company, but sourced from a third party LCI database or other sources. Secondary data includes industry average data (e.g., from published production data, government statistics, and industry associations), literature studies, engineering studies and patents, and may also be based on financial data, and contain proxy data, and other generic data. Primary data that go through a horizontal aggregation step are considered as secondary data.
Sensitivity analysis*	Systematic procedures for estimating the effects of the choices made regarding methods and data on the results of a PEF study.
Small and	An SME is defined as:
Medium-sized Enterprise (SME)	• Any company below the threshold for a medium-sized enterprise from the EU definition in EU recommendation 2003/361: Enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million;
	• Unless a local legislation on transparency defines SMEs as enterprises having fewer employees or a lower turnover or a lower annual balance sheet, in which case, that definition shall be used instead.
Sub-processes*	Processes used to represent the activities of the level 1 processes (= building blocks). Sub-processes may be presented in their (partially) aggregated form.
System boundary*	Definition of aspects included or excluded from the study. For example, for a "cradle-to-grave" EF analysis, the system boundary includes all activities from the extraction of raw materials through the processing, distribution, storage, use, and disposal or recycling stages.
Transport leg	Transport between 2 steps of the supply chain
Unit process *	Smallest element considered in the LCI for which input and output data are quantified.
Upstream*	Occurring along the supply chain of purchased goods/ services prior to entering the system boundary.
Water use*	EF impact category that represents the relative available water remaining per area in a watershed, after demand of humans and aquatic ecosystems has been met. It assesses the potential of water deprivation, to either humans or ecosystems, based on the assumption that the less water remaining available per area, the more likely another user will be deprived.
Weighting*	A step that supports the interpretation and communication of the analysis results. PEF results are multiplied by a set of weighting factors (in %), which reflect the perceived relative importance of the impact categories considered. Weighted EF results may be directly compared across impact categories, and also summed across impact categories to obtain a single overall score.
X <sub>ER,heat</sub> and X <sub>ER,elec</sub> factor of the CFF	The efficiency of the energy recovery process for both heat and electricity.

#### 344 Apparel and footwear definitions

- 345 Definitions come from:
- 346 \* "Clothing Technology, from fibre to fashion" (Eberle, 2004)
- 347 ¤ "How Shoes are Made" (Motawi, 2018)

Bast fibre	After pulling and roughing out the plant.	
extraction (originally for flax)*	<b>Retting</b> degrades the woody part of the stems so that the fibres are loosened. The stalks are placed in tanks of warm water where they lay for 5 to 8 days. This is followed by drying Breaking and <b>Scutching</b> : after loosening the fibres from the wood by retting, the straw is broken and the woody parts are removed by scutching. The products are line fibre, with a length of 45 to 90 cm, and scutcher tow, with a length of 10 to 25 cm.	
Bill of Materials (BOM)	The Bill of Materials (BOM) is the list and amounts of finished materials and components needed to manufacture and assemble a product. Raw materials, as well as their manufacturing details to convert them into finished materials and components, are included in this definition. This means that the BOM shall include more detailed information such as yarn type (size and construction method), textile formation (average yarn size and textile type - knit/woven/nonwoven) and finishing techniques (chemical finishes such as water repellency, stain release, etc as well as mechanical or heat treatments such as calendaring, brushing, shearing, etc).	
Colour fastness*	Fastness of dyes and prints to rubbing, washing, cross staining, light, weather, seawater, ironing and dry-cleaning solvents.	
Commodity	Commodities are vital components of commerce that are standardised and hence easy to exchange for goods of the same type, have a fairly uniform price around the world (excluding transport costs and taxes) and help make other products (The Economist, 2017)	
Defective products	<ul> <li>Defective products can be classified into two types:</li> <li>Defective products only once they have reached the brand's distribution scheme (in the scope of unsold consumer products)</li> <li>Defective products in manufacturing, before reaching the brand's distribution scheme (out of the scope of unsold consumer products)</li> </ul>	
Delasting	Delasting involves removing the shoe upper over a last (a foot-shaped tool).	
Die cutting ¤	Most shoe parts are made by die cutting. The cutting die looks just like a big cookie cutter but has a sharpened steel edge. Each shoe part will require its own cutting die.	
Dimensional stability*	Dimensional changes (shrinking, stretching or twisting) during aftercar laundering and cleaning procedures.	
Dyeing and finishing*	Includes all fabric processes that are not included in fibre production, ya production, and fabric formation. Finishing effectively means to improve or beautify the material, ready for sale. There are generally three basic objectiv in finishing	
	<ul> <li>Modification of the surface (raising, smoothing, embossing etc)</li> <li>Modification of the wearing properties (staining, creasing, draping etc)</li> <li>Modification of aftercare characteristics (ironing, shrinking etc)</li> </ul>	
Exceptional pieces	"Exceptional pieces" are defined as apparel or footwear products, non- industrially produced or handicraft and/or unique custom made and/or with a designation of Intangible Cultural Heritage (or others like Haute Couture in France), to be worn on specific occasions such as artistic representations,	

	ceremonial or formal dress. These pieces can require the intervention of a skilled craftsperson, or "artisan d'art", such as embroiderer, feather worker, pleater, goldsmith, adornment maker, milliner, bootmaker, glovemaker etc. (interpretation from UNESCO Convention <sup>4</sup> , definition "métiers de l'artisanat d'art" <sup>5</sup> ).					
Fibre fragment	A short piece of textile fibre, broken from the main textile construction or through its subsequent breakage in the natural environment					
Fur	Hide or skin, exclusively of animal origin, different from that of bovine, sheep and goat, with its original fibrous structure more or less intact tanned to be rot- proof, which by its characteristic always retains hair or wool or both. (Definition of the International Fur Federation (IEF))					
Genuine fur or genuine leather products	Apparel products or accessories containing at least 80% by weight of genuine fur and / or genuine leather.					
Grading*	Grading means the stepwise increase or decrease of a master pattern piece to create larger or smaller sizes. The starting point can be the smallest size or the middle size. Grading alters the overall size of a design but not its general shap and appearance. Computer-aided grading systems utilise internal calculatic algorithms (grading rules) for pattern construction.					
Hangtag	A hangtag is a removable tag attached to a product which provides non- required information about the product and the brand (Inspired from Textile Labelling definition, U.S. Federal Trade Commission).					
Higg Product Module (PM)	The Product Module is a sustainability assessment tool that considers product's environmental impact from creating materials all the way to produ end-of-life, developed by Cascale.					
Inventory glut	Items that are made for a brand/retailer and sent to their distribution center, such as surplus, excessive inventory, overstock and deadstock.					
Knitting*	Knitted fabrics are made from interlocking loops, formed from a single yarn or from many (ISO 7839:1984).					
	Circular knitting - The fabric is manufactured on circular machines as long lengths in the form of a tube. The fabric can be maintained in its tubular form throughout processing or, after the preparation and dyeing operations, it can be cut open for final finishing and garment making.					
Lasting	Lasting involves stretching the shoe upper over a last (a foot-shaped tool) and securing it in place. (Inspired from $^*$ )					
Leather	A general term for hide or skin, exclusively of animal origin, with its original fibrous structure more or less intact, tanned to be rot-proof. The hair or wool may or may not have been removed. Leather is also made from a hide or skin which has been split into layers or segmented either before or after tanning. If the leather has a surface coating, however applied, or a glued-on finish, such surface layers must not be thicker than 0,15 mm. However, if the tanned hide or skin is disintegrated mechanically and/or chemically into fibrous particles, small pieces or powders and then, with or without the combination of a binding agent, is made into sheets or other forms, such sheets or forms are not leather.					
Manufacturing leftovers	Deadstock fabrics (or surplus fabrics, fabric rolls leftovers). Deadstock fabric is excess fabric inventory, including roll ends, that will not be directly cut and/or used in the production of products.					

 <sup>&</sup>lt;sup>4</sup> Text of the Convention for the Safeguarding of the Intangible Cultural Heritage, Article 2.
 <sup>5</sup> Article 22, Loi n° 2014-626 du 18 juin 2014 relative à l'artisanat, au commerce et aux très petites entreprises; Arrêté du 24 décembre 2015 fixant la liste des métiers d'art, en application de l'article 20 de la loi n° 96-603 du 5 juillet 1996 relative au développement et à la promotion du commerce et de l'artisanat

Microfibre	Note: This definition does not include 'cutting scraps', which are the leftove fabric scraps when making apparel and footwear products, and which represents the "assembly losses" of another product. The textile industry definition of a microfibre is a synthetic fibre with a linea density of less than 1 denier. There is a different understanding of this term in the context of unintended release of fibres and thus subsequent microfibre pollution. The Microfibre Consortium, in this context does not determine the size nor the type. To avoid such confusion, fibre fragment / fibre fragmentation is the preferred terminology.				
	Source : TMC glossary				
Microplastic	A small piece of plastic debris measuring 5mm or less, found in the environment from the disposal or breakdown of consumer products and industrial waste. Synthetic fibre fragments are considered microplastics.				
	Source : TMC glossary				
Pattern*	A pattern is a diagrammatic representation of the way a garment part is constructed. This forms the working plan for its manufacture.				
Pilling resistance*	Measurement of the number of pills that form during a defined period of surface rubbing.				
Printing	Printing is the process of applying colour to fabric in definite patterns designs. A placement print is a design that is placed in a specific location or product, whereas all-over prints cover the whole fabric surface.				
Product	For communication purposes, a product is defined by an individual and unique specific material composition, material construction, fabric weight or material density, dyeing method as well as fabric or material treatment and finishes.				
Repairability	The capacity of a product to be repaired. This should not be confused with the "likelihood that the product will be repaired".				
Retting*	See bast fibre extraction.				
Scouring*	Removal of natural or adventitious impurities, or processing aids (waxes lubricants) applied during yarn and fabric formation.				
Scutching	See bast fibre extraction.				
Small series	Small series are defined as series produced globally under 1,000 units b product reference (model-material), and also not exceeding 500 product references (model-material) annually for the product sub-category for appare and under 500 units by product reference (model-material) for footwear, b brand (i.e. all market categories, women and men), based on SMEs an creative fashion brands practices.				
Sport segment	Product intended primarily for use in an organized or individual capacity relat to physical activity and designed with functional elements specifically for t intended use and practiced activity. Product appearance shall not be the so characteristic evaluated to determine inclusion in this segment.				
Stockfitting ¤	Stockfitting is an assembly operation that is done away from the main assembly. The separate outsole components are assembled on the stock fitting line before they are taken to the main assembly line.				
Treatments (finishing)* <i>Reworded for</i> <i>clarity</i>	Whereas mechanical (dry) finishing is concerned mainly with modifying the surface of the fabric, chemical (wet) finishing aims to effect a radical change in the basic fibre or fabric properties, in order to improve some aspect of its behaviour.				
·	<ul> <li>Examples of dry finishes are framing, raising, embossing, sanding.</li> <li>Examples of wet finishes are water repellence, stain resistance, flame resistance, anti-pilling.</li> </ul>				

Trims	A non-integral, often decorative, component that is part of a product. Trims include sewing thread, buttons, zippers, labels, edging, and hook and loop fastener. Embellishments including embroidery, heat transfers, and graphics which cover less than 15% of the surface area of a product are also considered trims (Cascale).
Unsold Consumer Products	Any consumer product that has not been sold including surplus, excessive inventory, overstock and deadstock, including products returned by a consumer in view of their right of withdrawal in accordance with Article 9 of Directive (EU) 2011/83/EU, or, where applicable, during any longer withdrawal period provided by the trader (as defined in Ecodesign for Sustainable Products Regulation (ESPR) compromise text, published on 19 December 2023). <sup>6</sup> See Section 6.1.1 for additional details.
Weaving*	Weaving is the name given to the interleaving of two sets of yarns, warp and weft, at right angles.

<sup>&</sup>lt;sup>6</sup> The ESPR definition should be applied to qualify unsold consumer products and may be updated if further precision is provided by the Implementing or Delegated Act adopted by the European Commission. Its scope is therefore to include all consumer products fit for sale that were not sold, with the following interpretation.

### 349 1 Introduction

The Product Environmental Footprint (PEF) method provides detailed and comprehensive technical rules on how to conduct PEF studies that are more reproducible, consistent, robust, verifiable and comparable. Results of PEF studies are the basis for the provision of EF information and they may be used in a diverse number of potential fields of applications, including in-house management and participation in voluntary or mandatory programmes.

For all requirements not specified in this PEFCR the user of the PEFCR shall refer tothe documents this PEFCR is in conformance with (see Section 2.7).

The compliance with the present PEFCR is optional for PEF in-house applications, whilst it is mandatory whenever the results of a PEF study or any of its content is intended to be communicated.

#### 361 **Terminology: shall, should and may**

362 This PEFCR uses precise terminology to indicate the requirements, the 363 recommendations and options that could be chosen when a PEF study is conducted.

- The term "shall" is used to indicate what is required in order for a PEF study to be in conformance with this PEFCR.
- The term "should" is used to indicate a recommendation rather than a
   requirement. Any deviation from a "should" requirement has to be justified when
   developing the PEF study and made transparent.
- The term "may" is used to indicate an option that is permissible. Whenever
   options are available, the PEF study shall include adequate argumentation to
   justify the chosen option.

# 372 2 General information about the PEFCR

### 373 2.1 Technical Secretariat

The Technical Secretariat is responsible for the development of this PEFCR. It is made up of voting and non-voting members, as well as observers.

- Technical Secretariat members will aspire to define common positions through
   consensus. The TS defines consensus as the absence of sustained opposition.
- The meeting chair will actively pursue consensus among members.
- In case consensus cannot be reached, a vote will be organised. The overall
  position will be adopted by two-thirds majority.

To ensure TS members' equal representation in all votes referred to in the terms of reference, the voting rights are as follow:

- For voting members: each financially contributing organisation has one vote;
- For members joining the TS later on: each financially contributing organisation
  has one vote.
- 386

#### Table 1 - PEFCR Apparel and Footwear TS members

No.	Name of the organization	Type of organisation	Starting date of participation	Main contact(s)	Member status
1	Cascale	Industry association	January 2020	Joël Mertens Baptiste Carriere- Pradal	Secretariat lead Voting
2	ADEME	Government agency	January 2020 as voting, January 2024 as non-voting	Maurine Poirier	Non-voting
3	Alliance for European Flax- Linen & Hemp	Industry association	January 2021	Marie Demaegdt	Voting
4	C&A	Industry	January 2020	Petra Fausten	Voting
5	Cotton Incorporated	Industry association	January 2020	Michele Wallace	Voting
6	Décathlon	Industry	January 2020	Laure Boissier Quentin Badonnel	Voting
7	ECOS	NGO	December 2021	Valeria Botta Luca Boniolo	Non-voting
8	FHCM	Industry association	January 2020 as non-voting, June 2020 as voting	Léonore Garnier	Voting
9	H&M	Industry	January 2020	İpek Kurtoglu	Voting

No.	Name of the organization	Type of organisation	Starting date of participation	Main contact(s)	Member status
10	Inditex	Industry	January 2020	Beatriz Beaza Lopez De La Osa Natalia Capelan Teijido Germán García Ibáñez	Voting
11	Lacoste	Industry	February 2021	Steve Duhamel Frédéric LeCoq Raynald Anguet	Voting
12	Nike Inc	Industry	January 2020	Adam Brundage Julia Riss	Voting
13	Refashion (Eco- TLC)	Industry association	January 2020	Maud Hardy Véronique Allaire Spitzer	Voting
14	Sympatex	Industry	January 2020	Rüdiger Fox	Voting
15	VF Corporation	Industry	January 2020	David Quass Niccolo Gervasoni	Voting
16	W.L. Gore & Associates	Industry	January 2020	Benjamin Bowers Marie Mawe	Voting
17	CEC	Industry association	January 2020	Carmen Arias Matthieu Vicard Maria Jose Ferreira	Non-voting
18	CNMI	Industry association	February 2021	Chiara Luisi	Non-voting
19	COTANCE	Industry association	January 2020	Gustavo Gonzalez- Quijano	Non-voting
20	EURATEX	Industry association	January 2020	Mauro Scalia	Non-voting
21	FESI	Industry association	January 2020	Katarzyna Sulisz	Non-voting
22	IFF (Fur Europe)	Industry association	January 2020	Marianne Coulavin	Non-voting
23	IWTO	Industry association	January 2020 as voting, January 2024 as non-voting	Jeanette Cook	Non-voting
24	European Commission EF Team	Government	January 2020	Alicia Boyano Larriba	Observer
25	European Environmental Bureau (EEB)	NGO	January 2020	Jean-Pierre Schweitzer	Observer
26	Ministry of Infrastructure & Watermanage- ment and its executive agency Rijkswaterstaat	Government	November 2023	Madelon de Leeuw Marije Slump	Observer
27	2BPolicy	Consultant	March 2020	Baptiste Carriere- Pradal Svenja Frøhlich Balkhausen	Technical facilitation
28	Quantis	Consultant	January 2020	Conrad Leuthold Mireille Faist	Technical expert

### 387 2.2 Consultations and stakeholders

- 388 Given the large number of participants, the names of organisations and individuals
- 389 participating in the public consultations on this PEFCR are provided in ANNEX IX –
- 390 List of organisations and individuals participating in the public consultations.
- 391

#### 392 First public consultation

- The first public consultation took place from 7 July 2021 to 24 September 2021, on the PEFCR for apparel and footwear stakeholder workspace.
- 395 A total of 996 comments were received from more than 80 organisations and 396 individuals.

#### 397 Second public consultation

- 398 The second public consultation took place from 18 March 2024 to 28 April 2024, on
- 399 the PEFCR for apparel and footwear stakeholder workspace.
- 400 A total of 5119 comments were received from more than 250 organisations and401 individuals.
- 402

# 2.3 Review panel and review requirements of the PEFCR

# 405 The names and the affiliations of the members of the review panel are listed in Table406 2 below.

407

#### Table 2 - PEFCR Apparel and Footwear review panel

Name of the member	Affiliation	Role
Ugo Pretato	Studio Fieschi & soci	Chair – LCA expert
Laurent Maeder	Maeder Conseils	Industry expert
Sonia Valdivia	World Resources Forum	NGO representative

408 The reviewers have verified that the following requirements are fulfilled:

The PEFCR has been developed in accordance with the requirements provided
 in Annex I and Annex II of the PEF method ;

- The PEFCR supports the creation of credible, relevant and consistent PEF
  profiles;
- The PEFCR scope and the representative products are adequately defined;
- The functional unit, allocation and calculation rules are adequate for the product
  category under consideration;
- Datasets used in the PEF-RPs and the supporting studies are relevant,
  representative, reliable, and in compliance with data quality requirements;
- The selected additional environmental and technical information are
   appropriate for the product category under consideration and the selection is
   done in accordance with the requirements stated in Annex I of the PEF method,
- The model of the RP and corresponding benchmark (if applicable) represent
   correctly the product category or sub-category;
- The RP model, disaggregated in line with the PEFCR and aggregated in ILCD
   format, are EF compliant following the rules available at:
- 425 http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml;
- The RP model in its corresponding Excel version is compliant with the rules
   outlined in Section A.2.3 of Annex II of the PEF method;
- The Data Needs Matrix is correctly implemented;
- The classes of performance, if identified, are appropriate for the product
  category.

431 The public review reports are provided in ANNEX III – Review reports of the PEFCR432 and PEF-RP(s) of this PEFCR.

#### 433 2.4 Review statement

434 This PEFCR was developed in compliance with the PEF Method adopted by the 435 Commission on 16 December 2021 (Recommendation 2279/2021).

436 The representative products correctly describe the average products sold in Europe437 (EU + EFTA) for the product sub-categories in scope of this PEFCR.

438 PEF studies carried out in compliance with this PEFCR would reasonably lead to 439 reproducible results and the information included therein may be used to make 440 comparisons and comparative assertions under the prescribed conditions (see 441 Section on limitations 3.8 and 3.8.1).

The review panel members confirm that they have been independent in their role in accordance with the requirements of the Recommendation 2021/2279 and they have no conflicts of interest regarding this review.

The review panel wishes to thanks the Technical Secretariat for the open and constructive collaboration during the review of the various PEFCR versions and related RP studies and supporting studies.

448 The review panel wishes to highlight the following points that need special attention in 449 applying the PEFCR and that should be addressed in future updates of the document:

The complexity and the broad scope of this PEFCR requires a special care when results of PEF studies are used in support of comparisons and comparative assertions intended to be disclosed to the public: PEFCR applicants are invited to strictly follow the indications of section 3.8.1 of the PEFCR. A future version of the PEFCR should further detail and improve the conditions to perform comparisons and comparative assertions

- The requirements on mandatory company-specific data take into account the current limitations on the origin and traceability of raw materials across the apparel and footwear supply chains. A future version of the PEFCR should consider the feasibility of increasing the collection of specific data throughout the supply chains
- A future version of the PEFCR should simplify the data collection and modelling
   of the distribution stage, as the impact for all the product sub-categories is
   generally not relevant compared to the other life cycle stages
- 464 The environmental footprint results of all apparel and footwear products will be 465 largely influenced by the achieved scores on intrinsic durability and repairability 466 multipliers (IDM and RM). In such perspective it is essential that such 467 parameters are carefully checked during PEF study verifications and that the 468 verification team includes specific expertise on apparel and footwear processes 469 and technologies. A future version of the PEFCR should in addition improve the 470 consideration of the extrinsic dimension of apparel and footwear products as 471 outlined in Annex VI.
- 472

### 473 2.5 Geographic validity

This PEFCR is valid for products in scope sold or consumed in the European Union + EFTA. Each PEF study shall identify its geographical validity listing all the countries where the product object of the PEF study is consumed/sold with the relative market share. In case the information on the market for the specific product object of the study is not available, Europe + EFTA shall be considered as the default market, with an equal market share for each country.

### 480 2.6 Language

481 The PEFCR is written in English. The original in English supersedes translated482 versions in case of conflicts.

# 483 2.7 Conformance to other documents

484 This PEFCR has been prepared in conformance with the following documents (in485 prevailing order):

486 • Product Environmental Footprint (PEF) method

	Note	The PEFCR currently does not conform to any other documents than the PEF method.
488		

# 489 3 PEFCR scope

- 490 The product category for this PEFCR is apparel and footwear, which is defined as 491 follows:
- 492 An apparel or footwear product to meet the consumer's specific needs,
   493 as defined per sub-category
- The full life cycle (cradle to grave) for apparel and footwear sold in the EU market is within the scope of this PEFCR. Additionally, this PEFCR could also be used to assess partial life cycle impacts of products included in this category.
- Exceptional pieces (see Definitions Section) are the result of intangible cultural heritage and high art craftsmanship which are made to be worn on specific occasions such as artistic representations, ceremonial or formal dress. They can represent from 5 hours up to 100 hours per piece of handmade processes or handicraft. They cannot be categorised following product sub-categories as seen in Table 4, and are not necessarily intended to meet consumers' needs.
- 503 They also have inconsistent care cycles with delicate components, e.g., a craft 504 embellishment cannot be washed a wedding dress is single use, etc. As a result, they 505 are not included in the scope of this PEFCR.
- 506 Finally, this PEFCR is applicable to products not yet on the EU market provided that 507 the following three conditions are met:
- The product will be launched on the EU market within the next 18 months from
   the publication date of the study;
- 510 2. The company is already selling similar products (e.g., same product sub-511 category) on the EU market;
- 512 3. The company can access the relevant mandatory primary data points (unsold513 consumer products quantity and air cargo distribution distance).
- 514 Thirteen different sub-categories are included in this PEFCR as described in Table 4.
- 515 Workwear is only partially included in the scope:

- 516 Uniforms (e.g. for airline crew, hotel staff, etc.) should be modelled using the 517 most relevant product sub-category from Table 4;
- 518 Protective wear is not in scope as its main protective function will require
  519 different materials, processes, testing etc.

520 Protective wear is defined as designed to be worn by an individual for protection 521 against one or more health and safety hazards (interpretation from ISO45005).

### 522 3.1 Product classification

523 The CPA/NACE codes for the products included in this PEFCR are provided in Table 524 3 below. Due to the categorization of products in the CPA/NACE system, some codes 525 are listed (for the reason of completeness) containing products that belong to the 526 respective sub-category, but also products that belong to other sub-categories. 527 Therefore, <u>this table is indicative only</u>, and the most relevant product sub-category for 528 a PEF study shall be found using Table 4.

529

Table 3 - CPA/NACE codes per product sub-category

Product sub-category	CPA/NACE code	
1. T-shirts	14.14.30 T-shirts, singlets and other vests, knitted or crocheted	
	14.14.22 Men's or boys' singlets and other vests, underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns, of textile fabric not knitted or crocheted	
	14.14.24 Women's and girls' singlets and other vests, slips, petticoats, briefs, panties, nightdresses, pyjamas, negligees, bathrobes, dressing gowns and similar articles, of textile fabric not knitted or crocheted	
2. Shirts and blouses	14.14.11 Men's or boys' shirts, knitted or crocheted	
	14.14.13 Women's or girls' blouses, shirts and shirt- blouses, knitted or crocheted	
	14.14.21 Men's or boys' shirts, of textile fabric not knitted or crocheted	
	14.14.22 Men's or boys' singlets and other vests, underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns, of textile fabric not knitted or crocheted	
	14.14.23 Women's or girls' blouses, shirts and shirt- blouses, of textile fabric not knitted or crocheted	
	14.14.24 Women's and girls' singlets and other vests, slips, petticoats, briefs, panties, nightdresses, pyjamas, negligees, bathrobes, dressing gowns and similar articles, of textile fabric not knitted or crocheted	
3. Sweaters and midlayers	14.19.12 Tracksuits, ski suits, swimwear and other garments, knitted or crocheted	
	14.39.10 Jerseys, pullovers, cardigans, waistcoats and similar articles, knitted or crocheted	
Product sub-category	CPA/NACE code	
-------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--
4. Jackets and coats	14.12.11 Men's ensembles, jackets and blazers, industrial and occupational	
	14.12.21 Women's ensembles, jackets and blazers, industrial and occupational	
	14.13.11 Men's or boys' overcoats, car coats, capes, cloaks, anoraks, windcheaters, wind-jackets and similar articles, knitted or crocheted	
	14.13.12 Men's or boys' suits, ensembles, jackets, blazers, trousers, bib and brace overalls, breeches and shorts, knitted or crocheted	
	14.13.13 Women's or girls' overcoats, car coats, capes, cloaks, anoraks, windcheaters, wind-jackets and similar articles, knitted or crocheted	
	14.13.14 Women's or girls' suits, ensembles, jackets, blazers, dresses, skirts, divided skirts, trousers, bib and brace overalls, breeches and shorts, knitted or crocheted	
	14.13.21 Men's or boys' overcoats, raincoats, car coats, capes, cloaks, anoraks, wind-cheaters, wind-jackets and similar articles of textile fabrics, not knitted or crocheted	
	14.13.22 Men's or boys' suits and ensembles of textile fabrics, not knitted or crocheted	
	14.13.23 Men's or boys' jackets and blazers, of textile fabrics, not knitted or crocheted	
	14.13.31 Women's or girls' overcoats, car coats, capes, cloaks, anoraks, wind-cheaters, wind-jackets and similar articles of textile fabrics, not knitted or crocheted	
	14.13.32 Women's or girls' suits and ensembles of textile fabrics, not knitted or crocheted	
	14.13.33 Women's or girls' jackets and blazers of textile fabrics, not knitted or crocheted	
	14.14.22 Men's or boys' singlets and other vests, underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns, of textile fabric not knitted or crocheted	
	14.14.24 Women's and girls' singlets and other vests, slips, petticoats, briefs, panties, nightdresses, pyjamas, negligees, bathrobes, dressing gowns and similar articles, of textile fabric not knitted or crocheted	
	14.14.30 T-shirts, singlets and other vests, knitted or crocheted	
	14.19.12 Tracksuits, ski suits, swimwear and other garments, knitted or crocheted	
5. Pants and shorts	14.12.11 Men's ensembles, jackets and blazers, industrial and occupational	
	14.12.12 Men's trousers, bib and brace overalls, breeches and shorts, industrial and occupational	
	14.12.21 Women's ensembles, jackets and blazers, industrial and occupational	
	14.12.22 Women's trousers, bib and brace overalls, breeches and sorts, industrial and occupational	
	14.13.12 Men's or boys' suits, ensembles, jackets, blazers, trousers, bib and brace overalls, breeches and shorts, knitted or crocheted	
	14.13.14 Women's or girls' suits, ensembles, jackets, blazers, dresses, skirts, divided skirts, trousers, bib and brace overalls, breeches and shorts, knitted or crocheted	

Product sub-category	CPA/NACE code	
	14.13.22 Men's or boys' suits and ensembles of textile fabrics, not knitted or crocheted	
	14.13.24 Men's or boys' trousers, bib and brace overalls, breeches and shorts of textile fabrics, not knitted or crocheted	
	14.13.32 Women's or girls' suits and ensembles of textile fabrics, not knitted or crocheted	
	14.13.35 Women's or girls' trousers, bib and brace overalls, breeches and shorts of textile fabrics, not knitted or crocheted	
	14.14.22 Men's or boys' singlets and other vests, underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns, of textile fabric not knitted or crocheted	
	14.14.24 Women's and girls' singlets and other vests, slips, petticoats, briefs, panties, nightdresses, pyjamas, negligees, bathrobes, dressing gowns and similar articles, of textile fabric not knitted or crocheted	
	14.19.12 Tracksuits, ski suits, swimwear and other garments, knitted or crocheted	
	14.19.22 Tracksuits, ski suits and swimwear; other garments of textile fabric, not knitted or crocheted	
6. Dresses, skirts and	14.12.11 Men's ensembles, jackets and blazers, industrial and occupational	
jumpsuits	14.12.21 Women's ensembles, jackets and blazers, industrial and occupational	
	14.13.14 Women's or girls' suits, ensembles, jackets, blazers, dresses, skirts, divided skirts, trousers, bib and brace overalls, breeches and shorts, knitted or crocheted	
	14.13.22 Men's or boys' suits and ensembles of textile fabrics, not knitted or crocheted	
	14.13.32 Women's or girls' suits and ensembles of textile fabrics, not knitted or crocheted	
	14.13.34 Women's or girls' dresses, skirts and divided skirts of textile fabrics, not knitted or crocheted	
	14.14.12 Men's or boys' underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns and similar articles, knitted or crocheted	
	14.14.14 Women's or girls' slips, petticoats, briefs, panties, nightdresses, pyjamas, dressing gowns, negligees, bathrobes and similar articles, knitted or crocheted	
	14.14.22 Men's or boys' singlets and other vests, underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns, of textile fabric not knitted or crocheted	
	14.14.24 Women's and girls' singlets and other vests, slips, petticoats, briefs, panties, nightdresses, pyjamas, negligees, bathrobes, dressing gowns and similar articles, of textile fabric not knitted or crocheted	
7. Leggings, stockings, tights and	14.31.10 Panty hose, tights, stockings, socks and other hosiery, knitted or crocheted	
socks	15.20.40 Parts of footwear of leather; removable insoles, heel cushions and similar articles; gaiters, leggings and similar articles, and parts thereof	
8. Underwear	14.14.12 Men's or boys' underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns and similar articles, knitted or crocheted	

Product sub-category	CPA/NACE code	
	14.14.14 Women's or girls' slips, petticoats, briefs, panties, nightdresses, pyjamas, dressing gowns, negligees, bathrobes and similar articles, knitted or crocheted	
	14.14.22 Men's or boys' singlets and other vests, underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns, of textile fabric not knitted or crocheted	
	14.14.24 Women's and girls' singlets and other vests, slips, petticoats, briefs, panties, nightdresses, pyjamas, negligees, bathrobes, dressing gowns and similar articles, of textile fabric not knitted or crocheted	
	14.14.25 Brassieres, girdles, corsets, braces, suspenders, garters and similar articles and parts thereof, whether or not knitted or crocheted	
	17.22.12 Sanitary towels and tampons, napkins and napkin liners for babies and similar sanitary articles and articles of apparel and clothing accessories, of paper pulp, paper, cellulose wadding or webs of cellulose fibres	
9. Swimwear	14.19.12 Tracksuits, ski suits, swimwear and other garments, knitted or crocheted	
	14.19.22 Tracksuits, ski suits and swimwear; other garments of textile fabric, not knitted or crocheted	
10. Apparel accessories	14.14.25 Brassieres, girdles, corsets, braces, suspenders, garters and similar articles and parts thereof, whether or not knitted or crocheted	
	14.19.13 Gloves, mittens and mitts, knitted or crocheted	
	14.19.19 Other made-up clothing accessories and parts of garments or of clothing accessories, knitted or crocheted	
	14.19.23 Handkerchiefs, shawls, scarves, veils, ties, cravats, gloves and other made-up clothing accessories; parts of garments or of clothing accessories, of textile fabric, not knitted or crocheted, n.e.c.	
	14.19.31 Clothing accessories of leather or of composition leather, except sports gloves	
	14.19.41 Hat forms, hat bodies and hoods of felt; plateaux and manchons of felt; hat shapes, plaited or made by assembling strips of any material	
	14.19.42 Hats and other headgear, of felt, or plaited or made by assembling strips of any material, or knitted or crocheted or made up from lace or other textile fabric in the piece; hairnets	
	22.29.10 Apparel and clothing accessories (including gloves), of plastics	
11. Open-toed shoes	15.20.12 Footwear with outer soles and uppers of rubber or plastics, other than waterproof or sports footwear	
	<ul><li>15.20.13 Footwear with uppers of leather, other than sports footwear, footwear incorporating a protective metal toe-cap and miscellaneous special footwear</li><li>15.20.14 Footwear with uppers of textile materials, other than sports footwear</li></ul>	
	15.20.32 Wooden footwear, miscellaneous special footwear and other footwear n.e.c.	
12. Closed-toed shoes	15.20.12 Footwear with outer soles and uppers of rubber or plastics, other than waterproof or sports footwear	
	15.20.13 Footwear with uppers of leather, other than sports footwear, footwear incorporating a protective metal toe-cap and miscellaneous special footwear	
	15.20.14 Footwear with uppers of textile materials, other than sports footwear	

Product sub-category	CPA/NACE code	
	15.20.32 Wooden footwear, miscellaneous special footwear and other footwear n.e.c.	
	15.20.11 Waterproof footwear, with outer soles and uppers of rubber or plastics, other than footwear incorporating a protective metal toe-cap	
	15.20.21 Tennis shoes, basketball shoes, gym shoes, training shoes and the like	
	15.20.29 Other sports footwear, except snow-ski footwear and skating boots	
	15.20.31 Footwear incorporating a protective metal toe-cap	
13. Boots	15.20.11 Waterproof footwear, with outer soles and uppers of rubber or plastics, other than footwear incorporating a protective metal toe-cap	
	15.20.12 Footwear with outer soles and uppers of rubber or plastics, other than waterproof or sports footwear	
	15.20.13 Footwear with uppers of leather, other than sports footwear, footwear incorporating a protective metal toe-cap and miscellaneous special footwear	
	15.20.14 Footwear with uppers of textile materials, other than sports footwear	
	15.20.21 Tennis shoes, basketball shoes, gym shoes, training shoes and the like	
	15.20.29 Other sports footwear, except snow-ski footwear and skating boots	
	15.20.31 Footwear incorporating a protective metal toe-cap	

530 The following codes apply to several product categories and have not been added to

531 this table, but are included in this PEFCR:

- 14.11.10 Apparel of leather or of composition of leather
- 14.19.11 Babies' garments and clothing accessories, knitted or crocheted
- 534 14.19.21 Babies' garments and clothing accessories, of textile fabric, not knitted
   535 or crocheted
- 536 14.19.32 Garments made up of felt or nonwovens, textile fabrics impregnated
   537 or coated
- 538 14.20.10 Articles of apparel, clothing accessories and other articles of fur skin,
   539 except headgear

## 540 3.2 Representative products

541 The PEF study of the representative products (PEF-RP) is available upon request to

542 the TS coordinator that has the responsibility of distributing it with an adequate

- 543 disclaimer about its limitations.
- 544 The product category includes apparel and footwear products sold in Europe.

545 This PEFCR covers 13 virtual representative products per the products sub-categories 546 defined in Table 4 below. If the product under study is made of multiple parts (e.g. a 547 suit composed of a jacket and a pair of pants, or a pack of three pairs of socks), the 548 most relevant category for each part shall be selected to conduct a partial footprint, 549 and the sum of the partial footprints shall be done to calculate the full product's 550 footprint.

- ANNEX IV Designing the representative product model, describes the steps taken
  to define the RP model.
- 553

No.	Sub- category/ representativ e product	Typical products included	Description and intended function
1	T-shirts	Singlets, t-shirts, polo shirts, other short-sleeved shirts	Garment to cover the upper body to the elbow
2	Shirts and blouses	Long-sleeved shirts, blouses, tunics, base layers	Garment to cover the upper body including the entire arm
3	Sweaters and midlayers	Pullovers, cardigans, hoodies, jerseys, sweatshirts, knitted and wool sweaters, vests	Garment to keep the upper body warm and covered
4	Jackets and coats	Blazers, suit jackets, overcoats, other light jackets, rain jackets, outdoor winter jackets, parkas, down jackets, fur jackets, outdoor vests, leather jackets	Garment to put on top of a shirt or sweater or to protect from the elements
5	Pants and shorts	Casual pants, outdoor pants, dress pants, jeans, sports pants, capri pants, shorts	Garment to cover the lower body, may protect from the elements
6	Dresses, skirts and jumpsuits	Short- and long-sleeved, strapless, wrap, long and short, one-piece suits	One-piece garment that covers both the upper and lower body, or the lower body only, other than pants and shorts
7	Leggings, stockings, tights and socks	Opaque and sheer tights, pantyhose, fishnets, ankle socks, knee socks, low-cut socks	Tight garment to cover the legs and/or feet
8	Underwear	Boxers, briefs, panties, bras, body-shaping suits	Garment worn under clothes, often next to the skin of the upper or lower body
9	Swimwear	Bikinis, bathing suits, racing-style swimwear, board shorts	Garment worn for water-based or sun- based activities
10	Apparel accessories	Hats: Caps, flat caps, woollen hats/beanies, fedoras, panamas, bowlers, newsboys, berets	Garment to cover the head
		<b>Scarves and ties</b> : Warm and light scarves, buffs, neckerchiefs, headscarves, shawls, bowties	Garment worn around the neck
		<b>Belts:</b> Dress belts, casual belts, buckle belts, tie-up belts, suspenders	Flexible band or strap worn around the waist or over the shoulders used

No.	Sub- category/ representativ e product	Typical products included	Description and intended function
			to secure or to hold up clothing such as pants
		<b>Gloves and mittens:</b> fingerless gloves, fashion gloves, outdoor sports gloves, mittens	Articles of clothing that protect hands and wrists from the elements. Used in pairs.
11	Open-toed shoes	Flip-flops, casual /fashion sandals, sports sandals, sports sandals, slippers	Open-toed shoes, providing protection from the ground. Used in pairs.
12	Closed-toed shoes	Slippers, tennis shoes, moccasins, espadrilles, sneakers, cleats, athletic shoes, dress shoes, protective toecap – toed shoes	Closed-toed shoes, providing protection from the ground. They may protect against water, the elements and/or heavy objects. Used in pairs.
13	Boots	Polymer boots, winter boots, hiking boots, dress boots, protective toecap - toed boots	Boots that cover the ankle, providing protection from the ground. They may protect against water, the elements, heavy objects and/or ankle injuries. Used in pairs.

555 According to the criterion in Table 4 for RP 11 to 13 which states that the function of

the footwear is "providing protection from the ground", cycling footwear is excluded

557 from this PEFCR.

## 3.3 Functional unit and reference flow

559 The functional unit (FU) is to provide an apparel or footwear product to meet the user's 560 specific needs for one use, as defined per sub-category. Table 5 below defines the 561 key aspects used to define the FU.

562

Table 5 - Key aspects to determine the unit of analysis

Aspect	Aspect detail	Description
What?	Function provided	To provide an apparel or footwear product to meet the consumer's needs, as defined per sub-category in Table 4
How much?	Magnitude of the function	One apparel product, one pair of socks or one pair of footwear as defined by a bill of materials.
How well?	Expected level of quality	Wear in good condition with appropriate use for the given product, as defined per sub-category in Section 3.3.3.
How long?	Duration of the product provided	One use which includes aspects such as duration of service, or lifetime, care cycles per lifetime and quality, as defined per sub-category.

563 The consumers' needs can vary quite widely for an apparel or footwear product, as 564 they can for example be related to work, to performing sports, enjoying leisure, to 565 protection purposes, or simply to the needs of the consumers to express themselves.

s66 «In good condition» means that the product does not present any of the defects that
would trigger the consumer to discard it, as defined by the intrinsic durability tests
presented in ANNEX V – Detailed requirements regarding intrinsic durability.

569 A use is defined as a 24-hour period, regardless of how many hours the apparel or 570 footwear product is worn within this 24-hour period. A use may not always include a 571 washing step as some products only require washing after a few uses as described in 572 Table 40. Both the "how well" and "how long" aspects will be dependent on the intrinsic 573 and extrinsic quality of the product, and its repairability. With an extended lifetime, the 574 impact of the use stage could be higher (e.g. more washes), however the impact of 575 the production (LCS 1 + LCS 2) will be lower per use. Products that fail to meet 576 baseline quality requirements will have a higher overall impact. See Section 3.3.3 for 577 more information.

578 The average product lifetime per sub-category is defined in Section 3.3.2.

579 Whilst product longevity also depends on consumer care, the functional unit only 580 focusses on aspects that are within the apparel and footwear manufacturers' control.

581 For communication purposes, a product is defined by an individual and unique specific 582 material composition, material construction, fabric weight or material density, dyeing 583 method as well as fabric or material treatment and finishes. To calculate the footprint 584 of the product (including any variation), a weighted production volume average of the 585 score of the individual variations shall be calculated to be used for the elaboration of 586 the BOM. For example, if for a cotton shirt, a variation necessitates a certain type of 587 cotton dyeing for dark colours and the other variation another type of dyeing for light 588 colours, the amount of dyeing of the corresponding technology will be calculated for 589 the BOM based on the corresponding production volumes. The weighted production 590 volume average shall be based on effective sales during the most recent annual 591 administration period on the European market if possible, or on forecasted sales 592 otherwise. This shall be done at product level, if possible, sub-category level 593 otherwise.

- 594 The reference flow is the amount of product needed to fulfil the defined function and 595 shall be measured in the fraction of the life cycle of the specific apparel or footwear 596 product studied.
- 597 For example, for a t-shirt with a lifetime of 45 uses, the reference flow will be 1/45<sup>th</sup> of
- 598 the t-shirt.
- 599 All quantitative input and output data collected in the study shall be calculated in 600 relation to this reference flow.
  - Note As indicated in the PEF method, *if the product lifetime is extended into a product with original product specifications (providing the same function) these processes shall be included in the FU and reference flow. [...] The user of the PEF method shall describe how reuse or refurbishment is included in the calculations of the reference flow and the full life cycle model, taking into account the "how long" of the FU.*

### 601 3.3.1 Guidance on sizing

- As detailed in Table 5, a product is defined by a Bill Of Materials (BOM), which accounts for multiple sizes using the concept of grading. Material consumption is not tied to the product net weight, but to the bill of materials consumption, which also includes other assembly losses beyond patterning.
- However, some companies will only have access to the final product weight. These
  companies shall use this section to estimate the BOM for their product. Companies
  that have access to their BOM shall use them.
- 609 First, the company shall use their internal reference size and convert it to the
- 610 associated reference size below (based on TS expertise), using the conversion
- 611 factors in Figure 1.
- 612 For apparel, the following medium sizes shall be used:
- Infants: (0 to 2 years): EU size 6 months (68 cm)
- Children (2 to 8 years): EU size 4 years (104 cm)
- Children (9 to 14 years): EU size 10 years (140 cm)
- Women: EU size 38

- Men (suits/blazers): EU size 50
- Men (other products): size M
- 619 Unisex: EU size 40
- 620 Bras: EU size 75B
- 621 For footwear, the following medium sizes shall be used:
- Infants: EU size 21
- 623 Children: EU size 32
- Women: EU size 38
- 625 Men: EU size 42

626 • Unisex: EU size 39

In case a product size range covers two sizes (e.g. a product for children manufactured
in sizes 2 to 14 years old), the user of the PEFCR shall run the score calculations twice
after amending the bill of materials if needed. Everything else will remain the same
and two scores will be obtained.

- 631 The number obtained shall then be extrapolated to the BOM using the assembly loss
- rate (a mandatory data point as indicated in Section 5.1), as illustrated in Figure 1
- 633 below for apparel and Figure 2 for footwear.





### 654 **3.3.2 Product lifetime**

### 655 3.3.2.1 Introduction

For the lifetime, the concept of the "duration of service" (DoS) from the Higg Product Module (PM) methodology is used where the duration of service is defined as *"the lifetime of the product with appropriate use for its intended function"*. The product's intended function is described in Table 4. A product is used "appropriately" when it is used according to its intended function (e.g. if a hat is used as a sock, its duration of service may vary).

According to this definition, the default duration of service is independent from the number of users. For example, by default, a t-shirt will be used 45 times in its lifetime, which could be:

- 665 45 uses with the same user;
- 666 20 uses with a first user, and 25 uses with a second user after the t-shirt has
  667 been donated for reuse.

668 This PEFCR aims to reflect the real-life DoS of apparel and footwear as closely as 669 possible. Product lifetime is estimated by assessing:

- 670 i. The intrinsic durability of a product product-specific attributes that contribute
  671 to its potential lifetime (e.g. physical toughness and design features);
- 672 ii. Extrinsic durability attributes external factors that influence the likelihood of a673 product reaching its potential lifetime;
- 674 iii. The repairability potential of the product.

This PEFCR includes a number of intrinsic (see Section 3.3.3) and repairability attributes (see Section 3.3.4). ANNEX VI – Exploring the extrinsic durability of apparel and footwear products lists extrinsic attributes and other intrinsic and repairability attributes that may be included in future versions of this PEFCR, where a causal link to DoS is proven. In the meantime, an extrinsic durability multiplier of 1 is considered for all products.

681 The multipliers included in this section can be combined should the product qualify 682 both for an intrinsic durability multiplier and a repairability multiplier. For example, for a t-shirt qualifying for an intrinsic durability multiplier of 1.17 and a
repairability multiplier of 1.05, the combined DoS multiplier becomes 1.17\*1.05 = 1.23.
The default duration of service as given in Section 3.3.2.2 can therefore be multiplied
by a combined DoS multiplier depending on certain criteria described in Section 3.3.3.

687 3.3.2.2 Default duration of service

Table 6 below lists the number of uses per product sub-category based on Cascale
(2020) for apparel, and expert judgement for footwear. The presented default lifetime
shall only be modified by the multipliers presented in Section 3.3.3 and 3.3.4.

- 691
- 692

Table 6 - Default product duration of service per product sub-category

No	Product sub-category	Product	Number of uses per product duration of service <sup>7</sup>
1	T-shirts	Average	45 <sup>8</sup>
2	Shirts and blouses	Average	40
3	Sweaters and midlayers	Average	85
4	Jackets and coats	Average	100
5	Pants and shorts	Average	70
6	Dresses, skirts and jumpsuits	Average	70
	Leggings, stockings, tights and socks	Average	55
7		Leggings/tights	70
/		Hosiery	50
		Socks	50
8	Underwear	Average	60
9	Swimwear	Average	30
10	Apparel accessories	Average	100
11	Open-toed shoes	Average	50
12	Closed-toed shoes	Average	100
13	Boots	Average	100

# A duration of service of one use shall be used for items clearly identified as single useitems (e.g. "for single use").

<sup>&</sup>lt;sup>7</sup> The number of uses per duration of service includes all kinds of reuses such as consumer to consumer donation, reuse at end of life or reuse of donated unsold consumer products

<sup>&</sup>lt;sup>8</sup> Calculated based on the percentages of the fibre types in the RP.

Note Scientific evidence was missing at this stage to define different default durations of service for apparel products made up of materials different from textiles (e.g. leather, fur), but such an amendment to Table 7 is highly recommended in a future version of the PEFCR.

695 The numbers included above are independent from the number of users. The reuse 696 rate of apparel products is 23%, and 10% for footwear as detailed in Section 5.10. In 697 literature, re-commerce models are evaluated as allowing to extend the average 698 product life up to 1.7 times, based on average length of second-hand ownership (Cline 699 E., 2019). As a result, the lifetime extension due to reuse would be 16% for apparel 700 products and 7% for footwear. Due to the limited number of robust consumer studies 701 conducted, the numbers included in Table 6 have a high uncertainty. A conservative 702 approach has then been followed and a lifetime extension due to reuse has not been 703 integrated to the default DoS.

For the determination of the specific duration of service, the default duration of service
combined with the corresponding duration of service factors (supported with evidence)
shall be used. The methodology is described in the two following Sections 3.3.3 (for
the Intrinsic Durability Multiplier IDM) and 3.3.4 (for the Repairability Multiplier RM).
The specific duration of service is therefore:

- 709
- 710
- 711

As the IDM multiplier can reach a maximum IDM<sub>Max</sub> of 1.45 and a minimum IDM<sub>Min</sub> of

Specific  $DoS = Default DoS \times IDM \times RM$ 

Equation 1 - Calculation of specific duration of service

713 0.67 (see Section 3.3.3.3) and the Repairability Multiplier (RM) a maximum RM<sub>Max</sub> of

1.15 and a minimum RM<sub>Min</sub> of 1, the specific duration of service can reach a maximum

715 and a minimum of:

716 Specific  $DoS = Default DoS \times IDM \times RM$ 

- 719

### 720 **3.3.3 Intrinsic durability**

This PEFCR intends to support product eco-design to extend product lifetime by evaluating the environmental performance of products with respect to their intended function, series size and their expected possible failures. Product testing for Duration of Service (DoS) to prevent associated product failure risks can represent a high economic cost (laboratory tests and external verification or certification) as well as an environmental burden (energy resources to test duration of service care cycles, possible material or product destruction).

- 728 Therefore, DoS tests can only be appropriate when:
- Tests are aligned with the product's intended function;
- Tests are predicting product end-of-life (EoL) potential factors;
- Tests are economically and environmentally relevant: number of tests need to be adjusted to product series size for economic accessibility to companies of all sizes. When applied to large product series, economies of scale are possible and DoS testing is suitable (e.g. the cost ratio is 1/100,000 produced units against 1/1,000 produced units for a small series). When applied to small product series, the cost of DoS testing is too high and needs to be adjusted to the degree of product failure risks.
- 738 This section is split into three sections:
- Section 3.3.3.1 describes the further segmentation of the product under study
   to select the product's testing protocol defined in ANNEX V Detailed
   requirements regarding intrinsic durability.
- Section 3.3.3.2 describes the assessment of the product's intrinsic durability
   based on the conducted durability and functionality tests. Based on the test
   results, a normalized test point for each test is assigned.
- Section 3.3.3.3 describes the conversion of the individual normalized test
   results from the durability testing to the final Intrinsic Durability Multiplier (IDM)
   for the product.
- Examples of the calculation of the IDPS and IDM of fictional products is provided in
  Part V in ANNEX V Detailed requirements regarding intrinsic durability.

All tests shall be conducted on only one size of garment and the results applied to allsizes.

The intrinsic durability tests are optional, and though highly recommended, not mandatory. A default intrinsic durability multiplier of 0.67 shall be used should no intrinsic durability tests be conducted (except for exemptions mentioned in Section 3.3.3.2).

752

### 753 3.3.3.1 Segmentation

Note

754 To ensure that the most relevant tests are used to differentiate products' physical 755 durability performance, the following sub-category segmentations will define a 756 product's testing protocol. The segmentation methodology groups segments of the 757 subcategories based on their intended use, technicity, and the age group (footwear 758 only) of the intended users. The rationale for this segmentation is that not all tests are 759 relevant to all products within a sub-category, and even with the same tests, there are 760 different thresholds and weighting, which should be applied depending on the use 761 case and user age of different product segments within a sub-category. The intent of 762 these physical durability testing protocols is not to change the fundamental duration of 763 service for a given product within a sub-category, but rather to assess the duration of 764 service for a product within a sub-category through its most relevant lens.

The definitions of the segments can be found in ANNEX V – Detailed requirements
regarding intrinsic durability.

Note Clarifications on which tests need to be conducted on different variations of the same product are provided in Part I in ANNEX V – Detailed requirements regarding intrinsic durability.

### 767 Apparel (subcategories 1-10)

The segmentation for subcategories 1-10 will use the hierarchy presented in Figure 3. First products are segmented by technicity to define the relevant tests based on the product's construction. The next level will be the intended end use (sporting or nonsporting application). This will further refine the test protocol set by the first

- 572 segmentation by defining weighting factors for the tests based on intended end use. 573 This provides for a maximum of four different test protocols for each of the apparel 574 subcategories, though there may be overlap between protocols, where there is the 575 same test and thresholds for two different segments, or where two segments such as 576 sport and non-sport have the same testing protocol (e.g. woven t-shirts).
- 777

Figure 3 - Flow Chart for Apparel Segmentation



778

779

### 780 Footwear (subcategories 11-13)

The footwear specific subcategories will have similar segmentation to the apparel to ensure the tests selected for a given product most accurately represent factors which impact the duration of service of a product and is presented in Figure 4. The footwear segments will be divided first into either the sport or non-sport segments. The nonsport segment will then be further segmented into one of five classes based on the intended use and design of the product. For sport shoes, the segments will be defined by the type of sport for which the product has been designed.

788



### 791 3.3.3.2 Assessment

Once a product's sub-category and segment have been determined, its relevant physical durability assessment table can be found in Annex V, Part II (based on TS judgment). Unless there is an overriding exemption as outlined below, all tests within the testing table shall be run on each product. All physical durability tests need to be conducted in an ISO 17025 accredited lab. The results of each test shall be recorded, and a score assigned for the test based on the testing thresholds listed in the relevant 798 product table. All tests will be scored using one of four threshold levels as shown in 799 Table 7, unless otherwise stated in an individual test table.

Table 7 - Thresholds and Test Points

800

Threshold	Test P	oints
<b>Below Basic</b>		0
Basic		5
Moderate		10
Aspirational		15

801 Each test has an individually assigned weighting. For subcategories 1-9 there is also 802 a differentiation between critical and non-critical tests that must be considered. This is 803 explained in detail in Section 3.3.3.3.

### 804 Not Applicable, Not Possible and Not Conducted Tests

805 There will be cases where tests for a product cannot be completed. The reason a test 806 cannot be completed for a product shall determine how that test is incorporated into the product score. Each test not completed shall be placed in one of the three 807 808 categories below, and the justification shall be verified during the validation of the 809 results.

#### 810 Not Applicable

811 Tests are deemed "not applicable" if the product does not have the specific attribute 812 being tested (e.g. the testing table calls for a zipper failure test, but the product does 813 not have a zipper). "Not applicable" tests shall then be omitted from the final calculation 814 of product score.

#### 815 Not Possible

816 Tests are deemed "not possible" when the ability to perform a given test on a given 817 product is not possible due to physical limitations of either the product or the testing 818 apparatus. A complete explanation shall be provided to justify when a test has been deemed not possible for a specific product. "Not possible" tests shall then be omitted 819 from the final calculation of the product score. An example of an acceptable 820 821 justification for a "not possible" test would be the case of a product with a material that 822 has a finish which renders a specific test impossible or irrelevant. An example of this 823 would be an applied finish such as PU coating which would make a pilling test 824 irrelevant. An example of an unacceptable justification would be claiming that a test is825 "not possible" because to get a test sample would require destroying the product.

### 826 Not Conducted

Tests which have not been performed, but which do not fall into either previous category shall be deemed as "not conducted." "Not conducted" tests shall receive a test result of below basic and shall be included in the final calculation of the product durability score.

### 831 Exemptions

The durability tables listed in Annex V do not apply to genuine fur or genuine leather apparel products, to menstrual underwear and to small series. The IDM for these products shall therefore equal 1. For small series, durability testing is optional.

### 835 Additional Functionalities

Annex V, Part III outlines additional functionalities for which additional tests shall be conducted, on products for which the relevant functionality is claimed as an attribute the product has. Examples include apparel insulation or footwear waterproofness. These additional functionalities tests shall be included in the final product score in addition to the tests from the tables in Annex V, Part II.

841 3.3.3.3 Scoring

# 842 Criticality and End of Life Categories for apparel products (subcategories 1 to843 9)

The "End of Life Category" column included in Annex V, Tables 5 to 36 describes the 844 845 general aspect of the product which is being assessed by the tests in that category. 846 For example, t-shirts can be discarded due to product deformation, issues with fabric 847 strength or fabric aspect damage, seam aspect damage, accessories aspect damage 848 or colour damage. The "criticality" of a test within an end-of-life category indicates the 849 primary importance of that test for assessing the overall performance of the product to 850 that end-of-life category. If a product scores below basic on a critical test, then the 851 product will receive below basic scores for all other tests within the same end of life category. For example, in the "fabric aspect damage" end of life category for t-shirts,
three tests need to be conducted, but only the "product aspect: holes or broken yarn"
test is actually critical.

One exception to this is the case of a criticality of "2 of 3 needed." In this case 2 of the 3 tests in the given category must score basic or above for the specific test results to be considered to determine the product performance. If 2 of the tests in this category score below basic, then all tests within the category shall be scored as below basic. If only one of the tests in the category scores below basic, then all tests shall be included with their weighted individual test scores in the total product score.

### 861 Weighting and Product Score

Each test has an associated weighting within each table, which indicates the weight of the individual test result in the total product score. The individual weighting multiplied by the individual test score gives the weighted individual test score, as described in Equation 3.

866 Weighted Individual Test Score = Individual Test Score × Test Weighting

867

### Equation 3 - Weighted Individual Test Score Equation

The product score is the sum of all weighted individual test scores over the total weighting for the product, as described in Equation 4. The Intrinsic Durability Product Score will be between 0 and 15.

- 871 Intrinsic Durability Product Score (IDPS)
   872 = Sum of all Weighted Individual Test Scores Total Product Weighting
- 873 874

## Equation 4 - Product Score

### 875 Intrinsic Durability Product Score to Intrinsic Durability Multiplier Equation

All products will receive an Intrinsic Durability Multiplier (IDM) based on their Intrinsic Durability Product Score (IDPS). Based on the limited available knowledge on the extent of impact product durability can have on product lifetime it was determined that the product lifetime duration of service should not have a disproportionate impact on the per use impact of a product. The range of IDMs therefore goes from 0.67 to 1.45, which translates up to a 50% higher environmental impact per use for a product with 882 low durability and up to a 30% lower environmental impact per use for a product with 883 high durability (TS judgement). A lower IDPS will mean a lower IDM and a higher IDPS 884 will mean a higher IDM. The IDM will be used to determine the total number of uses 885 of a product over its lifetime. Products with an IDPS below 2.5 will all receive the lowest 886 IDM of 0.67. Products with an IDPS between 2.5 to 15.0 will receive an IDM according 887 to Equation 5, where x is the IDPS and y is the IDM. The coefficients in Equation 5 888 lead to a linear increase of the IDM between the minimum (0.67) and maximum (1.45) 889 scores.

- 890
- if  $IDPS \leq 2.5, IDM = 0.67$
- 891 *if* IDPS > 2.5,  $IDM = 0.514 + (0.0624 \times IDPS)$
- 892 Equation 5 - Conversion of Product Score to Lifetime Modifier
- 893

894 Examples of the calculation of the IDPS and IDM of fictional products is provided in 895 Part V in ANNEX V – Detailed requirements regarding intrinsic durability.

896 3.3.4 Repair/refurbish

897 The lifetime of a product can be extended through repair to maintain it in "good 898 condition".

899 Two aspects are taken into account to define a repairability multiplier (RM, see 900 Calculation of the Repairability Multiplier ):

- 901 • The intrinsic repairability of an apparel or footwear product, as in the capacity 902 of a product to be repaired, independently of whether or not the repair will 903 actually happen (promoting ecodesign practices). This includes two criteria: 904 the Repair cost ratio (RC) and Spare Parts (SP);
- 905 • The external repairability, as in the existence of an after-sales service for 906 repair, and its quality. This includes two criteria: Repair Service (RS) and 907 "Right to Repair" Communication (RRC).
- 908 3.3.4.1 Repair cost ratio (RC)

909 The cost of repair is the key driver in repairability (ADEME, 2022). The Repair Cost

910 Ratio evaluates the cost of repair, using the EU average repair cost of the product subcategory and the average EU product selling price. Customer mailing fees shall be
included if the customer is responsible for paying for shipping back to the repair facility.
The RC<sub>EU</sub> criterion shall be calculated according to Equation 6, unless the user of the
PEFCR chooses to calculate a company sales-specific RC (RCcss), in which case
Equation 9 shall be used.

916 
$$RC_{EU} = \frac{AverageRepairCost_{EU}}{ProductSellingPrice_{EU}} = \frac{AverageRepairCost_{FR} * PPP_{EU}}{ProductSellingPrice_{EU} * PPP_{FR}}$$

Equation 6

 $\frac{11001 \text{ ugenepul George}}{ProductSellingPrice_{EU} * PPP_{FR}}$ 

918

919 with the following parameters:

920 ProductSellingPrice<sub>EU</sub>: the average selling price for the product in the EU market
921 based on EU volumes of the product sub-category sold during the most recent annual
922 administration period, which shall be calculated according to Equation 7.

923 ProductSellingPrice: the selling price for the product in country i, based on volumes
924 of the product sub-category sold in country i during the most recent annual
925 administration period

AverageRepairCost<sub>EU</sub>: the average repair cost of the relevant sub-category shall be
used, calculated from the average repair cost in France (ADEME, 2022) and using the
Purchasing Power Parity (PPP, Eurostat<sup>9</sup>). Default data from Table 8 based on
Equation 8 shall be used.

930 AverageRepairCost<sub>FR</sub>: the average repair cost for the product sub-category in France

931 **PPP**<sub>EU</sub>: the Purchasing Power Parity of EU relative to the EU from the latest version
932 of the Eurostat database<sup>9</sup>. This value, being the reference, will always be 1.

933 **PPP**<sub>FR</sub>: the Purchasing Power Parity of France relative to the EU from the closest year

compared to the year used for the product selling price in the the Eurostat database<sup>9</sup>.

- 935 In Eurostat 2022, this value is 1.07128.
- 936 **PPP**<sub>i</sub>: the Purchasing Power Parity of country i relative to the EU from the latest
   937 version of the Eurostat database<sup>9</sup>.
- 938 **W**<sub>i</sub>: the weight of country i in the company's EU product sales volumes of the product
- 939 sub- category from the most recent annual administration period

<sup>&</sup>lt;sup>9</sup> <u>https://ec.europa.eu/eurostat/web/purchasing-power-parities/database</u>. An ECAS account is required to access the Eurostat database

941 
$$ProductSellingPrice_{EU} = \sum_{i=1}^{n} \frac{ProductSellingPrice_{i} * PPP_{EU} * W_{i}}{PPP_{i}}$$

942 
$$= \sum_{i=1}^{n} \frac{ProductSellingPrice_i * W_i}{PPP_i}$$

Equation 7

945 
$$AverageRepairCost_{EU} = AverageRepairCost_{FR} * \frac{PPP_{EU}}{PPP_{FR}} = \frac{AverageRepairCost_{FR}}{PPP_{FR}}$$
  
946 Equation 8

### Table 8 - Average repair cost per product sub-category

Product sub-category	Average repair cost in France <sup>10</sup> AverageRepairCost <sub>FR</sub>	Average repair cost in EU AverageRepairCost <sub>EU</sub>
1. T-shirts	€ 10.00	€ 9.33
2. Shirts and blouses	€ 10.00	€ 9.33
3. Sweaters and midlayers	€ 15.00	€ 14.00
4. Jackets and coats	€ 31.00	€ 28.94
5. Pants and shorts	€ 14.00	€ 13.07
6. Dresses, skirts and		
jumpsuits	€ 9.00	€ 8.40
7. Leggings, stockings, tights		
and socks	€ 9.00	€ 8.40
8. Underwear	€ 9.00	€ 8.40
9. Swimwear	€ 9.00	€ 8.40
10. Apparel accessories	€ 9.00	€ 8.40
11. Open-toed shoes	€ 21.00	€ 19.60
12. Closed-toed shoes	€ 21.00	€ 19.60
13. Boots	€ 21.00	€ 19.60

For example, a company selling a t-shirt on the EU market at an average selling price

of 35 EUR will have an  $\mathsf{RC}_{\mathsf{EU}}$  of 

<sup>&</sup>lt;sup>10</sup> Source : ADEME, 2021

951 
$$RC_{EU} = \frac{AverageRepairCost_{EU}}{ProductSellingPrice_{EU}} = \frac{9.33 \ EUR}{35 \ EUR} = 27\%$$

952 The calculation of a company sales-specific RC is specified in Equation 9.

$$RC_{CSS} = \sum_{i=1}^{n} \frac{RepairCost_{i} * W_{i}}{ProductSellingPrice_{i}}$$

954

953

Equation 9

955 with the following parameters:

RepairCost<sub>i</sub>: the repair cost for the product sub-category in country i. This shall be
calculated by using a weighted average of product sales volumes and PPPs according
to Equation 10 and default data from Table 8.

959 ProductSellingPrice: the selling price for the product in country i, based on volumes
960 of the product sub-category sold in country i during the most recent annual
961 administration period.

962 **W**<sub>i</sub> (%): the share of country i in the company's EU product sales volumes of the 963 product sub-category from the most recent annual administration period

964 **n:** the number of EU countries in which the company sells the product sub-category965

966 
$$RepairCost_{i} = \frac{AverageRepairCost_{FR} * PPP_{i}}{PPP_{FR}}$$

967

968 with the following parameters:

969 AverageRepairCostFR: the average repair cost for the product sub-category in France

Equation 10

970 **PPP**<sub>i</sub>: the Purchasing Power Parity of country i relative to the EU from the latest
971 version of the Eurostat database<sup>11</sup>.

972 **PPP**<sub>FR</sub>: the Purchasing Power Parity of France relative to the EU from the closest year

973 compared to the year used for the product selling price in the Eurostat database<sup>11</sup>. In

- 974 Eurostat 2022, this value is 1.07128.
- 975 For example, a company selling a t-shirt with 70% of the sales volume in France, 20%
- 976 in Spain and 10% in Belgium at 35 EUR in all 3 countries will have an RCcss of

<sup>&</sup>lt;sup>11</sup> <u>https://ec.europa.eu/eurostat/web/purchasing-power-parities/database</u>. An ECAS account is required to access the Eurostat database

977	$RC_{CSS} = \sum_{i=1}^{n} \frac{RepairCost_i * W_i}{ProductSellingPrice_i} = \frac{AverageRepairCost_{FR} * W_{FR} * PPP_{FR}}{ProductSellingPrice_{FR} * PPP_{FR}} + $
978	$\frac{AverageRepairCost_{FR}*W_{ES}*PPP_{ES}}{ProductSellingPrice_{ES}*PPP_{ES}} + \frac{AverageRepairCost_{FR}*W_{BE}*PPP_{BE}}{ProductSellingPrice_{BE}*PPP_{FR}} = \frac{10 \ EUR*0.7*1.07128}{35 \ EUR*1.07128} + \frac{10 \ EUR*0.7*1.07128}{10 \ EUR*0.7*1.07128} + 10 \ EUR*0.7*1.0$
979	$\frac{10  EUR * 0.2 * 0.97606}{35  EUR * 1.07128} + \frac{10  EUR * 0.1 * 1.17693}{35  EUR * 1.07128} = 20\% + 5\% + 3\% = 28\%$
980	The RC criterion is used in scoring in 2 ways:
981	1. Pass/Fail factor:
982	• The RC passes if RC $\leq 33^{12}$ %. The product is considered as repairable
983	and the repairability multiplier will be $> 1$ .
984	• The RC fails if RC > 33%. The product is not considered as repairable
985	and the repairability multiplier will be 1.

9862. RC is used in scoring of RM as a multiplying factor with a linear distribution for987 $33\% \ge RC \ge 10\%$  (see Calculation of the Repairability Multiplier ).

### 988 3.3.4.2 Spare Parts (SP)

Providing spare parts is useful for repair and demonstrates an effort from brands. The
SP criteria is defined as providing technical or aesthetic equivalent to a missing or
broken spare part. A spare part includes all trims (buttons, zippers, belt buckles etc.),
threads, and/or the spare parts that are obviously needed to repair the product. The
SP criterion has no time limit.

- 994 The SP criterion is used in scoring in the following way:
- If available in all locations (in all physical and all virtual points of sale) or the
   product does not need spare parts, SP = 1
- If no spare parts are available, SP = 0

998 3.3.4.3 Repair Service (RS)

Providing or offering repair is a big driver to real repair and demonstrates a strong
brand effort. The RS criterion is defined as making repair services and/or aftersales
services geographically and economically accessible. The basic list of repairs that

<sup>&</sup>lt;sup>12</sup> 33% is reported to be the psychological threshold for above which product replacement is preferred to repair (ADEME, 2022).

shall be provided (brands may provide more repair services than the basic list of repairs) are the ones listed in Table 9 and represent around 80% of repairs done on the market (Refashion 2023). Point(s) of deposit should be available in both physical and virtual points of sale, at no extra cost for basic repairs (see list in the Repair column in Table 9) relevant for the product.

- 1007 The RS criterion is used in scoring in the following way:
- If available in all locations (in all physical and all virtual points of sale) and free
   for the repairs mentioned in Table 9, RS = 1
- If available in all locations (in all physical and all virtual points of sale), RS =
  0.5
- 1012 If not, RS = 0
- 1013

Table 9 - Repairs to be provided as a service

		Repair communication allowing repair by consumer	
Category	Repair		
		(Y/N)	
Apparel	Replacement of shirt collar or cuff	Ν	
	Belt-loop repair	Ν	
	Changing the lining	Ν	
	Installation of knee pads, elbow pads	Y	
	Fixing loose or missing buttons	Y	
	Pocket lining replacement	Ν	
	Repairing undone seam, fallen hem	Y	
	Tear repair	Y	
	Tear repair, snag, moth hole	Y	
	Zip change	Ν	
Footwear	Forefoot sole part replacement	Ν	
	Complete resoling of the shoe	Ν	
	Repairing undone stitching	Ν	
	Bonbout replacement	Ν	
	Reattach a heel	Ν	
	Eyelet replacement	Ν	
	Lining repair (heel cover, interior, insock)	Ν	
	Cleaning of sneakers	Y	
	(beautification/restoration)	1	
	Heel replacement	Ν	
	Zipper replacement	Ν	

### 1014 3.3.4.4 "Right to Repair" Communication (RRC)

1015 The availability of information on repair is one of the main drivers for repairability. 1016 Aligned with the EU directive "Right to Repair"<sup>13</sup>, the RRC criterion includes 1017 information on repair during the sale and throughout the garment life, which shall 1018 include the following:

- Conformity warranty information according to EU regulations (see
   <u>https://europa.eu/youreurope/business/dealing-with-customers/consumer-</u>
   <u>contracts-guarantees/consumer-guarantees/index\_en.htm</u> for more
   information);
- Repair documentation (generic). Table 9 provides the list of repairs that shall
   be covered by the repair documentation provided by the brand together with
   the product at the point of sale. For all the repairs relevant to the product:
- 1026• If the Repair communication column = N : the repair documentation shall1027indicate that repairs shall be done using professional repair services
- If the Repair communication column = Y : the brand shall decide to either
   share detailed reparability information for the consumer to be able to
   conduct the repair successfully themself, OR the communication shall
   indicate that repairs can be done using professional repair services
   provided by the brand
- Repair services & Spare parts communication if relevant;
- A "repair map" an online/offline guide to where repairs can be made, covering
   either the location of repair services provided by the brand **OR** a map of all
   existing repair shops the product can be repaired at.
- 1037 The RRC criterion is used in scoring in the following way :
- If all the above conditions are achieved, RRC = 1
- If not, RRC = 0
- 1040 The brand may decide on the format of the repair documentation, but it shall contain1041 as a minimum:
- The list of repairs related to the product (see Table 9). Repair documentation
  shall be provided for all the relevant repairs;

<sup>&</sup>lt;sup>13</sup> <u>https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52023PC0155</u>

- Online/Offline "repair map" (mapping for repair location) OR communication on 1044 • 1045 brand repair service;
- 1046 • The availability and accessibility of the spare parts that are obviously needed 1047 to repair the product;
- 1048 • The resources needed for the repair:
- 1049 a) Equipment needed;
- 1050

- b) Other useful information: tutorials, link to the spare parts stores, etc.
- 1051 3.3.4.5 Calculation of the Repairability Multiplier
- 1052 The calculation of the repairability multiplier (RM) reflects the biggest driver for repair,
- 1053 i.e. the Repair Cost Ratio, and aims to drive brand engagement in repairability.
- 1054 The RM is calculated as follows (TS expertise):
- If RC > 33% then RM = 11055
- If  $33\% \ge RC \ge 10\%$  then  $RM = 1 + \left( \left( \frac{-RC}{0.23} + \frac{0.33}{0.23} \right) * (0.5 * RS + 0.3 * RRC + 0.3) \right)$ 1056
- $(0,2 * SP) \times (0.15)$ 1057

• If RC < 10% then 
$$RM = 1 + (1 * (0.5 * RS + 0.3 * RRC + 0.2 * SP)) * 0.15$$

With the following parameters: 1059

1060 **RM:** the Repairability Multiplier, used in the calculation of the specific duration of 1061 service in Equation 1. Its minimum value is 1 and its maximum value 1.15.

RC: the Repair Cost ratio as defined in Section 3.3.4.1. RC is calculated using 1062 1063 Equation 8, unless the user of the PEFCR chooses to calculate a company sales-1064 specific RC, in which case Equation 9 shall be used.

1065 **RS:** the Repair Services criterion as defined in Section 3.3.4.3. If repair services are 1066 available in all locations (in all physical and all virtual points of sale) and free for the 1067 repairs mentioned in Table 9, RS = 1. If they are available in all locations (in all physical 1068 and all virtual points of sale) but not free, RS = 0.5, otherwise RS = 0.

1069 **RRC:** the Right to Repair Communication as defined in Section 3.3.4.4. RRC = 1 if all 1070 the conditions listed in Section 3.3.4.4 are achieved. Otherwise RRC = 0.

1071 **SP:** the Spare Parts criterion as defined in Section 3.3.4.2. SP = 1 if spare parts are 1072 available in all locations (in all physical and all virtual points of sale) or the product 1073 does not need spare parts, otherwise SP = 0.

For example, if a company has a RC of 27%, has repair services available in all locations (in all physical and all virtual points of sale) and offers repairs for free for the categories in Table 9 (RS = 1), fulfils all the criteria for the "Right to Repair" communication (RRC = 1), and spare parts are available in all locations (in all physical and all virtual points of sale) or the product does not need spare parts (SP = 1), then the repairability multiplier would be:

1080 
$$RM = 1 + \left( \left( \frac{-0.27}{0.23} + \frac{0.33}{0.23} \right) * (0,5 * 1 + 0,3 * 1 + 0,2 * 1) \right) * 0.15 = 1.04$$

1081

## 1082 3.4 System boundaries

The following life cycle stages and processes shall be included in the system boundary: the entire life cycle (from cradle to grave) of apparel and footwear products including the raw material production (including packaging production for intermediary and final products), manufacturing, distribution, use and end-of-life life cycle stages. The system boundaries are shown in Figure 5 for apparel and Figure 6 for footwear. The main processes for each life cycle stage are also indicated below.





Table 10 - Processes included per life cycle stage (non-exhaustive list)

Life cycle stage	Short description of the processes included (non-exhaustive list)		
LCS1 Raw materials acquisition and pre-processing	<ul> <li>Production or extraction of raw textile, rubber, and plastic materials; fibrous and non-fibrous animal-based materials (including leather materials, tanning and finishing); packaging materials, hangtag and trims</li> <li>Transport of raw material transport to manufacturing plant (see Section 6.1.6)</li> </ul>		
LCS2 Manufacturing	<ul> <li>Apparel and footwear</li> <li>Scouring (e.g. wool, cotton, linen)</li> <li>Combing, carding, hackling</li> <li>Production of yarn through spinning (production of yarn from staple fibres) and melt / solution spinning (production of filament)</li> <li>Production of knitted fabric (e.g. knitting circular, knitting flat)</li> <li>Production of woven fabric</li> <li>Production of padded filling (e.g. non-woven fabric, tufted fabric, felted fabric)</li> <li>Dyeing: Bleaching, dyeing and printing processes</li> <li>Treatments, both wet and dry (includes scouring, pre-dye treatments, finishing, chemical treatments (e.g. moisture management and water repellence), coating, lamination, heat treatments (e.g. curing, drying, heat setting, calendaring), mechanical treatments (e.g. raising, brushing))</li> <li>Assembly (includes sewing)</li> <li>Any other manufacturing process</li> <li>Transport of intermediate products between manufacturing processes see Section 6.1.6)</li> <li>Production of semi-finished and intermediate products packaging and manufacturing losses and leftovers</li> </ul>		
	Footwear only: Compound forming Die-cutting In-sole production and assembly Lasting & delasting Out-sole treatment (e.g., vulcanisation) Sewing, fusing Stockfitting		
LCS3 Distribution	<ul> <li>E-commerce: <ul> <li>Transport from factory to the final client (factory to consumer)</li> <li>Transport from factory to warehouse/ distribution centre located in Europe</li> <li>Transport from a warehouse/ distribution centre located in Europe to a local warehouse/ distribution centre</li> <li>Transport from local warehouse/ distribution centre to final client</li> <li>Transport of distribution losses and unsold consumer products</li> <li>Recycling, incineration (with and without energy recovery) and landfilling of the secondary, tertiary packaging, unsold consumer products and distribution losses</li> </ul> </li> <li>Retail/ in-store: <ul> <li>Transport from factory to warehouse/ distribution centre located in Europe</li> <li>Transport from set of the stribution centre located in Europe</li> <li>Transport from set of the stribution centre located in Europe</li> <li>Transport from retail/ stores to final client (consumer travel)</li> <li>Transport of distribution losses and unsold consumer products</li> </ul> </li> </ul>		

	<ul> <li>Recycling, incineration (with and without energy recovery) and landfilling of the secondary, tertiary packaging, unsold consumer products and distribution losses</li> </ul>
LCS4 Use	Apparel • Washing / cleaning • Drying • Ironing Footwear • Care Both
	Repair
LCS5 End of life	<ul> <li>Transportation from user to collection point</li> <li>Transportation from collection point to sorting point (incl. transport for reuse inside and outside of Europe)</li> <li>Transportation from sorting point to recycling</li> <li>Transportation from user to disposal</li> <li>Recycling, incineration (with and without energy recovery) and landfilling of the products as well as of primary packaging</li> </ul>

Hangers are exceptionally given away to consumers (expert judgment). They are thusconsidered as capital goods and are excluded from the study.

Temporary displays are very seldom recommended by apparel and footwear brands (expert judgement). As such, they are excluded from the system boundaries of apparel and footwear products but shall be included in the footprint of any retailer deciding to use them. In this case, the type of materials and number of temporary displays shall be determined, brought back to a single product, and be treated as secondary packaging.

According to this PEFCR, the following processes may be excluded based on the cutoff rule: production and distribution of packaging for raw materials, based on the results of the PEF-RP study. More information is available in the PEF-RP study itself.

1106 No additional cut-off is allowed.

Each PEF study done in accordance with this PEFCR shall provide in the PEF study
a diagram indicating the activities falling in situation 1, 2 or 3 of the data needs matrix
(see Section 5.4).

## 1110 3.5 List of EF impact categories

Each PEF study carried out in compliance with this PEFCR shall calculate the PEFprofile including all EF impact categories listed in the Table below. As climate change was identified as a most-relevant impact category, and the sub-categories 'Climate change - biogenic' and 'Climate change - land use and land transformation' contribute more than 5% each to the total impact of some RPs, these sub-categories shall be reported separately.

1117

Table 11 - Impact categories for the PEF profile

EF impact category	Impact indicator	Unit	Characterization model	Robust- ness
Climate change, total <sup>14</sup>	Global Warming Potential (GWP100)	kg CO <sub>2</sub> - eq	Bern model - Global warming potential (GWP) over a 100-year time horizon based on IPCC 2021 (Forster et al., 2021).	1
Ozone depletion	Ozone Depletion Potential (ODP)	kg CFC- 11-eq	EDIP model based on the ODPs of the World Meteorological Organisation (WMO) over an infinite time horizon (WMO 2014 + integrations)	1
Human toxicity, cancer	Comparative Toxic Unit for humans (CTUh)	CTUh	Based on USEtox2.1 model (Fantke et al. 2017), adapted as in Saouter et al., 2018	
Human toxicity, non- cancer	Comparative Toxic Unit for humans (CTUh)	CTUh	Based on USEtox2.1 model (Fantke et al. 2017), adapted as in Saouter et al., 2018	111
Particulate matter	Impact on human health	disease incidence	PM model (Fantke et al., 2016 in UNEP 2016)	1
Ionising radiation, human health	Human exposure efficiency relative to U235	kBq U <sup>235</sup> - eq	Human health effect model as developed by Dreicer et al., 1995 (Frischknecht et al, 2000)	11
Photochemic al ozone formation, human health	Tropospheric ozone concentration increase	kg NMVOC - eq	LOTOS-EUROS model (Van Zelm et al, 2008) as applied in ReCiPe 2008	11
Acidification	Accumulated Exceedance (AE)	mol H <sup>+</sup> - eq	Accumulated Exceedance (Seppälä et al. 2006, Posch et al, 2008)	II
Eutrophicatio n, terrestrial	Accumulated Exceedance (AE)	mol N -eq	Accumulated Exceedance (Seppälä et al., 2006, Posch et al, 2008)	11

<sup>&</sup>lt;sup>14</sup> The indicator "Climate Change, total" is a combination of three sub-indicators: Climate change – Change fossil; Climate change –Change biogenic; Climate change – land use and land use change. The sub-indicators are further described in section 4.4.10 of Annex I. The sub-categories 'Climate change –fossil', 'Climate change – biogenic' and 'Climate change - land use and land use change' shall be reported separately, if they show a contribution of more than 5% each to the total score of climate change.

EF impact category	Impact indicator	Unit	Characterization model	Robust- ness
Eutrophicatio n, freshwater	Fraction of nutrients reaching freshwater end compartment (P)	kg P -eq	EUTREND model (Struijs et al, 2009) as applied in ReCiPe 2008	II
Eutrophicatio n, marine	Fraction of nutrients reaching marine end compartment (N)	kg N -eq	EUTREND model (Struijs et al, 2009) as applied in ReCiPe 2008	II
Ecotoxicity, freshwater	Comparative Toxic Unit for ecosystems (CTUe)	CTUe	Based on USEtox2.1 model (Fantke et al. 2017), adapted as in Saouter et al., 2018	111
Land use (occupation and transformatio n)	Soil quality index (dimensionless) <sup>15</sup>	Dimensio nless (pt)	Soil quality index based on LANCA model (De Laurentiis et al. 2019) and on the LANCA CF version 2.5 (Horn and Maier, 2018)	
Water use	User deprivation potential (deprivation- weighted consumption)	m <sup>3</sup> world - eq	Available WAter REmaining (AWARE) model (Boulay et al., 2018; UNEP 2016)	111
Resource use <sup>16</sup> , minerals and metals	Abiotic resource depletion (ADP ultimate reserves)	kg Sb -eq	van Oers et al., 2002 as in CML 2002 method, v.4.8	111
Resource use, fossils	biotic resource depletion – fossil fuels (ADP-fossil)	MJ	van Oers et al., 2002 as in CML 2002 method, v.4.8	111

1118 The full list of normalisation factors and weighting factors are available in ANNEX I -

1119 List of EF normalisation and weighting factors. The full list of characterization factors

1120 is available at this link <u>http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml</u>. The EF

1121 reference package 3.1 shall be used.

# 1122 3.6 Additional technical information

### 1123

Note

No additional technical information currently needs to be reported.

<sup>&</sup>lt;sup>15</sup> This index is the result of the aggregation, performed by JRC, of 4 indicators (biotic production, erosion resistance, mechanical filtration, and groundwater replenishment) provided by the LANCA model for assessing impacts due to land use as reported in De Laurentiis et al, 2019.

<sup>&</sup>lt;sup>16</sup> The results of this impact category shall be interpreted with caution, because the results of ADP after normalization may be overestimated. The European Commission intends to develop a new method moving from depletion to dissipation model to better quantify the potential for conservation of resources.

## 1124 3.7 Additional environmental information

### 1125 3.7.1 General information

Biodiversity is considered as relevant for each product sub-category in scope of the PEFCR based on TS expert judgement. To assess and report impacts on biodiversity, an organic certification system for natural fibres may be used as a proxy. The PEFCR applicant shall report whether any of the materials are certified as organic and report the total mass percentage of the product that is certified organic.

1131 Additional environmental information may include the following (non-exhaustive list):

- Corporate level Information regarding the company's work with environmental responsibility, such as which initiatives the company has joined (e.g. reporting to CDP), or data about specific environmental characteristics of the product;
- Product level Information on any sustainability programs followed at product or production level, and share or product or production covered (e.g., percentage of cardboard from a certified source or percentage of textiles from certified labels (e.g. OEKO-TEX® MADE IN GREEN or ZDHC's MRSL compliance)).

To substantiate the above information, reference should be made to the Directive on Empowering Consumers for the Green Transition (ECGT), adopted on 20 February 2024. This directive complements other EU legislation, most notably the Green Claims Directive, proposed in March 2023 and not yet adopted.

Disclosed information about a company's efforts in environmental responsibility or sustainability programs, both at the corporate or product/production level, may qualify as environmental claims. Environmental claims are defined as "any non-mandatory message or representation (including text, images, or symbols) in commercial communication, suggesting that a product or trader positively impacts the environment, is less harmful, or has improved its environmental impact over time" (European Parliament and Council of the European Union, 2005).

1151 Under the Directives, this information will have to be substantiated and verified within1152 commercial business-to-consumer practices.
The directives will also set requirements for environmental labelling schemes, such as certification programs that ensure a product, process, or company meets environmental label standards. These schemes will have to be verified by a third party either through an approved certification scheme or recognized public authority and are subject to regular reviews. This applies to schemes both within and outside the EU, including those already established (European Commission, 2023).

Note This general additional environmental information does not impact calculations. This list will be updated regularly as required. Until the Green Claims Directive is fully approved, all supplementary information, including participation in certification schemes, should be substantiated with evidence. A certification document that verifies the acquired certifications shall be disclosed during the study review.

### 1159 **3.7.2 Fibre fragment impact calculation**

Fibre fragment leakage is often associated with the production, use and end-of-life stages of apparel and footwear products. Although scientific research is still ongoing to fully understand and model the impact of fibre fragments coming from apparel and footwear products on all environmental compartments, a first estimation of the impact of fibre fragments coming from the product's care cycle on the marine biota and sediments can be calculated and shall be included in any PEF study.

The release of fibre fragments into the marine environment during washing applies only to textile products as defined in the EU Textiles Labelling Regulation in the case of apparel and for footwear labelled as textiles in EU Footwear Labelling Directive. In general, genuine leather and genuine fur articles will not be washed, dried, ironed or steamed (see Section 6.4.1) and will therefore not have fragment release related to these processes.

> Note This initial fibre fragment impact assessment is limited and embeds a high uncertainty (both from the inventory data and the modelling used). It is recommended the approach is updated as soon as more information is available to:

 Cover the entire lifecycle of apparel and footwear products, including production of raw materials, and shedding during use (wear) and end-of-life.

- Include the impact of fibre fragments on the entire marine compartment, as well as on any other relevant environmental compartment such as freshwater, air and land.
- 1172 3.7.2.1 Fibre fragment inventory for one care cycle

1173 First, a fibre fragment inventory for the product's care cycle needs to be calculated. 1174 For each textile raw material used (based on the product's BOM and the associated 1175 manufacturing processes (e.g. circular or flat knitting, weaving, etc.)), secondary data 1176 shall be used, unless primary data is available. The secondary data proxies used for 1177 fibre fragment inventory calculations shall be taken from the TMC's most recent annual 1178 report. The most representative data proxies shall be selected based on the BOM of 1179 the product being assessed, and a BOM weighted calculation approach shall be 1180 applied in the case of a product with mixed fibre composition. In case primary data is 1181 used, it shall be obtained using the TMC (The Microfibre Consortium Test Method: 1182 quantification of fibre release from fabrics during domestic laundering, Version 1.2), 1183 ISO 4484:1 or AATCC TM212 test methods. When using primary data, a test shall be 1184 conducted for each fabric in the product. Trims, electronic parts, metals, and footwear 1185 components shall be excluded from the inventory.

1186 The fibre fragment inventory for each raw material is obtained using Equation 11:

1187 
$$FFLoss_{i} = \frac{Weight_{Product}}{UsesPerCareCycle} * (MaterialShare_{i} * AvgFFLoss_{i})$$

1188

Equation 11

1189 With the following parameters:

- 1190 **FFLoss**<sub>i</sub> (g fibre fragment emitted/use): the fibre fragments emitted from raw material
- 1191 i for 1 use
- 1192 WeightProduct (kg) : weight of the product

1193 **UsesPerCareCycle** (use/wash): number of uses of the product prior to a care cycle.

- 1194 Default values from Table 40 shall be used.
- 1195 MaterialShare<sub>i</sub> (%): share of raw material i according to the Bill of Materials
- AvgFFLoss<sub>i</sub> (g fibre fragment emitted/kg of product/wash): the average fibre fragment
  quantity emitted for 1kg of raw material i and 1 care cycle for the relevant raw material
- and fabric construction, based on secondary data from TMC's most recent annual
  report.
- 1200 **TotalFFLoss** (g fibre fragment emitted/kg of product/wash): the total fibre fragment 1201 quantity emitted for 1kg of raw material i and 1 care cycle, based on primary data 1202 using the TMC (The Microfibre Consortium Test Method: quantification of fibre release 1203 from fabrics during domestic laundering, Version 1.2), ISO 4484:1 or AATCC TM212 1204 test methods.
- 1205

When using primary data, Equation 10 shall be used, replacing **AvgFFLoss**<sub>i</sub> with the total fibre fragment loss **TotalFFLoss**. For primary data from blended fabrics, the fibre fragment loss FFLoss<sub>i</sub> shall be allocated to each raw material in the blend according to its material composition MaterialShare<sub>i</sub>.

1210 3.7.2.2 Fibre fragment impact on marine biota

1211 The impact of the fibre fragments shed during the care cycle shall be calculated based 1212 on the inventory following Section 3.7.2.1, using the most relevant characterisation 1213 factor from the MarILCA publications (Corella-Puertas, 2023 and Saadi, 2024). The 1214 relevant material characterisation factor shall be chosen and if the material is not 1215 available, the closest available proxy shall be chosen according to the material 1216 selection in Section 3.8.2. The default initial fibre diameter of 10 µm shall be used, 1217 unless primary data are used. Both the midpoint (PAF\*m<sup>3\*</sup>day/use, representing the 1218 ecosystem quality impact based on affected fraction of species) and the endpoint 1219 (PDF\*m2\*year/ use, representing the ecosystem quality damage based on 1220 disappeared fraction of species) impacts shall be calculated to evaluate the physical 1221 effects on biota from fibre fragment emissions to marine environments.

1222 The fibre fragment inventory of each raw material is multiplied by the characterisation 1223 factor of each raw material (or closest proxy) and then summed to obtain the total fibre 1224 fragment impact as per Equation 12 for the midpoint impact and Equation 13 for the1225 endpoint impact.

Equation 12

Equation 13

1226 
$$MidpointImpact = \sum_{i=1}^{n} MidpointImpact_{i} = \sum_{i=1}^{n} \left( \frac{FFLoss_{i}}{1000} * MidpointCF_{i} \right)$$

1227

1228 
$$EndpointImpact = \sum_{i=1}^{n} EndpointImpact_{i} = \sum_{i=1}^{n} \left( \frac{FFLoss_{i}}{1000} * EndpointCF_{i} \right)$$

1230 With the following parameters:

1231 **FFLoss**i (g fibre fragment emitted/use): see Equation 11

1232 **MidpointImpact** (PAF\*m<sup>3</sup>\*day/use): the midpoint impact of the product for 1 use

1233 **n**: number of raw materials in the Bill of Materials

1234 **MidpointImpact**<sub>i</sub> (PAF\*m<sup>3\*</sup>day/use): the midpoint impact of raw material i for 1 use

MidpointCF<sub>i</sub> (PAF\*m<sup>3\*</sup>day/ kg fibre fragment emitted): the characterisation factor of
 the midpoint impact for 1 kg of fibre fragment emitted for raw material i, based on
 MariLCA data<sup>17</sup>. The default initial fibre diameter of 10 μm shall be used, unless
 primary data are used.

1239 EndpointImpact (PDF\*m<sup>2</sup>\*year/ use): the endpoint impact of the product for 1 use

EnddpointImpact<sub>i</sub> (PDF\*m<sup>2</sup>\*year/use): the endpoint impact of raw material i for 1 use
 EndpointCF<sub>i</sub> (PDF\*m<sup>2</sup>\*year/ kg fibre fragment emitted): the characterisation factor of

1242 the endpoint impact for 1 kg of fibre fragment emitted for raw material i, based on

MariLCA data<sup>17</sup>. The default initial fibre diameter of 10 μm shall be used, unless
primary data are used.

### 1245 3.7.2.3 Communication of results

To be consistent with the other characterised results shared in a PEF study, the fibre fragment impact shall be shared per use, using the same care cycle information provided in Section 6.4.1. (apparel products) and Section 6.4.4 (footwear products). The PEF report shall include the following results:

<sup>&</sup>lt;sup>17</sup> Saadi, N; Lavoie, J; Fantke, P; Redondo-Hasselerharm, P; Boulay, A.-M. "Including Impacts of Microplastics in Marine Water and Sediments in Life Cycle Assessment"

- the total midpoint and endpoint fibre fragmentation impact of the product
- the midpoint and endpoint impact for each of the raw materials included in the
  BoM
- the inventory of fibre fragments released from each raw materials included in
  the BoM
- 1255 The following sentence shall be included next to the results:

1256 "This fibre fragment impact embeds a high uncertainty due to the developing nature of
1257 the underlying scientific assessment methodology but reflects the best practice and
1258 the currently most up to date scientific knowledge on the matter. It is recommended
1259 the approach is updated as soon as more information is available to:

- Cover the entire lifecycle of apparel and footwear products, including
   production of raw materials, and shedding during use (wear) and end-of-life.
- Include the impact of fibre fragments on the entire marine compartment, as well
  as on any other relevant environmental compartment such as freshwater, air
  and land.".

Due to the uncertainty of the approach, this method shall not be used to substantiate fibre fragment specific claims.

1265

1266 3.7.2.4 Example calculation

Note

1267 A 170 g circular knitted t-shirt (Weight = 0.17 kg) is composed of 50% cotton 1268 (MaterialShare<sub>1</sub> = 0.5) and 50% polyester (MaterialShare<sub>2</sub> = 0.5). As the fibre fragment 1269 inventory for blended polyester-cotton fabrics is not available at the time of publication, 1270 the proxy of 100% cotton fabric for 50% of the product and 100% polyester fabric for 1271 the other 50% of the product shall be used. A t-shirt is worn twice (UsePerCareCycle 1272 = 2) before being washed according to Table 40.

For cotton, the closest proxy in TMC's 2024 annual report for the composition is "Staple fibre" and for the fabric structure "Weft knit". For polyester, the closest proxy in TMC's 2024 annual report for the composition is "Staple fibre" and for the fabric structure "Weft knit". The fibre fragment inventory is obtained using Equation 14 (AvgFFLoss provided are from the TMC 2024 annual report).

1278 
$$FFLoss_{cotton} = \frac{0.17 \ kg}{2 \ uses/wash} * (50\% \ share \ of \ cotton * \ AvgFFLoss_{cottonWeftKnlt})$$
1279 
$$= \frac{0.17 \ kg}{2 \ uses/wash}$$
1280 \* (0.5 \* 0.749 g fibre fragment emitted/kg of product/wash)
1281 = 0.032 g fibre fragment emitted/use
1282 
$$FFLoss_{Polyester}$$
1283 
$$= \frac{0.17 \ kg}{2 \ uses/wash}$$
1284 \* (50% \ share \ of \ polyester \* \ AvgFFLoss\_{PolyesterWeftKnlt})
1285 
$$= \frac{0.17 \ kg}{2 \ uses/wash}$$
1286 \* (0.5 \* 0.749 g fibre fragment emitted/kg of product/wash)
1285 
$$= \frac{0.17 \ kg}{2 \ uses/wash}$$
1286 \* (0.5 \* 0.749 g fibre fragment emitted/use
1288 Equation 14
1289 The fibre fragment inventory of each material is then multiplied by the characterisation
1290 factor of each material (directly available in this case) as per Equation 15 for the
1291 midpoint/mpact\_cotton = FFLoss\_cotton \* MidpointCF\_{cotton.10 \ um}
1293 
$$= \frac{0.032 \ g \ fibre fragment emitted/use}{1000 \ g/kg} * 1.04 * 10^5 \ PAF * m3$$
1294 \* day/ kg fibre fragment emitted = 3.32 \ PAF \* m<sup>2</sup> \*  $\frac{day}{use}$ 
1295 Midpoint/mpact\_polyester = FFLoss\_polyester \* MidpointCF\_{FET,100 \ use}}
1296 
$$= \frac{0.032 \ g \ fibre fragment emitted = 444.26 \ PAF * m3 * \frac{day}{use}$$
1297 \* day/ kg fibre fragment emitted = 444.26 \ PAF \* m<sup>3</sup> \* \frac{day}{use}
1298 Equation 15
1299 Endpoint/mpact\_cotton = FFLoss\_cotton \* EndpointCF\_{cotton.10 \ um}
1300 
$$= \frac{0.032 \ g \ fibre fragment emitted = 444.26 \ PAF * m3 * \frac{day}{use}}{use}$$
1301 \* year/ kg fibre fragment emitted = 9.12 \* 10^{-5} \ PDF \* m<sup>2</sup> \* \frac{year}{use}

1302EndpointImpact\_{Polyester} = FFLoss\_Polyester \* EndpointCF\_{PET.10µm}1303= 
$$\frac{0.032 \text{ g fibre fragment}}{1000 \frac{\text{g}}{\text{kg}}} * 383.80 \text{ PDF * m2}$$
1304\* year/ kg fibre fragment emitted =  $1.22 * 10^{-2} \text{ PDF * } m^2 * \frac{\text{year}}{\text{use}}$ 1305Equation 16130613071308total fibre fragment impacts of each material are then summed to obtain the1309total fibre fragment impact as per Equation 17 for the midpoint impact and Equation130918 for the endpoint impact.1311= FFLoss\_Cotton \* MidpointCF\_Cotton,10µm + FFLoss\_Polyester1312\* MidpointCF\_PET.10µm1313=  $\frac{0.032 \text{ g fibre fragment emitted/use}}{1000 \text{ g/kg}} * 1.04 * 10^5 \text{ PAF * m3}$ 1314\* day/kg fibre fragment emitted +  $\frac{0.032 \text{ g fibre fragment emitted/use}}{1000 \text{ g/kg}}$ 1315\* 1.40 \* 10^7 PAF \* m3 \* day/kg fibre fragment emitted = 3.32 + 444.261316= 447.57 PAF \* m3 \* day/kg fibre fragment emitted = 3.32 + 444.261316= 447.57 PAF \* m3 \* day/kg fibre fragment emitted = 3.32 + 444.261319= FFLoss\_Cotton \* EndpointCF\_Cotton.10µm + FFLoss\_Polyester1320\* 1.40 \* 10^7 PAF \* m3 \* day/kg fibre fragment emitted = 3.32 + 444.261319=  $FFLoss_Cotton * EndpointCF_Cotton.10µm + FFLoss_Polyester1320* 2.86 PDF * m21321=  $\frac{0.032 \text{ g fibre fragment emitted}}{1000 \frac{\text{ kg}}}$ 1322*  $\frac{\text{ sec mather $ 

### 1326 3.8 Limitations

1327 The following limitations shall be included in the PEF study report when conducting1328 PEF studies in accordance with this PEFCR:

Because the PEF method is product- and not user- centric, this PEFCR does
 not allow for differentiation between the impact of a new or second-hand item.

- The allocation for raw material and product transport is mass-based. This may underestimate the environmental impacts from the transport of products with a low density (high volume per mass). To evaluate this, more information on product volume and weight is needed. We recommend investigating this topic by gathering data in a next version of this PEFCR.
- The duration of service of items is included in this PEFCR, but its granularity 1336 regarding garment characteristics is low, as there is a lack of robust data 1337 1338 assessing the duration of services in number of uses, correlating it with such 1339 garment attributes like garment type, fibre composition, fabric structure or 1340 garment construction. Intrinsic durability calculations have limitations, as the 1341 link between product performance in laboratory tests and the associated 1342 performance thresholds, and how a product breaks down due to wearing and 1343 domestic care is still being studied. Additionally, the assessment of colour 1344 damage could be further refined with more granularity regarding different colour 1345 effects (dark, light, solid, shot, etc.). Further studies should also aim to precisely 1346 define the levels of degradation which the majority of consumers would 1347 consider end of life and use these endpoints to set relevant thresholds for 1348 laboratory testing. Furthermore, the methodology to measure the duration of 1349 service is highly debated and may be refined in the future. Non-physical durability attributes such as design (use of adjustable design features such as 1350 1351 adjustable waist, enabling detaching and replacing parts such as pockets), or 1352 making the garment fit for different purposes, which may have an impact on 1353 how long a single user will use a product, are not included in this PEFCR. See more details in Section 3.3.2.1 and ANNEX VI - Exploring the extrinsic 1354 1355 durability of apparel and footwear products.

- Toxicity aspects are measured with the LCIA method USEtox, which includes human toxicity (cancer and non-cancer effects) and freshwater ecotoxicity, but no marine water or terrestrial ecotoxicity for the moment. This method therefore does not cover the full impacts of chemicals on humans and ecosystems, which are covered by chemical legislation and other methodologies in Europe.
- This PEFCR contains several exemptions for genuine leather and fur products:
- 1362 1363

1364

1365

- The durability tables listed in ANNEX V Detailed requirements regarding intrinsic durability do not apply
- Specific garment use instructions for these products shall be followed, the general washing and cleaning tables for modelling the use phase don't apply
- The model for fibre fragment releases related to the cleaning
   processes don't apply to these products
- The durability tables listed in ANNEX V Detailed requirements regarding
   intrinsic durability do not apply to menstrual underwear and are optional for
   small series. Hence, for these products, the durability multiplier defined in
   Section 3.3.3 doesn't necessarily apply. As a result:
- the footprint of menstrual underwear shall not be compared to the
  footprint of other underwear
  - the footprint of small series for which no durability testing has
    been conducted shall not be compared to the footprint of other
    apparel and footwear products
  - The repair costs are based on repairs in France and lack representativeness
     on an EU scale. It is recommended to update the data as soon as more recent
     and representative information is available on country-specific repair costs to
     ensure the data remains aligned with current market price evolutions.
  - Recycling pathways, especially textile-to-textile or footwear-to-footwear, are
    expected to develop rapidly in the next few years. It will be therefore necessary
    to enrich further the current draft related to the verifiable evidence to be given
    for using a factor of R<sub>2</sub>>0, especially in the case of a garment with recyclability
    disruptors.
  - The initial fibre fragment impact assessment included in these PEFCR is limited
     and embeds a high uncertainty (both from the inventory data and the modelling

used). The TMC test method is a quantification of fibre release from fabrics
during simulated domestic laundering, reflecting the initial washing cycle.
The total fibre shedding through domestic laundry or other apparel care is,
therefore, only an approximation. Furthermore, no inventory data is available
on fibre shedding during the use phase nor on fibre emissions in the
manufacturing process. It is recommended to update the approach as soon as
more information is available to:

- Cover the entire lifecycle of apparel and footwear products,
  including production of raw materials, and shedding during use
  (wear) and end-of-life.
- Include the impact of fibre fragments on the entire marine
   compartment, as well as on any other relevant environmental
   compartment such as freshwater, air and land.
- Using a standard size of M can lead to inconsistencies between brands, as
   companies have different size tables according to their targeted customers.

1404 This PEFCR has a time validity until 31<sup>st</sup> December 2025<sup>18</sup>. Updates may be 1405 conducted earlier should any key limitation need to be resolved, key technologies 1406 change (e.g. recycling), or should better data be made available to inform the default 1407 product duration of service per product sub-category (see Table 6).

### 1408 **3.8.1 Comparisons and comparative assertions**

According to Section A.3.1 in Annex A of the PEF method, a product of a sub-category
(e.g., sub-category 1, T-shirts) can be compared to the RP as well as to any other
product of this sub-category.

1412 Comparison and comparative assertions of products of the same sub-category should 1413 acknowledge the vast variety of products and their functions within that sub-category. 1414 E.g., a blazer as well as a raincoat belong to the jackets and coats sub-category. The 1415 corresponding function «Garment to put on top of a shirt or sweater or to protect from 1416 the elements" provides a very general description. However, more specific aspects 1417 such as the degree of protection, which is provided, but also more subjective aspects

<sup>&</sup>lt;sup>18</sup> subject to the extension of the validity of the EF database currently under review

such as to the conditions when a garment will be worn, are also determining the intended function at the consumer level. A more detailed definition of the functional unit and the sub-categories in the future can facilitate more robust and meaningful comparisons and comparative assertions.

For every internal use of this PEFCR and for eco-design purposes, it is recommended that while conducting comparisons of PEF study results, the limitations highlighted in section 3.8 of this PEFCR should be taken into account, and the materiality of the limitations for external communication vs. internal communication are evaluated accordingly.

- 1427 Due to the exemptions related to some products (see also section 3.8), the following1428 restrictions regarding comparisons and comparative assertions are set:
- Genuine leather and/or fur apparel products shall not be compared to the
  footprint of other apparel products.
- The footprint of menstrual underwear shall not be compared to the footprint of
  other underwear.
- The footprint of small series for which no durability testing has been conducted
   shall not be compared to the footprint of other apparel and footwear products.

1435

1436

#### 3.8.2 Data gaps and proxies

1437 3.8.2.1 Data gaps frequently encountered for company-specific data

The list of mandatory data points provided in Section 5.1 has been adapted to ensure there is no recurring company-specific data gap. Some data points, namely the share of unsold consumer products and the company level air cargo distances and share of product mass transported might be more difficult to find. However, due to the significance of these two data points, it was decided to keep them as mandatory data points without which compliance with this PEFCR cannot be obtained.

1444 In the future, more primary data related to the lifespan of garments and footwear may 1445 be made available to increase the robustness of key parameters such as the number of wears before a care cycle. In the meantime, the default duration of service asdescribed in Section 3.3.2.2 shall be used.

1448 3.8.2.2 Processes excluded from the PEFCR due to missing datasets

1449 No processes are excluded from the PEFCR due to missing datasets.

1450 3.8.2.3 Data gaps for secondary datasets and guidance to select proxies

ANNEX VII – Inventory modelling and default datasets ("Data gaps proxies" tab) contains a list of datasets that could not be found in the EF database at the time the PEFCR was developed because no exact match was found during the supporting studies and PEF-RP study (e.g., exact fibre but not produced in the exact region). Should there be an exact match in the version of the EF database available during further PEF studies, that exact match shall be used instead of the recommendations from Annex VII ("Data gaps proxies" tab).

- 1458 Significant investments are being made in both the innovation and scalability of 1459 apparel and footwear recycling. Several pathways and technologies are in 1460 development, but only the recycling pathways currently implemented at scale are 1461 considered in this version of the PEFCR.
- 1462 In case of no exact match between the dataset and the system modelled (type of 1463 material, technology of the process, geographic representativeness, etc.), the user of 1464 the PEFCR shall follow the guidance below to choose the best proxy.
- 1465 In case the best proxy isn't fully covering the process modelled (e.g. only the first step 1466 of a multi-step process), the LCA practitioner shall find as many additional proxies as
- 1467 needed to model the missing steps.

1468

Life Cycle Stage 1 – Raw materials acquisition and pre-processing:

- 1469 • For natural materials, a dataset based on the closest animal or vegetal species 1470 shall be chosen. For synthetic materials, the closest material based on the 1471 synthesis route of the polymer shall be selected.
- 1472 • Should different datasets be available for that material proxy in the EF database (e.g. leather, cattle), the closest one shall be selected (e.g., chrome, olive-leaf 1473 1474 or vegetable tanning).
- 1475 • When multiple locations are available for the same raw material (e.g., coconut 1476 fiber from Philippines, India or Sri Lanka):
- For natural materials, the location with the closest climate conditions 1477 1478 shall be chosen (e.g. dry conditions requiring more irrigation);
- 1479 • For synthetic materials, the location with the most similar electricity mix 1480 shall be chosen (e.g. high share of renewables in the local electricity 1481 mix). This assessment shall be based on the information provided by the 1482 EF database documentation first, and on the International Energy Agency<sup>19</sup> otherwise if needed. 1483
- 1484 • Should the user of the PEFCR have no information on the origin of the material, 1485 a global location (GLO) shall be used.
- 1486

Life Cycle Stage 2 - Manufacturing

- 1487 • A dataset based on the same material form shall be selected (e.g., fiber or yarn 1488 or fabric)
- 1489 • Should there be more than one process for that manufacturing stage available in the EF database, the most similar process to the one under study shall be 1490 1491 selected (e.g., dyeing, knitting, bonding, foaming etc.).
- 1492 Recycled synthetic fibres that are spun from fibers shall use "spinning" 1493 (production mix)" as proxy
- 1494 If multiple technologies are available for the same manufacturing stage, the • 1495 most similar one for the most appropriate material shall be selected (e.g., batch 1496 dyeing vs continuous dyeing). To help select a proxy for spinning based on yarn

<sup>&</sup>lt;sup>19</sup> <u>https://www.iea.org/countries</u>

- size and textile formation based on yarn count, please look at the followingresources:
- 1499 o For spinning based on yarn size: <u>https://howtohigg.org/higg-</u>
   1500 <u>msi/textiles/yarn-formation-method/</u>
- 1501 o For textile formation based on yarn count: <u>https://howtohigg.org/higg-</u>
   1502 <u>msi/textiles/textile-formation/</u>
- When multiple locations are available for the same technology, the location with
   the most similar electricity mix shall be chosen (e.g. high share of renewables
   in the local electricity mix). This assessment shall be based on the information
   provided by the EF database documentation first, and on the International
   Energy Agency<sup>20</sup> otherwise if needed.
- Should the user of the PEFCR have no information on the origin of the material,
  a global location (GLO) shall be used.
- For user of the PEFCR lacking information on the manufacturing processes
   included in their value chain (aside from assembly), default modelling guidance
   is provided in Section 6.2.
- 1513 Other Life Cycle Stages
- If no exact match can be found, the user of the PEFCR shall use the default datasets provided in ANNEX VII – Inventory modelling and default datasets
   ("Default datasets & DQR" tab).
- 1517 3.8.2.4 List of processes requiring ILCD-EL compliant proxies
- 1518 In case of waste treatment outside of Europe, the default dataset for the landfilling of
- 1519 textiles as provided in ANNEX VII Inventory modelling and default datasets ("Data
- 1520 gap proxies" tab) may be used.
- 1521

<sup>&</sup>lt;sup>20</sup> <u>https://www.iea.org/countries</u>

# 4 Most relevant impact categories, life cycle stages, processes and elementary flows



### 1525 4.1 Most relevant EF impact categories

1526

The most relevant impact categories per product sub- category are listed in Table 12, as calculated in the PEF-RP study v3.0:

Table 12 - Most relevant im	pact categories per RP
-----------------------------	------------------------

Impact category	RP1	RP2	RP3	RP4	RP5	RP6	RP7	RP8	RP9	RP10	RP11	RP12	RP13
Climate change	19%	21%	16%	18%	20%	20%	21%	21%	24%	16%	19%	18%	18%
Ozone depletion	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Human toxicity, cancer	1%	1%	0%	1%	1%	1%	1%	1%	2%	1%	2%	1%	2%
Human toxicity, non-cancer	2%	1%	1%	1%	1%	1%	1%	2%	1%	1%	5%	3%	4%
Particulate matter	17%	19%	15%	18%	19%	18%	19%	17%	20%	17%	17%	17%	17%
Ionising radiation	1%	1%	0%	0%	1%	1%	1%	1%	1%	0%	0%	0%	0%
Photochemical ozone formation	3%	3%	2%	2%	3%	3%	3%	3%	4%	2%	4%	3%	4%
Acidification	6%	6%	12%	10%	6%	7%	8%	6%	7%	13%	10%	10%	10%
Eutrophication, terrestrial	3%	3%	8%	7%	3%	4%	4%	3%	3%	9%	7%	7%	7%
Eutrophication, freshwater	3%	2%	2%	2%	2%	2%	2%	3%	1%	2%	1%	1%	1%
Eutrophication, marine	4%	3%	9%	7%	3%	4%	4%	3%	3%	8%	5%	6%	5%
Ecotoxicity, freshwater	3%	3%	12%	9%	3%	4%	5%	3%	3%	10%	8%	9%	8%
Land use	2%	2%	9%	5%	2%	2%	2%	2%	0%	4%	3%	3%	3%
Water use	19%	16%	8%	8%	14%	15%	10%	16%	4%	8%	3%	5%	3%
Resource use, minerals and metals	7%	7%	2%	6%	8%	6%	6%	6%	10%	3%	6%	6%	7%
Resource use, fossils	12%	13%	5%	8%	13%	11%	13%	13%	18%	6%	11%	9%	10%
Total most relevant contribution (%)	83%	81%	88%	83%	80%	81%	82%	82%	83%	81%	82%	83%	82%

Note: RP1. T-shirts, RP2. Shirts and blouses, RP3. Sweaters and midlayers, RP4. Jackets and coats, RP5. Pants and shorts, RP6. Dresses, skirts and
 jumpsuits, RP7. Leggings, stockings, tights and socks, RP8. Underwear, RP9. Swimwear, RP10. Apparel accessories, RP11. Open-toed shoes, RP12. Closed toed shoes, RP13. Boots.

### 1531 4.2 Most relevant life cycle stages

#### 1532 The most relevant life cycle stages for per product sub-category are listed in Table 13, as calculated in the PEF-RP study v3.0:

1533

Table 13 - Most relevant life cycle stage per impact categories per RP

Impact category	RP1	RP2	RP3	RP4	RP5	RP6	RP7	RP8	RP9	RP10	RP11	RP12	RP13
Climate change	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	<b>1</b> , <b>2</b> , 4	<b>1</b> , <b>2</b> , 4	1, 2	1, 2	1, 2	1, 2
Ozone depletion													
Human toxicity, cancer													
Human toxicity, non-cancer													
Particulate matter	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1	1, 2
Ionising radiation													
Photochemical ozone formation													
Acidification	1, 2	1, 2	1	1	1, 2	1, 2	1, 2	1, 2, 4	<b>1</b> , <b>2</b> , 4	1	1	1	1
Eutrophication, terrestrial			1	1						1	1	1	1
Eutrophication, freshwater													
Eutrophication, marine	1, 2		1	1		1, 2		1, 2		1	1	1	1
Ecotoxicity, freshwater			1	1			1, 2			1	1	1	1
Land use			1										
Water use	1, 2	1	1	1	1	1	1, 2	1	<mark>2, 4</mark>	1			
Resource use, minerals and metals	1, 2	1, 2			1, 2	1, 2	1, 2	1, 2, 4	1, 2		1	1	1
Resource use, fossils	1, 2	1, 2		1, 2	1, 2	1, 2	1, 2	1, 2, 4	1, 2		1, 2	1, 2	1, 2

1534 Note: RP1. T-shirts, RP2. Shirts and blouses, RP3. Sweaters and midlayers, RP4. Jackets and coats, RP5. Pants and shorts, RP6. Dresses, skirts and

1535 jumpsuits, RP7. Leggings, stockings, tights and socks, RP8. Underwear, RP9. Swimwear, RP10. Apparel accessories, RP11. Open-toed shoes, RP12. Closed-

1536 toed shoes, RP13. Boots.

1537 1. Raw materials extraction and pre-processing, 2. Manufacturing, 3. Distribution, 4. Use, 5. End of life.

### 1538 4.3 Most relevant processes

### 1539 The most impacting processes for the product category in scope of this PEFCR are indicated by a cross in Table 14, as calculated in

the PEF-RP study v3.0:

#### 1541

Table 14 - Most impacting processes per product sub-category

Process per life cycle stage (LCS)	RP1	RP2	RP3	RP4	RP5	RP6	RP7	RP8	RP9	RP10	RP11	RP12	RP13
LCS1: Raw material acquisition and pre-processing													
Cashmere fiber {GLO}   raw   production mix   LCI result			х	Х									
Cotton fibre {GLO}   technology mix   production mix, at farm   "as is" delinted product   LCI result	х	Х	х	Х	х	Х	Х	Х		х			
Leather, cattle, chrome tanned (wet-blue) {GLO}   technology mix   production mix, at tannery   m2   LCI result											Х	Х	х
Leather, veal/calf, chrome tanned (wet-blue) {GLO}   technology mix   production mix, at tannery   m2   LCI result											Х	Х	Х
Leather, ovine (sheep), chrome tanned (wet- blue) {GLO}   technology mix   production mix, at tannery   m2   LCI result					х					Х	Х		х
Leather, caprine (goat), chrome tanned (wet- blue) {GLO}   technology mix   production mix, at tannery   m2   LCI result					х					Х	Х	Х	Х
Leather, swine, chrome tanned (wet-blue) {GLO}   technology mix   production mix, at tannery   m2   LCI result										Х			
Nylon 6, fossil fuel-based {GLO}   hydrolytic polymerisation of caprolactam   production mix, at plant   petrochemical based   LCI result				Х	Х		Х	Х	Х				

Process per life cycle stage (LCS)	RP1	RP2	RP3	RP4	RP5	RP6	RP7	RP8	RP9	RP10	<b>RP11</b>	RP12	RP13
PET granulates, bottle grade {EU+EFTA+UK}   via purified terephthalic acid (PTA) and ethylene glycol   production mix, at plant   192.17 g/mol per repeating unit   LCI result	х	Х		х	Х	Х	Х	Х	Х		Х	х	Х
Silk {GLO}   drying, immersion, brushing, reeling   production mix, at plant   1 kg   LCI result										Х			
Wool {GLO}   sheep   production mix, at farm   1 kg wool   LCI result			Х	Х		Х	Х			Х		Х	
Dressed mink fur, farmed, global origin except china {GLO}   technology mix   production mix, at plant   1kg   LCI result				х									-
Acrylic fiber {GLO}   polymerisation of acrylonitrile with the ethyl acetate, spinning, post-spinning treatment   production mix, at plant   petrochemical based   LCI result				х						Х			
Styrene-butadiene rubber (SBR) fiber {EU+EFTA+UK}   Emulsion polymerization of styrene and butadiene   production mix, at plant   23.5 % styrene   LCI result											Х	х	X
Ethylene vinyl acetate copolymer {GLO}   Technology mix   Production mix, at plant   LCI result											Х		
Thermoplastic polyurethane (TPU) {GLO}   reaction of diisocyanates (hard segment) with diols (soft segment)   production mix, at plant   petrochemical based   LCI result													X
Viscose fibre {GLO}   virgin production from hardwood sulphite pulp   production mix, at plant   1kg of product   LCI result				х			х						
Elastane fibre / spandex {GLO}   dry spinning, extrusion, texturising   production mix, at plant   1kg of product   LCI result							Х				Х	х	Х
Latex production {GLO}   technology mix   production mix, at plant   100% active substance   LCI result											Х		1
Zipper tape and puller, metal {GLO}   production, at plant   1kg of product, brass zipper   LCI result					Х								Х
Stainless steel hot rolled {RoW}   hot rolling   production mix, at plant   stainless steel   LCI result													X
Shoe eyelet, metal {GLO}   production, at plant   1kg of product, brass based   LCI result											Х	х	X

Process per life cycle stage (LCS)	RP1	RP2	RP3	RP4	RP5	RP6	RP7	RP8	RP9	RP10	RP11	RP12	RP13
Plastic bag, LDPE {EU+EFTA+UK}   raw material production, plastic extrusion   production mix, at plant   thickness: 0.03 mm, grammage: 0.0275 kg/m2   LCI result	х						х	х					
Transoceanic ship, containers {GLO}   heavy fuel oil driven, cargo   consumption mix, to consumer   27.500 dwt payload capacity, ocean going   LCI result		х			Х								
LCS2: Manufacturing													
Spinning, for knit, ring-spun {GLO}   spinning process   production mix   service of spinning 1kg of yarn (raw material excluded)   LCI result	Х	Х	Х		Х	Х	Х	Х					
Spinning, for woven, ring-spun {GLO}   spinning process   production mix   service of spinning 1kg of yarn (raw material excluded)   LCI result		Х		Х	Х	Х		Х					
Spinning, continuous filament (dry) {GLO}   spinning process   production mix   service of spinning 1kg of yarn (raw material excluded)   LCI result				Х	Х		Х		Х			Х	
Knitting, circular {GLO}   knitting process   production, at plant   service of knitting fabric   LCI result	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х			
Knitting, flat {GLO}   knitting process   production, at plant   service of knitting fabric   LCI result			Х										
Weaving (different fabric counts) {GLO}   service, Fabric, Weaved, Mix of different counts   production mix, at plant   service, Fabric, Weaved, Mix of different counts   LCI result		Х		Х	Х	Х		Х	Х	Х		Х	Х
Pre-dye preparation (scouring, etc), knit textile, natural fibers {GLO}   Pre-treatment   production mix, at plant   textile service   LCI result		Х			Х	Х	Х	Х	Х				
Dyeing, batch (incl. piece, jet, jig, kier, yarn), acid dyes {GLO}   Dyeing   production mix, at plant   textile service for 1 kg of fabric   LCI result				Х	Х		х	Х	Х	Х		Х	
Dyeing, batch (incl. piece, jet, jig, kier [fiber], paddle, pad-batch, yarn), direct, sulfur, vat or reactive dyes {GLO}   Dyeing   production mix, at plant   textile service for 1 kg of fabric   LCI result	Х	Х			Х	Х	Х	Х					
Dyeing, batch (incl. piece, jet, jig, kier, yarn), disperse or cationic dyes {GLO}   Dyeing   production mix, at plant   textile service for 1 kg of fabric   LCI result		Х		Х	Х	Х	Х					Х	

Process per life cycle stage (LCS)	RP1	RP2	RP3	RP4	RP5	RP6	RP7	RP8	RP9	RP10	<b>RP11</b>	RP12	RP13
Finishing, stain resistant/stain release {GLO}   pad dry-cure method   production mix, at plant   service   LCI result	х	Х		х	Х	Х	Х	Х	Х	Х		Х	Х
Injection molding, for foam {GLO}   injection process   production mix, at plant   item(s) = pair   LCI result											Х	Х	Х
Lamination, water based glue {GLO}   lamination process   average service, at plant   1 kg of water based glue laminated fabric   LCI result											Х	Х	Х
Coating, water based emulsion {GLO}   Finishing   technology mix   textile service for 1 kg of fabric   LCI result											Х	Х	Х
Cementing/gluing {GLO}   cementing process   production mix, at plant   service of glueing 1 pair of shoes   LCI result											Х	Х	
Vulcanizing {GLO}   vulcanizing, press vulcanisation- injection molding   production mix, at plant   service for 1 pair   LCI result												Х	
Transoceanic ship, containers {GLO}   heavy fuel oil driven, cargo   consumption mix, to consumer   27.500 dwt payload capacity, ocean going   LCI result					Х								
LCS3: Distribution													
Cargo plane {GLO}   technology mix, kerosene driven, cargo   consumption mix, to consumer   65 t payload   LCI result	х	Х		х	Х	Х	Х	Х	Х	Х	Х	Х	Х
Transoceanic ship, containers {GLO}   heavy fuel oil driven, cargo   consumption mix, to consumer   27.500 dwt payload capacity, ocean going   LCI result	х	Х			Х			Х	Х				
Electricity grid mix 1kV-60kV {EU+EFTA+UK}   technology mix   consumption mix, to consumer   1kV - 60kV   LCI result		х				х						Х	
Thermal energy from natural gas {EU+EFTA+UK}   technology mix regarding firing and flue gas cleaning   production mix, at heat plant   MJ, 100% efficiency   LCI result		Х				Х						Х	Х
LCS4: Use stage													
Handwashing {EU+EFTA+UK}   handwashing process   production mix, at plant   service   LCI result								х	X				

Process per life cycle stage (LCS)	RP1	RP2	RP3	RP4	RP5	RP6	RP7	RP8	RP9	RP10	RP11	RP12	RP13
Washing, 40 degrees C, average {EU+EFTA+UK}   washing, warm water   production mix, at plant   service   LCI result	Х	х			Х	x	Х						
Washing, 60 degrees C, average {EU+EFTA+UK}   washing, warm water   production mix, at plant   service   LCI result								Х					
Washing, dry cleaning {EU+EFTA+UK}   washing process   production mix, at plant   service   LCI result					Х	х							
Tumble drying {EU+EFTA+UK}   drying, condenser tumble dryer   production mix, at plant   service   LCI result	Х				Х	X	Х	Х					

1542 Note: RP1. T-shirts, RP2. Shirts and blouses, RP3. Sweaters and midlayers, RP4. Jackets and coats, RP5. Pants and shorts, RP6. Dresses, skirts and

1543 jumpsuits, RP7. Leggings, stockings, tights and socks, RP8. Underwear, RP9. Swimwear, RP10. Apparel accessories, RP11. Open-toed shoes, RP12. Closed-

toed shoes, RP13. Boots.

## 1546 4.4 Most relevant elementary flows

Note	Due to the inaccessibility of disaggregated datasets in the EF 3.1
	database, the most relevant direct elementary flows could not be
	identified at this stage.

### 1550 5 Life cycle inventory

This chapter defines which data need to be collected to conduct a PEF study according to this PEFCR. All newly created datasets shall be EF compliant. Sections 5.1.2 to 5.1.6 indicate the specific data collection requirements and accompanying documents needed for the "mandatory" and "mandatory, if available" data.

- 1555 There are 3 types of information in related to the specific data:
- **Document information:** Refer to the document containing the data to be collected.
- **Calculation:** Refer to the calculation required to obtain the data.
- **Collection period:** Refer to the time period for the collection of primary data.
- 1559 Where data is required, it must always be representative of the production and up to date.
- 1560 For all other processes the Data Needs Matrix is applicable, as explained in Section 5.4.

### 1561 5.1 List of mandatory company-specific data

1562 The following company-specific data shall be collected by companies using this PEFCR,

with a data quality rating (DQR) ≤1.5, as calculated using Equation 20 and Table 16. They
are summarised in Table 15 but detailed in the next sub-sections.

- 1565 Some data is flagged as "mandatory, if available". 'If available' shall be interpreted as 1566 obtained by the user of the PEFCR by asking the relevant direct or indirect business partner.
- 1567

Table 15 - Summary of mandatory and "mandatory if available" company-specific data

Life cycle stage	Mandatory / mandatory if available company-specific data
LCS1 Raw materials	<ul> <li>At least 95% of the product's Bill Of Materials (BOM) by weight, covering 100% of the main fabrics, lining, padding, and electronic parts and metals</li> </ul>
acquisition and pre-processing	If the BOM isn't available, product weight and reference size
	Raw materials mass transported
	<ul> <li>If available, raw materials transport distances, modes, share of raw material mass transported for each transport leg, and utilisation rates for trucks</li> </ul>
LCS2	If the BOM isn't available, assembly loss rate for the product studied
Manufacturing	If available, manufacturing technologies
	If available, other processing loss rates
	<ul> <li>If available, energy mix of the manufacturing steps for the product studied – exempted for SMEs</li> </ul>
	<ul> <li>If available, intermediate product transport distances, modes, share of semi- finished product mass transported for each origin and utilisation rates for trucks</li> </ul>
LCS3	Air cargo distances at company level
Distribution	• Air cargo share of product mass transported for each origin at company level

Life cycle stage	Mandatory / mandatory if available company-specific data
	Product weight (if not collected in LCS1)
	<ul> <li>If available, product transport distances, modes, share of product mass transported for each origin and utilisation rates for trucks</li> </ul>
LCS4 Use	Apparel: Product type, if delicate product or sportswear
LCS5 End of life	• N/A
General	<ul> <li>Share (% product) of unsold consumer products at product sub-category or product category (apparel and footwear) level</li> </ul>
	<ul> <li>Highly recommended but not mandatory – intrinsic durability tests and repairability information (product selling price in the EU, and repair documentation)</li> </ul>

#### 1568

1569 The EF database provides a large number of relevant datasets. Based on the mandatory, 1570 primary data such as the amount of polyester fabric, users of the PEFCR will have to select 1571 the most relevant dataset from the EF database for the assessment of LCS1 and LCS2, 1572 such as e.g. polyester pellets, but as well the datasets related to the transformation to fabric 1573 from spinning to knitting and dyeing for example. Primary data for energy and transport can 1574 be used to individualize the supply chain if desired. Companies can also decide to create 1575 new EF-compliant datasets fully based on primary data if they wish, aside for LCS4 where 1576 the use of secondary data is mandatory. More information on how to create EF compliant 1577 datasets can be found here:

1578 <u>https://eplca.jrc.ec.europa.eu/permalink/Guide\_EF\_DATA.pdf</u>

1579

### 5.1.1 General data collection requirements

1580 Overall, sampling is not allowed in the context of this PEFCR.

1581 The following data requirements are not linked to a specific life cycle stage and therefore 1582 mentioned here. All other data collection requirements are specified in the corresponding life 1583 cycle stage sections.

- 1584
- Share (% product) of unsold consumer products at product sub-category or product
   category (apparel and footwear) level

1587 **Collection period:** The average unsold consumer products rate of the last three 1588 administration periods for the product sub-category shall be used, or if not available, at 1589 product category level (apparel and footwear). More information on unsold consumer 1590 products is available in Section 6.1.1.

- Highly recommended but not mandatory intrinsic durability tests and repairability
   information (product selling price in the EU, and repair documentation)
- 1593 Information on the primary data collection for intrinsic durability and repairability are1594 defined:
- 1595 For intrinsic durability: in Section 3.3.3 and ANNEX V Detailed requirements
- 1596 regarding intrinsic durability.
- 1597 For repairability: in Section 3.3.4 Repair/refurbish

#### 1598 **5.1.2 Life cycle stage 1 – Raw materials (except packaging)**

1599 5.1.2.1 Bill of Materials

Primary data shall be provided for at least 95% of the Bill Of Materials (BOM) by weight, covering 100% of the main fabrics, lining, padding, and electronic parts (e.g. lights and batteries in shoes or RFID in outdoor jackets) and metals. The remaining % of the BOM shall be calculated to mirror the garment composition, excluding metals and electronic parts.

The BOM shall include more detailed information such as yarn type (size and construction method), textile formation (average yarn size and textile type - knit/woven/nonwoven), and finishing techniques (chemical finishes such as water repellency, stain release, etc. as well as mechanical or heat treatments such as calendaring, brushing, shearing, etc.) to select the most relevant dataset from the most recent version of the EF database in the modelling of the life cycle stage 2 (Section 6.2).

1610 To illustrate the approach for a t-shirt with a net weight of 85g and a total BOM of 100g 1611 covered at 98% (e.g., 80g cotton, 15g polyester and 3g steel) including the main fabrics, 1612 lining, padding, electronic parts and metals, the 2% missing, 2g, shall be modelled as 1.7g 1613 cotton and 0.3g polyester. If detailed data are available, regionalized data per country shall 1614 be used. In the case of an origin from multiple sources, a product weighted average of the 1615 different sources shall be used to properly represent the variability, if possible, a company 1616 weighted average otherwise. If the product has been made for more than a year, the sourcing 1617 data for this material for this specific product shall be used. If the product has been made for 1618 less than a year, the sourcing data for the purchase order for this material for this specific 1619 product shall be used.

1620 Should the BOM not be available, the product weight and reference size shall be collected 1621 to retro-calculate it (see Section 3.3.1 for details). 1622 There are four possible scenarios for raw material transport:

- i) In case the exact location of the supplier is known as well as the transport mode (e.g.
   the specific type of truck, ship and train or plane), the share of product mass
   transported and utilisation ratio, the user of the PEFCR shall use the specific data
   available.
- 1627 <u>The mandatory data</u> are thus the mass transported as defined in Section 6.1.2, the 1628 precise transport mode (e.g., truck load, EUROx European emissions standards), 1629 the distance per transport mode, the share of product mass transported and the 1630 utilisation ratio for truck transport. PEF studies shall specify the utilisation ratio to be 1631 used for each truck transport modelled and clearly indicate whether the utilisation 1632 ratio includes empty return trips (PEF method).
- 1633 ii) In case the exact location of the supplier is known as well as the transport mode, but
  1634 the specific type of truck, ship, train or plane and the share of product mass
  1635 transported are not known, the user of the PEFCR shall use the specific data available
  1636 and the default values (including utilisation ratio) for the transport modes given in
  1637 Table 32.
- 1638 <u>The mandatory data</u> are thus the mass transported as defined in Section 6.1.2, the 1639 transport mode, but not specific (e.g., truck load, EUROx European emissions 1640 standards), and the distance per transport mode.
- 1641 iii) In case the only specific information available is whether or not the supplier is located
  1642 in the same continent as the processing plant or the location of the supplier but not
  1643 the transport mode, the user of the PEFCR shall use the default values provided in
  1644 Table 32 related to the specific supply chain location, transport modes and shares of
  1645 product mass transported.
- 1646 <u>The mandatory data</u> are thus the mass transported as defined in Section 6.1.2, and 1647 the approximate location (same continent or not) of the processing plant.

iv) In case no information on the supply chain location is available, the transport shall be
 modelled as if the supplier is located outside the continent of the processing plant.
 This shall be done using the default values in Table 32.

- 1651 <u>The mandatory data</u> are thus the mass transported as defined in Section 6.1.2.
- 1652 5.1.2.2 Data collection requirement for LCS1
- At least 95% of the product's Bill of Materials (BOM) by weight, covering 100% of the
   main fabrics, lining, padding, and electronic parts and metals.

- 1655 Document information: BOM of the finished product including material. The BOM shall1656 be representative of the production.
- 1657

1658

• If the BOM isn't available, product weight and reference size

1659 Document information: Weight of the finished product indicated in the product1660 specification by reference size.

1661 Calculation: If the product specification is not available, it is necessary to weigh at least1662 3 products and calculate the average weight.

1663

• Raw materials mass transported

1665 Calculation: In order to identify the total mass of raw material transported, it is necessary
1666 to calculate the amount of raw materials needed to create one product. This amount shall
1667 take into account all the losses that occur throughout the product's life cycle (pre1668 processing losses, manufacturing leftovers, manufacturing losses (including assembly
1669 losses), unsold consumer products and distribution losses).

- If available, raw materials transport distances, modes, provenance (share of total transport), and utilisation rates for trucks
- 1672 **Collection period:** Annual administrative period as a basis for the data collection

### 1673 5.1.3 Life cycle stage 2 - Manufacturing

- 1674 5.1.3.1 Manufacturing data
- 1675 If the BOM is not available, primary data shall be provided for the assembly loss rate for the1676 product studied.
- 1677 The specific manufacturing technologies shall be used to select the most relevant dataset if

1678 available, otherwise default manufacturing datasets can be found in ANNEX VII – Inventory

1679 modelling and default datasets ("Default datasets & DQR" tab). Guidance for the selection

- 1680 of the best dataset can be found in Section 3.8.2.3.
- 1681 If the specific loss rates of the manufacturing steps are available, they shall be used to adapt1682 the most relevant dataset from the most recent version of the EF database.

1683 The specific location of the manufacturing steps shall be determined to select and/or adapt 1684 the country energy mix of the datasets as a minimum, and the specific energy type if data 1685 are available, unless the user of the PEFCR is an SME without access to specific data, see 1686 Section 6.2 for more information. 1687 In case of multiple suppliers, for both the specific energy mix and loss rates, a product 1688 weighted average of the data shall be made first or, if not possible, a company weighted 1689 average. No specific time-period to determine the weighted average is required. The user of 1690 the PEFCR just shall ensure that the DQR of the information is  $\leq$ 1.5.

#### 1691 5.1.3.2 Transport data

1692 There are four possible scenarios for semi-finished and intermediate products transport:

- i) In case the exact location of the supplier is known as well as the transport mode (e.g.
   the specific type of truck, ship and train or plane), the share of product mass
   transported and utilisation ratio, the user of the PEFCR shall use the specific data
   available.
- 1697 <u>The mandatory data</u> are thus the mass transported of the semi-finished & 1698 intermediate products at the entry gate of the assembly step as defined in Section 1699 6.2.1, the precise transport mode (e.g., truck load, EUROx European emissions 1700 standards), the distance per transport mode, the share of product mass transported 1701 and the utilisation ratio for truck transport. PEF studies shall specify the utilisation 1702 ratio to be used for each truck transport modelled and clearly indicate whether the 1703 utilisation ratio includes empty return trips (PEF method).
- ii) In case the exact location of the supplier is known as well as the transport mode, but
  the specific type of truck, ship, train or plane and the share of product mass
  transported are not known, the user of the PEFCR shall use the specific data available
  and the default values (including utilisation ratio) for the transport modes given in
  Table 32.
- 1709 <u>The mandatory data</u> are thus the mass transported of the semi-finished & 1710 intermediate products at the entry gate of the assembly step as defined in Section 1711 6.2.1, the transport mode, but not specific (e.g., truck load, EUROx European 1712 emissions standards), and the distance per transport mode.
- 1713 iii) In case the only specific information available is whether or not the supplier is located
  1714 in the same continent as the processing plant, the user of the PEFCR shall use the
  1715 default values provided in Table 32 related to the specific supply chain location,
  1716 transport modes and share of product mass transported.
- 1717 <u>The mandatory data</u> are thus the mass transported of the semi-finished & 1718 intermediate products at the entry gate of the assembly step as defined in Section 1719 6.2.1, and the approximate location (same continent or not) of the processing plant.

- iv) In case no information on the supply chain location is available, the transport shall be
  modelled as if the supplier is located outside the continent of the processing plant.
  This shall be done using the default values in Table 32.
- 1723 <u>The mandatory data</u> are thus the mass transported of the semi-finished & 1724 intermediate products at the entry gate of the assembly step as defined in Section 1725 6.2.1.
- 1726 5.1.3.3 Data collection requirements for LCS2
- If the BOM isn't available, assembly loss rate for the product studied

Assembly loss rate definition: The assembly loss rate is the total finished material losses in making and assembling a product. This is typically comprised of cutting losses (determined by the marker efficiency) as well as other manufacturing losses due to material defects (e.g. pattern pieces that cannot be used and must be re-cut) and uncorrectable production errors (e.g. sewing errors, embellishment errors, stained pattern pieces)

- 1734 **Marker efficiency definition:** The marker efficiency, also known as the pattern 1735 efficiency, is the area of useful pattern pieces for a product that can be cut from a known 1736 area of fabric. Typically, this is calculated in pattern making software.
- Document information: Product specific marker efficiency for each finished material
  used in the product. If both production site and a brand's internal marker efficiencies are
  available, the production site marker efficiency shall be used.
- 1740 Note: If the internal marker efficiency is used to generate a procurement amount for a
- fabric, the total fabric amount should follow the calculation structure for having a Bill of
  Materials (since the amount of ordered fabric is known).

1743 **Calculation:** In order to calculate the assembly loss rate, a mass weighted average of 1744 the marker efficiency for each finished material of the product must be considered. To 1745 this average, an additional 10% loss shall be added to account for production losses.

- 1746
- 1747 If available, manufacturing technologies
- 1748 Note: Supporting documents needed to prove the manufacturing technologies
  1749 (traceability, technology pack (tech pack), audit) will be defined at a later stage if needed.
- 1750
- 1751 If available, other processing loss rates

1752 Calculation: It is necessary to calculate the amount of input material for that process1753 and the amount of output intermediate product to calculate the loss rate.

- Example: The input to a dyeing process would be the amount of greige fabric ordered
  for the appropriate annual administrative period. The output for this dyeing process would
  be the amount of dyed fabric that meets customer requirements and is shipped. If
  10,000,000 kilograms of greige fabric is used and only 9,000,000 kilograms of dyed fabric
  is shipped, the loss rate would be (10,000,000 9,000,000) / 10,000,000 x 100% = 10%
  Collection period: Annual administrative period as a basis for the data collection of the
  processing loss rates.
- 1761
- If available, energy mix of the manufacturing steps for the product studied SMEs
   are exempt

1764 Calculation and document information: Provide the energy mix and applicable
1765 certificate depending on the PEF method's electricity modeling requirements (see section
1766 5.8 on electricity modeling).

- 1767 Collection period: Annual administrative period as a basis for the data collection of1768 energy mix.
- 1769
- If available, intermediate product transport distances, modes, share of product mass
   transported and utilisation rates for trucks

1772 Collection period: Annual administrative period as a basis for the data collection
1773 Note: Supporting documents needed to prove the transport parameters will be defined
1774 at a later stage if needed.

- 1775
- 1776

### 5.1.4 Life cycle stage 3 - Distribution

1777 5.1.4.1 Transport scenarios

Primary data at company level shall be used for air cargo distances and share of product
mass transported (more details provided in Section 6.3.1). The final product weight shall also
be provided.

1781 There are four possible scenarios for each transport leg:

i) In case the transport distances are known as well as the transport mode (e.g. the
specific type of truck, ship and train or plane), the share of product mass transported
for each origin and utilisation ratio, the user of the PEFCR shall use the specific data
available.

- 1786The mandatory data are thus the final product weight, the precise transport mode1787(e.g., truck load, EUROx European emissions standards), the distance per transport1788mode, the share of product mass transported for each origin and the utilisation ratio1789for truck transport. PEF studies shall specify the utilisation ratio to be used for each1790truck transport modelled and clearly indicate whether the utilisation ratio includes1791empty return trips (PEF method).
- ii) In case the distances are known as well as the transport mode, but the specific type
  of truck, ship, train or plane and the share of product mass transported for each origin
  are not known, the user of the PEFCR shall use the specific data available and the
  default values (including utilisation ratio) for the transport modes given in Table 37.
- 1796The mandatory data are thus the final product weight, the transport mode, but not1797specific (e.g., truck load, EUROx European emissions standards), and the distance1798per transport mode.
- iii) In case the shares of product mass transported for each origin are known as well as
  the transport mode, but the specific type of truck, ship, train or plane and the distances
  are not known, the user of the PEFCR shall use the default values provided in Table
  37 related to the distances, transport modes and share of product mass transported
  for each origin.
- 1804The mandatory data are thus final product and the shares of product mass transported1805for each origin.
- iv) In case no information on the shares of product mass transported for each origin or
  the distances are known, the transport shall be modelled using the default values in
  Table 37.
- 1809 <u>The mandatory data</u> are thus the final product weight.

1810 The specific utilisation ratio<sup>21</sup> for truck transport shall be used when available, or, if not 1811 possible, the default value of 64% from the EF dataset for Truck (>32t, EURO 4) shall be 1812 used.

- 1813 5.1.4.2 Data collection requirements for LCS3
- **Note:** Supporting documents needed to prove the transport parameters will be defined at a
- 1815 later stage if needed.
- 1816 Air cargo distances at company level

<sup>&</sup>lt;sup>21</sup> Real load transported divided by the mass of the payload considering empty returns (ratio of the distance travelled to collect the next load after unloading the product to the distance travelled to transport the product).

1817 1818 1819	<b>Collection period:</b> Annual administrative period as a basis for the data collection of air cargo distances.
1820	Air cargo share of product mass transported for each origin at company level
1821	Collection period: Annual administrative period as a basis for the data collection of air
1822	cargo distances.
1823	Product weight (if not collected in LCS1)
1824	Document information: Weight of the finished product indicated in the product
1825	specification by reference size.
1826	Calculation: If the product specification is not available. It is necessary to weigh at
1827	least 3 products and calculate the average weight.
1828	
1829	If available, product transport distances, modes, share of product mass transported
1830	for each origin and utilisation rates for trucks
1831	Collection period: Annual administrative period as a basis for the data collection
1832	
1833	5.1.5 Life cycle stage 4 - Use stage
1834	The categorisation of the product as sportwear, or delicate is a mandatory specific data in
1835	order to identify the relevant modelling scenarios for the use phase (Table 40).
1836	
1837	5.1.5.1 Data collection requirements for LCS4
1838	Document information: If delicate product: refer to the care label.
1839	Definitions reminder:
1840	*Delicate garments are defined as items requiring dry cleaning only based on their
1841	care label
1842	*Sportswear is defined as garments primarily worn for sports activities, both indoor
1843	and outdoor (*Laitala, 2018b)
1844	

#### 1845 **5.1.6 Other primary information**

Primary data shall be provided for the share (% product) of unsold consumer products for the average of the last three annual administration periods. Primary data by product subcategory shall be used if available, if not at product category level (Apparel & Footwear). Assessing the intrinsic product quality (see Section 3.3.3) or repairability (see Section 3.3.4) is highly recommended, but not mandatory. Should the LCA practitioner decide to include an intrinsic durability or a repairability multiplier, then primary data shall be used.

See ANNEX VII – Inventory modelling and default datasets ("Data requirements" tab) for
the list of all company-specific data to be collected.

### 1854 5.2 List of processes expected to be run by the company

Apparel and footwear brands don't typically conduct their own manufacturing, instead relying on relationships with specialised manufacturing facilities. Similarly, distribution does not necessarily include company owned facilities, with third party distribution centres and thirdparty retailers being common.

While this means that there are no processes that are directly run by the company, the list of mandatory company-specific data from Section 5.1 is information considered to be widely available to apparel and footwear companies.

### 1862 5.3 Data quality requirements

1863 The data quality of each dataset and the total PEF study shall be calculated and reported.1864 The calculation of the DQR shall be based on the following formula with four criteria:

$$DQR = \frac{TeR + GeR + TiR + P}{4}$$

1866

Equation 19

Where TeR is technological representativeness, GeR is geographical representativeness,
TiR is time representativeness, and P is precision. The representativeness (technological,
geographical and time-related) characterises to what degree the processes and products

1870 selected are depicting the system analysed, while the precision indicates the way the data1871 are derived and related level of uncertainty.

1872 The next chapters provide tables with the criteria to be used for the semi-quantitative1873 assessment of each criterion.

### 1874 **5.3.1 Company-specific datasets**

1875 The scope of primary data collected should follow the scope of the corresponding dataset in 1876 the EF database: e.g., if the climatisation of the factory is not included in the spinning 1877 dataset, it is not necessary to include it in the primary data.

1878 The DQR shall be calculated at the level-1 disaggregation, before any aggregation of sub-1879 processes or elementary flows is performed. The DQR of company-specific datasets shall 1880 be calculated as following:

- Select the most relevant activity data and direct elementary flows: most relevant activity data are the ones linked to sub-processes (i.e. secondary datasets) that account for at least 80% of the total environmental impact of the company-specific dataset, listing them from the most contributing to the least contributing one. Most relevant direct elementary flows are defined as those direct elementary flows contributing cumulatively at least with 80% to the total impact of the direct elementary flows.
- Calculate the DQR criteria TeR, TiR, GeR and P for each most relevant activity data
   and each most relevant direct elementary flow. The values of each criterion shall be
   assigned based on Table 16.
- 1891a. Each most relevant direct elementary flow consists of the amount and<br/>elementary flow naming (e.g. 40 g carbon dioxide). For each most relevant<br/>elementary flow, the user of the PEFCR shall evaluate the 4 DQR criteria<br/>named TeR-EF, TiR-EF, GeR-EF, PEF. For example, the user of the PEFCR shall<br/>evaluate the timing of the flow measured, for which technology the flow was<br/>measured and in which geographical area.
- 1897b. For each most relevant activity data, the 4 DQR criteria shall be evaluated1898(named TeR-AD, TiR-AD, GeR-AD, PAD) by the user of the PEFCR.
- 1899c. Considering that the data for the mandatory processes shall be company-1900specific, the score of P cannot be higher than 3, while the score for TiR, TeR,1901and GeR cannot be higher than 2 (The DQR score shall be  $\leq 1.5$ ).

- 1902 3. Calculate the environmental contribution of each most relevant activity data (through 1903 linking to the appropriate sub-process) and direct elementary flow to the total sum of 1904 the environmental impact of all most-relevant activity data and direct elementary 1905 flows, in % (weighted, using all EF impact categories). For example, the newly 1906 developed dataset has only two most relevant activity data, contributing in total to 1907 80% of the total environmental impact of the dataset:
- 1908 Activity data 1 carries 30% of the total dataset environmental impact. The 1909 contribution of this process to the total of 80% is 37.5% (the latter is the weight 1910 to be used).
- Activity data 2 carries 50% of the total dataset environmental impact. The 1911 1912 contribution of this process to the total of 80% is 62.5% (the latter is the weight 1913 to be used).

#### 4. Calculate the TeR, TiR, GeR and P criteria of the newly developed dataset as the 1914 weighted average of each criteria of the most relevant activity data and direct 1915 1916 elementary flows. The weight is the relative contribution (in %) of each most relevant 1917 activity data and direct elementary flow calculated in step 3.

- 1918 The user of the PEFCR shall calculate the total DQR of the newly developed dataset 1919 using Equation 20, where, TiR, TeR, GeR, P are the weighted average calculated as specified in point (4). 1920
- 1921

$$DQR = \frac{\underline{TiR} + \underline{TeR} + \underline{GeR} + \underline{P}}{4}$$

- 1922
- 1923

Equation 20

- Ratin PEF and PAD TiR-EF and TiR-AD TeR-EF and TeR-AD GeR-EF and GeR-AD g The data refers to The activity data and the most recent The elementary elementary flows flows and the annual Measured/calculate reflects the exact activity data exactly administration 1 d and externally geography where the period with the technology of verified process modelled in respect to the EF the newly the newly created report publication developed dataset dataset takes place date The data refers to The elementary The activity data and Measured/calculate maximum 2 flows and the elementary flows) 2 d and internally activity data are a partly reflects the annual verified, plausibility geography where the administration proxy of the
- Table 16 DQR assessment criteria for datasets with company-specific information\*
| Ratin<br>g | $\mathbf{P}_{EF}$ and $\mathbf{P}_{AD}$                                                                                                                                          | TiR-EF and TiR-AD                                                                                                                  | TeR- <sub>EF</sub> and TeR-AD                   | GeR- <sub>EF</sub> and GeR-AD                                   |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------|
|            | checked by<br>reviewer                                                                                                                                                           | periods with<br>respect to the EF<br>report publication<br>date                                                                    | technology of the<br>newly developed<br>dataset | process modelled in<br>the newly created<br>dataset takes place |
| 3          | Measured/calculate<br>d/literature and<br>plausibility not<br>checked by<br>reviewer OR<br>Qualified estimate<br>based on<br>calculations<br>plausibility checked<br>by reviewer | The data refers to<br>maximum three<br>annual<br>administration<br>periods with<br>respect to the EF<br>report publication<br>date | Not applicable                                  | Not applicable                                                  |
| 4-5        | Not applicable                                                                                                                                                                   | Not applicable                                                                                                                     | Not applicable                                  | Not applicable                                                  |

P<sub>EF</sub>: Precision for elementary flows; P<sub>AD</sub>: Precision for activity data; TiR<sub>-EF</sub>: Time Representativeness for
 elementary flows; TiR<sub>-AD</sub>: Time representativeness for activity data; TeR<sub>-EF</sub>: Technology representativeness for
 elementary flows; TeR<sub>-AD</sub>: Technology representativeness for activity data; GeR<sub>-EF</sub>: Geographical
 representativeness for elementary flows; GeR<sub>-AD</sub>: Geographical representativeness for activity data.

# 1928 5.3.2 DQR of the PEF study

Information on how to calculate the DQR of a PEF study is found in Section 5.6. In case a
secondary dataset is identified as a most relevant process in the PEF study, its DQR shall
be recalculated according to Section 4.6.5.3 of the PEF method.

# 1932 5.4 Data needs matrix

All processes required to model the product and outside the list of mandatory companyspecific data (listed in Section 5.1) shall be evaluated using the Data Needs Matrix (see Table 17). The user of the PEFCR shall apply the DNM to evaluate which data are needed and shall be used within the modelling of its PEF, depending on the level of influence the user of the PEFCR (company) has on the specific process. The following three cases are found in the DNM and are explained below:

- 1939 1. **Situation 1**: the process is run by the company applying the PEFCR;
- 19402. Situation 2: the process is not run by the company applying the PEFCR but the1941 company has access to (company-)specific information;

- 1942 3. Situation 3: the process is not run by the company applying the PEFCR and this
  1943 company does not have access to (company-)specific information.

Figure 7 - Illustrates how to use the DNM



### 1948

Table	17 -	Data	Needs	Matrix	(DNM)
rabic	11	Data	INCCUS	matrix	

		Most relevant process	Other process				
1: process e company e PEFCR	Option 1	Provide company-specific data (as requested in the PEFCR) and create a company-specific dataset, in aggregated form (DQR≤1.5) <sup>22</sup> Calculate the DQR values (for each criterion + total)					
Situation 1 run by the using the	Option 2		Use default secondary dataset in PEFCR, in aggregated form (DQR≤3.0) Use the default DQR values				
Situation 2: process not run by the company using the PEFCR but with access to company-specific information	Option 1	Provide company-specific data (as requested dataset, in aggregated form (DQR≤1.5) Calculate the DQR values (for each criterion	ed in the PEFCR) and create a company-specific n + total)				
	Option 2	Use company-specific activity data for transport (distance), and substitute the sub-processes used for electricity mix and transport with supply-chain specific EF compliant datasets (DQR≤3.0)* Re-evaluate the DQR criteria within the product specific context					
	Option 3		Use company-specific activity data for transport (distance), and substitute the sub-processes used for electricity mix and transport with supply-chain specific EF compliant datasets (DQR≤4.0)* Use the default DQR values.				
ess not run by the the PEFCR and company- specific nation	Option 1	Use default secondary data set in aggregated form (DQR≤3.0) Re-evaluate the DQR criteria within the product specific context					
Situation 3: proce company using without access to inforn	Option 2		Use default secondary data set in aggregated form (DQR≤4.0) Use the default DQR values				

- 1949 \*Disaggregated datasets shall be used.
- 1950 The options described in the DNM are not listed in order of preference.

## 1951**5.4.1 Processes in situation 1**

1952 For each process in situation 1 there are two possible options:

<sup>&</sup>lt;sup>22</sup> Company-specific datasets shall be made available to the EC

- The process is in the list of most relevant processes as specified in the PEFCR or is
   not in the list of most relevant process, but still the company wants to provide
   company- specific data (option 1);
- The process is not in the list of most relevant processes and the company prefers to
  use a secondary dataset (option 2).

## 1958 Situation 1/Option 1

For all processes run by the company and where the user of the PEFCR applies companyspecific data. The DQR of the newly developed dataset shall be evaluated as described in Section 5.3.1

## 1962 Situation 1/Option 2

For the non-most relevant processes only, if the user of the PEFCR decides to model the process without collecting company-specific data, then the user shall use the secondary dataset listed in the PEFCR together with its default DQR values listed here.

1966 If the default dataset to be used for the process is not listed in the PEFCR, the user of the1967 PEFCR shall take the DQR values from the metadata of the original dataset.

### 1968 5.4.2 Processes in situation 2

When a process is not run by the user of the PEFCR, but there is access to company-specificdata, then there are three possible options:

- The user of the PEFCR has access to extensive supplier-specific information and
   wants to create a new EF compliant dataset (Option 1);
- The company has some supplier-specific information and wants to make some minimum changes (Option 2);
- The process is not in the list of most relevant processes and the company wants to
   make some minimum changes (option 3).

### 1977 Situation 2/Option 1

1978 For all processes not run by the company and where the user of the PEFCR applies 1979 company- specific data, the DQR of the newly developed dataset shall be evaluated as 1980 described in Section 5.3.1

### 1981 Situation 2/Option 2

1982 The user of the PEFCR shall use company-specific activity data for transport and shall 1983 substitute the sub-processes used for electricity mix and transport with supply-chain specific 1984 PEF compliant datasets, starting from the default secondary dataset provided in the PEFCR.

1985 Please note that the PEFCR lists all dataset names together with the UUID of their 1986 aggregated dataset. For this situation, the disaggregated version of the dataset is required.

1987 The user of the PEFCR shall make the DQR context-specific by re-evaluating TeR and TiR 1988 using Table 16. The criteria GeR shall be lowered by 30%<sup>23</sup> and the criteria P shall keep the 1989 original value.

### 1990 Situation 2/Option 3

1991 The user of the PEFCR shall apply company-specific activity data for transport and shall

1992 substitute the sub-processes used for electricity mix and transport with supply-chain specific

1993 PEF compliant datasets, starting from the default secondary dataset provided in the PEFCR.

1994 Please note that the PEFCR lists all dataset names together with the UUID of their 1995 aggregated dataset. For this situation, the disaggregated version of the dataset is required.

In this case, the user of the PEFCR shall use the default DQR values. If the default dataset
to be used for the process is not listed in the PEFCR, the user of the PEFCR shall take the
DQR values from the original dataset.

#### 1999

Table 18 - DQR criteria assessment for secondary datasets

	TiR	TeR	GeR
1	The EF report publication date happens within the time validity of the dataset	The technology used in the EF study is exactly the same as the one in scope of the dataset	The process modelled in the EF study takes place in the country the dataset is valid for
2	The EF report publication date happens not later than 2 years beyond the time validity of the dataset	The technologies used in the EF study is included in the mix of technologies in scope of the dataset	The process modelled in the EF study takes place in the geographical region (e.g. Europe) the dataset is valid for
3	The EF report publication date happens not later than 4 years beyond the time validity of the dataset	The technologies used in the EF study are only partly included in the scope of the dataset	The process modelled in the EF study takes place in one of the geographical regions the dataset is valid for

<sup>&</sup>lt;sup>23</sup> In situation 2, option 2 it is proposed to lower the parameter GeR by 30% in order to incentivise the use of company-specific information and reward the efforts of the company in increasing the geographic representativeness of a secondary dataset through the substitution of the electricity mixes and of the distance and means of transportation.

	TiR	TeR	GeR
4	The EF report publication date happens not later than 6 years beyond the time validity of the dataset	The technologies used in the EF study are similar to those included in the scope of the dataset	The process modelled in the EF study takes place in a country that is not included in the geographical region(s) the dataset is valid for, but sufficient similarities are estimated based on expert judgement.
5	The EF report publication date happens later than 6 years after the time validity of the dataset	The technologies used in the EF study are different from those included in the scope of the dataset	The process modelled in the EF study takes place in a different country than the one the dataset is valid for

### 2000 **5.4.3 Processes in situation 3**

- 2001 If a process is not run by the company using the PEFCR and the company does not have
- 2002 access to company-specific data, there are two possible options:
- It is in the list of most relevant processes (situation 3, option 1);
- It is not in the list of most relevant processes (situation 3, option 2).

### 2005 Situation 3/Option 1

- 2006 In this case, the user of the PEFCR shall make the DQR values of the dataset used context-
- specific by re-evaluating TeR, TiR and GeR, using the table(s) provided. The criteria P shallkeep the original value.

### 2009 Situation 3/Option 2

- For the non-most relevant processes, the user of the PEFCR shall apply the corresponding secondary dataset listed in the PEFCR together with its DQR values.
- 2012 If the default dataset to be used for the process is not listed in the PEFCR, the user of the 2013 PEFCR shall take the DQR values from the original dataset.
- 2014 More concrete examples of how to apply the DNM can be found in ANNEX VIII Data 2015 collection scenarios and examples of the application of the DNM in the context of this 2016 PEFCR.

# 2017 5.5 Which datasets to use?

2018 This PEFCR lists the secondary datasets to be applied by the user of the PEFCR. It also 2019 gives a guidance on how to deal with data gaps and how to select proxies (see Section

- 2020 3.8.2). Whenever a dataset needed to calculate the PEF profile is not among those listed in 2021 this PEFCR, then the user shall choose between the following options (in hierarchical order):
- Use an EF compliant dataset available on one of the nodes of the Life Cycle Data
   Network <u>http://eplca.jrc.ec.europa.eu/LCDN/;</u>
- Use an EF compliant dataset available in a free or commercial source;
- Use another EF compliant dataset considered to be a good proxy. In such case this information shall be included in the "limitations" section of the PEF report.
- Use an ILCD entry level (EL) compliant dataset. These datasets shall be included in the "limitations" section of the PEF report. A maximum of 10% of the total environmental impact may be derived from ILCD-EL compliant datasets (calculated cumulatively from lowest to largest contribution to the total EF profile).
- If no EF compliant or ILCD-EL compliant proxy is available, it shall be excluded from
   the PEF study. This shall be clearly stated in the PEF report as a data gap and
   validated by the PEF study and PEF report verifiers.

# 2034 5.6 How to calculate the average DQR of the study

To calculate the average DQR of the PEF study, the user of the PEFCR shall calculate separately the TeR, TiR, GeR and P for the PEF study as the weighted average of all most relevant processes, based on their relative environmental contribution to the total single overall score. The calculation rules explained in Section 4.6.5.8 of the PEF method shall be used.

# 2040 5.7 Allocation rules

The allocations rules that shall be followed are indicated in Table 19. Default data should be used for life cycle stages 3 (distribution and allocation of transport), 4 (use stage, allocation of washing) and 5 (end of life, allocation of end-of-life treatment), unless primary data are used for LCS3. 2045

### Table 19 - Allocation rules

Process	Allocation rule	Modelling instructions	Allocation factor
Manufacturing			
Spinning	Mass allocation	Industry data shall be	N/A
Sizing	Mass allocation	modelled at process	
Knitting	Mass allocation	level.	
Dyeing	Mass allocation		
Printing	Area allocation		
Finishing	Mass allocation		
Assembly	Unit allocation		
Compound forming	Mass allocation		
Die-cutting	Mass allocation		
In-sole production	Mass allocation		
Sewing	Unit allocation		
Stockfitting	Mass allocation		
Distribution			
All transport processes related to the distribution of the final product to the final client	Mass allocation	The distribution impacts (trucks, vans, etc.) are based on the distance travelled and the mass of the product being transported (tonne- kilometre (tkm)).	N/A
Consumer travel	Volume allocation	The impacts from consumer travel (allocation of the car impact) shall be based on volume.	The allocation factor shall be calculated as the volume of the product divided by the maximum volume (0.2m <sup>3</sup> for a passenger car).
Intermediate storage at warehouse/ distribution centre and retail/ stores	The allocation shall be based on the space (in m <sup>3</sup> ) and time (in weeks) occupied by the representative product.	The impacts of storage shall be based on volume of storage location and product volume, as well as the average storage time.	The allocation factor is calculated as the ratio between the product volume*time and storage capacity volume*time. To adjust for additional space the product takes in the storage facility, a storage volume factor of 4 is used for ambient storage, thus the product volume shall be multiplied by 4 (OEFSRs retail, 2018).

# 2046 5.8 Electricity modelling

- 2047 The following electricity mix shall be used in hierarchical order:
- Supplier-specific electricity product shall be used if for a country there is a 100%
- 2049 tracking system in place, or if:
- 2050 o available, and

- 2051 o the set of minimum criteria to ensure the contractual instruments are 2052 reliable is met. 2053 The supplier-specific total electricity mix shall be used if: 2054  $\circ$  available, and 2055 the set of minimum criteria to ensure the contractual instruments are 2056 reliable is met. 2057 The 'country-specific residual grid mix, consumption mix' shall be used. • Country-specific means the country in which the life cycle stage or activity 2058 2059 occurs. This may be an EU country or non-EU country. The residual grid 2060 mix prevents double counting with the use of supplier-specific electricity 2061 mixes in (a) and (b). 2062 • As a last option, the average EU residual grid mix, consumption mix 2063 (EU+EFTA), or region representative residual grid mix, consumption mix, 2064 shall be used. 2065 2066 Note: for the use stage, the consumption grid mix shall be used. 2067 2068 The environmental integrity of the use of supplier-specific electricity mix depends on 2069 ensuring that contractual instruments (for tracking) reliably and uniquely convey 2070 claims to consumers. Without this, the PEF lacks the accuracy and consistency 2071 necessary to drive product/ corporate electricity procurement decisions and accurate 2072 consumer (buyer of electricity) claims. Therefore, a set of minimum criteria that relate
- to the integrity of the contractual instruments as reliable conveyers of environmental
  footprint information has been identified. They represent the minimum features
  necessary to use supplier-specific mix within PEF studies.
- 2076

# 2077 Set of minimum criteria to ensure contractual instruments from suppliers

A supplier-specific electricity product/ mix may only be used if the user of the PEF method ensures that the contractual instrument meets the criteria specified below. If contractual instruments do not meet the criteria, then country-specific residual electricity consumption-mix shall be used in the modelling.

2082

2083 The list of criteria below is based on the criteria of the GHG Protocol Scope 2 2084 Guidance<sup>24</sup>. A contractual instrument used for electricity modelling shall:

2085 2086

# Criterion 1 – Convey attributes

- Convey the energy type mix associated with the unit of electricity produced.
- The energy type mix shall be calculated based on delivered electricity,
   incorporating certificates sourced and retired (obtained or acquired or
   withdrawn) on behalf of its customers. Electricity from facilities for which the
   attributes have been sold off (via contracts or certificates) shall be
   characterized as having the environmental attributes of the country residual
   consumption mix where the facility is located.
- 2093

2094

## Criterion 2 – Be a unique claim

- Be the only instruments that carry the environmental attribute claim
   associated with that quantity of electricity generated.
- Be tracked and redeemed, retired, or cancelled by or on behalf of the company (e.g. by an audit of contracts, third party certification, or may be handled automatically through other disclosure registries, systems, or mechanisms).
- 2101

# 2102 Criterion 3 – Be as close as possible to the period to which the contractual 2103 instrument is applied

2104

# 2105 Modelling 'country-specific residual grid mix, consumption mix':

- Datasets for residual grid mix, consumption mix, per energy type, per country and pervoltage are made available by data providers.
- 2108
- 2109 If no suitable dataset is available, the following approach should be used:
- 2110 Determine the country consumption mix (e.g. X% of MWh produced with hydro energy,
- 2111 Y% of MWh produced with coal power plant) and combine them with LCI datasets per
- 2112 energy type and country/region (e.g. LCI dataset for the production of 1MWh hydro
- 2113 energy in Switzerland):
- 2114 Activity data related to non-EU country consumption mix per detailed energy type shall
- 2115 be determined based on:
- Domestic production mix per production technologies;

<sup>&</sup>lt;sup>24</sup> World Resources Institute (WRI) and World Business Council for Sustainable Development WBCSD (2015): GHG Protocol Scope 2 Guidance. An amendment to the GHG Protocol. Corporate Standard

2117	<ul> <li>Import quantity and from which neighbouring countries;</li> </ul>
2118	Transmission losses;
2119	Distribution losses;
2120	• Type of fuel supply (share of resources used, by import and / or domestic supply).
2121	
2122	These data may be found in the publications of the International Energy Agency (IEA
2123	( <u>www.iea.org</u> ).
2124	
2125	Available LCI datasets per fuel technologies. The LCI datasets available are generally
2126	specific to a country or a region in terms of:
2127	<ul> <li>fuel supply (share of resources used, by import and/ or domestic supply);</li> </ul>
2128	<ul> <li>energy carrier properties (e.g. element and energy contents);</li> </ul>
2129	<ul> <li>technology standards of power plants regarding efficiency, firing technology,</li> </ul>
2130	flue-gas desulphurisation, NOx removal and de-dusting.
2131	Allocation rules:
2132	The allocation rules below shall be followed for life cycle stage 2 (manufacturing). If primary

2133 data are used for life cycle stage 3 (distribution), the distribution allocation rules shall be

- 2134 used as well.
- 2135

## Table 20 - Allocation rules for electricity

Process	Physical relationship	Modelling instructions
Manufacturing	Mass	The electricity mix used shall be a production-weighted average when data from multiple sites are used.
Distribution	Volume	The electricity mix used shall be a volume-weighted average when data from multiple sites are used.

2136

If the consumed electricity comes from more than one electricity mix, each mix source shall be used in terms of its proportion in the total kWh consumed. For example, if a fraction of this total kWh consumed is coming from a specific supplier a supplierspecific electricity mix shall be used for this part. See below for on-site electricity use. A specific electricity type may be allocated to one specific product in the following conditions:

- If the production (and related electricity consumption) of a product occurs in
   a separate site (building), the energy type physical related to this separated
   site may be used.
- If the production (and related electricity consumption) of a product occurs in
   a shared space with specific energy metering or purchase records or
   electricity bills, the product-specific information (measure, record, bill) may
   be used.
- If all the products produced in the specific plant are supplied with a publically available PEF study, the company wanting to make the claim shall make all PEF studies available. The allocation rule applied shall be described in the PEF study, consistently applied in all PEF studies connected to the site and verified. An example is the 100% allocation of a greener electricity mix to a specific product.
- 2156

# 2157 **On-site electricity generation**:

2158 If on-site electricity production is equal to the site own consumption, two situations2159 apply:

- No contractual instruments have been sold to a third party: the own
   electricity mix (combined with LCI datasets) shall be modelled.
- Contractual instruments have been sold to a third party: the 'country-specific residual grid mix, consumption mix' (combined with LCI datasets) shall be used.

If electricity is produced in excess of the amount consumed on-site within the defined system boundary and is sold to, for example, the electricity grid, this system may be seen as a multifunctional situation. The system will provide two functions (e.g. product + electricity) and the following rules shall be followed:

- If possible, apply subdivision. Subdivision applies both to separate electricity
   productions or to a common electricity production where you may allocate
   based on electricity amounts the upstream and direct emissions to your own
   consumption and to the share you sell out of your company (e.g. if a
   company has a windmill on its production site and exports 30% of the
   produced electricity, emissions related to 70% of produced electricity should
   be accounted in the PEF study).
- If not possible, direct substitution shall be used. The country-specific

residual consumption electricity mix shall be used as substitution<sup>25</sup>.

2178 Subdivision is considered as not possible when upstream impacts or direct emissions2179 are closely related to the product itself.

# 2180 5.9 Climate change modelling

2181 The impact category 'climate change' shall be modelled considering three sub-2182 categories:

- Climate change fossil: This sub-category includes emissions from peat and calcination/carbonation of limestone. The emission flows ending with '(fossil)'
   (e.g. 'carbon dioxide (fossil)' and 'methane (fossil)') shall be used, if available.
- 2. Climate change biogenic: This sub-category covers carbon emissions to air 2186 2187 (CO<sub>2</sub>, CO and CH4) originating from the oxidation and/or reduction of biomass 2188 by means of its transformation or degradation (e.g. combustion, digestion, 2189 composting, landfilling) and CO<sub>2</sub> uptake from the atmosphere through 2190 photosynthesis during biomass growth - i.e. corresponding to the carbon content of products, biofuels or aboveground plant residues, such as litter and 2191 2192 dead wood. Carbon exchanges from native forests<sup>26</sup> shall be modelled under 2193 sub-category 3 (incl. connected soil emissions, derived products, residues). 2194 The emission flows ending with '(biogenic)' shall be used.
- A simplified modelling approach shall be used when modelling foreground emissions.

2196 Only the emission 'methane (biogenic)' is modelled, while no further biogenic 2197 emissions and uptakes from atmosphere are included. If methane emissions can be 2198 both fossil or biogenic, the release of biogenic methane shall be modelled first and 2199 then the remaining fossil methane.

2200 2201 3. Climate change – land use and land use change: This sub-category accounts for carbon uptakes and emissions (CO<sub>2</sub>, CO and CH4) originating from

<sup>&</sup>lt;sup>25</sup> For some countries, this option is a best case rather than a worst case

<sup>&</sup>lt;sup>26</sup> Native forests – represents native or long-term, non-degraded forests. Definition adapted from Table 8 in Annex V C(2010)3751 to Directive 2009/28/EC.

carbon stock changes caused by land use change and land use. This subcategory includes biogenic carbon exchanges from deforestation, road construction or other soil activities (including soil carbon emissions). For native forests, all related CO<sub>2</sub> emissions are included and modelled under this subcategory (including connected soil emissions, products derived from native forest<sup>27</sup> and residues), while their CO<sub>2</sub> uptake is excluded. The emission flows ending with '(land use change)' shall be used.

2209 For land use change, all carbon emissions and removals shall be modelled following 2210 the modelling guidelines of PAS 2050:2011 (BSI, 2011) and the supplementary 2211 document PAS2050-1:2012 (BSI, 2012) for horticultural products. PAS 2050:2011 (BSI, 2011): "Large emissions of GHGs can result as a consequence of land use 2212 2213 change. Removals as a direct result of land use change (and not as a result of long-2214 term management practices) do not usually occur, although it is recognized that this 2215 could happen in specific circumstances. Examples of direct land use change are the 2216 conversion of land used for growing crops to industrial use or conversion from 2217 forestland to cropland. All forms of land use change that result in emissions or 2218 removals are to be included. Indirect land use change refers to such conversions of 2219 land use as a consequence of changes in land use elsewhere. While GHG emissions 2220 also arise from indirect land use change, the methods and data requirements for 2221 calculating these emissions are not fully developed. Therefore, the assessment of 2222 emissions arising from indirect land use change is not included.

2223 The GHG emissions and removals arising from direct land use change shall be 2224 assessed for any input to the life cycle of a product originating from that land and shall 2225 be included in the assessment of GHG emissions. The emissions arising from the 2226 product shall be assessed on the basis of the default land use change values provided 2227 in PAS 2050:2011 Annex C, unless better data are available. For countries and land 2228 use changes not included in this annex, the emissions arising from the product shall 2229 be assessed using the included GHG emissions and removals occurring as a result of 2230 direct land use change in accordance with the relevant sections of the IPCC (2006). 2231 The assessment of the impact of land use change shall include all direct land use

<sup>&</sup>lt;sup>27</sup> Following the instantaneous oxidation approach in IPCC 2013 (Chapter 2). 210

change occurring not more than 20 years, or a single harvest period, prior to undertaking the assessment (whichever is the longer). The total GHG emissions and removals arising from direct land use change over the period shall be included in the quantification of GHG emissions of products arising from this land on the basis of equal allocation to each year of the period<sup>28</sup>.

- Where it can be demonstrated that the land use change occurred more than 20 years prior to the assessment being carried out, no emissions from land use change should be included in the assessment.
- 2240
  2. Where the timing of land use change cannot be demonstrated to be more than
  20 years, or a single harvest period, prior to making the assessment (whichever
  is the longer), it shall be assumed that the land use change occurred on 1
  January of either:
- the earliest year in which it can be demonstrated that the land use change
  had occurred; or
- on 1 January of the year in which the assessment of GHG emissions and
   removals is being carried out.

The following hierarchy shall apply when determining the GHG emissions and removals arising from land use change occurring not more than 20 years or a single harvest period, prior to making the assessment (whichever is the longest):

- where the country of production is known and the previous land use is known,
   the GHG emissions and removals arising from land use change shall be those
   resulting from the change in land use from the previous land use to the current
   land use in that country (additional guidelines on the calculations can be found
   in PAS 2050- 1:2012);
- 2256
  2. where the country of production is known, but the former land use is not known,
  the GHG emissions arising from land use change shall be the estimate of
  average emissions from the land use change for that crop in that country
  (additional guidelines on the calculations can be found in PAS 2050-1:2012);

<sup>&</sup>lt;sup>28</sup> In case of variability of production over the years, a mass allocation should be applied.

3. where neither the country of production nor the former land use is known, the
GHG emissions arising from land use change shall be the weighted average of
the average land use change emissions of that commodity in the countries in
which it is grown.

Knowledge of the prior land use can be demonstrated using a number of sources of information, such as satellite imagery and land survey data. Where records are not available, local knowledge of prior land use can be used. Countries in which a crop is grown can be determined from import statistics, and a cut-off threshold of not less than 90% of the weight of imports may be applied. Data sources, location and timing of land use change associated with inputs to products shall be reported." [end of quote from PAS 2050:2011]

2271 Soil carbon storage shall not be modelled, calculated and reported as additional 2272 environmental information.

2273 The sum of the three sub-categories shall be reported.

The sub-category 'Climate change-biogenic' shall be reported separately. The subcategory 'Climate change-land use and land transformation' shall be reported separately.

# 2277 5.10 Modelling of end of life and recycled content

The end of life of products used during the manufacturing, distribution, retail, the use stage or after use shall be included in the overall modelling of the life cycle of the product. Overall, this should be modelled and reported at the life cycle stage where the waste occurs. This section provides rules on how to model the end of life of products as well as the recycled content.

### 2283 **5.10.1 Circular Footprint formula**

The Circular Footprint Formula (CFF) is used to model the end of life of products as well as the recycled content and is a combination of "material + energy + disposal", i.e.:

2287 Material 
$$(1 - R_1)E_V + R_1 \times \left(AE_{recycled} + (1 - A)E_V \times \frac{Q_{Sin}}{Q_p}\right) + (1 - A)R_2 \times \left(E_{recyclingEoL} - E_V^* \times \frac{Q_{Sout}}{Q_p}\right)$$

2288 Energy 
$$(1 - B)R_3 \times (E_{ER} - LHV \times X_{ER,heat} \times E_{SE,heat} - LHV \times X_{ER,elec} \times E_{SE,elec})$$

2289 Disposal  $(1 - R_2 - R_3) \times E_D$ 

2290 With the following parameters

A: allocation factor of burdens and credits between supplier and user of recycledmaterials.

B: allocation factor of energy recovery processes. It applies both to burdens andcredits. It shall be set to zero for all PEF studies.

2295 Qs<sub>in</sub>: quality of the ingoing secondary material, i.e. the quality of the recycled material2296 at the point of substitution.

2297 Qsout: quality of the outgoing secondary material, i.e. the quality of the recyclable2298 material at the point of substitution.

2299 **Q**<sub>p</sub>: quality of the primary material, i.e. quality of the virgin material.

R<sub>1</sub>: it is the proportion of material in the input to the production that has been recycledfrom a previous system.

**R**<sub>2</sub>: it is the proportion of the material in the product that will be recycled (or reused) in a subsequent system.  $R_2$  shall therefore take into account the inefficiencies in the collection and recycling (or reuse) processes.  $R_2$  shall be measured at the output of the recycling plant.

R<sub>3</sub>: it is the proportion of the material in the product that is used for energy recovery atEoL.

Erecycled (Erec): specific emissions and resources consumed (per functional unit) arising
 from the recycling process of the recycled (reused) material, including collection,
 sorting and transportation process.

ErecyclingEoL (ErecEoL): specific emissions and resources consumed (per functional unit)
 arising from the recycling process at EoL, including collection, sorting and
 transportation process.

E<sub>v</sub>: specific emissions and resources consumed (per functional unit) arising from theacquisition and pre-processing of virgin material.

2316 E\*v: specific emissions and resources consumed (per functional unit) arising from the
2317 acquisition and pre-processing of virgin material assumed to be substituted by
2318 recyclable materials.

EER: specific emissions and resources consumed (per functional unit) arising from the
 energy recovery process (e.g. incineration with energy recovery, landfill with energy
 recovery, etc.).

EsE,heat and EsE,elec: specific emissions and resources consumed (per functional unit)
 that would have arisen from the specific substituted energy source, heat and electricity
 respectively.

E<sub>D</sub>: specific emissions and resources consumed (per functional unit) arising fromdisposal of waste material at the EoL of the analysed product, without energy recovery.

XER,heat and XER,elec: the efficiency of the energy recovery process for both heat and
 electricity.

2329 LHV: lower heating value of the material in the product that is used for energy2330 recovery.

The CFF relies on several parameters which account for: physical characteristics of products sent to recycling (e.g. the material quality after recycling and the heating value of the material); impacts of processes (impact of energy production, recycling and substituted virgin material production); and the market reality for a recycled product.

The **A** factors to be used depend on the recycling pathway and on the material type and are defined in Table 21. For cases not foreseen in Table 21, the **A** factor should be selected according to the latest version of Part C of Annex II of the PEF method.

- 2339 The **B** factor shall equally be set according to the latest version of Part C of Annex II
- of the PEF method and is defined as 0 at the time this PEFCR is being written.
- The parameters of the CFF are to be defined for each raw material / disposed materialand reported and justified in the product footprint report.
- 2343 In the case of recycling, the  $R_2$ ,  $E_{rec}$ ,  $E_{recEoL}$ ,  $E_v$  and  $E^*_v$  shall be defined for every 2344 recycling process.
- The **R**<sub>1</sub> factor shall be defined as the share of recycled material in each raw material.
  - The rate of recycling, R<sub>2</sub>, defined for each recycling scenario applicable shall
     account for the quantity of recycled material effectively produced by the
     recycling process (accounting for processing loss rates).
  - The rate of material sent to energy recuperation, R<sub>3</sub>, shall correspond to the rate of product sent to incineration with energy recovery<sup>29</sup> (including the share of product sent to incineration as municipal waste and the share of product collected as used clothing and footwear articles, sorted as non-recyclable and sent to incineration).
  - The share of product landfilled or disposed of without energy recovery, equal to  $1 - R_2 - R_3$ , equates to considering by default that the losses of the recycling process<sup>30</sup> are landfilled or disposed of, without energy recovery. If the recycling losses are known to be disposed of otherwise, the end-of-life may be modelled accordingly.
  - The quality factor ratios for each substitution,  $\frac{Q_{s_{in}}}{Q_p}$  and  $\frac{Q_{s_{out}}}{Q_p}$ , should account for the difference in quality in comparison to the virgin material. In particular, in the case of mechanical recycling, the fibres have a lesser quality than the virgin fibres they would substitute. The nature and unit of the parameter chosen to measure material quality is not defined by the PEF method. Substitution rates or economic values are used for this parameter.

 $<sup>^{29}</sup>$  The CFF includes the recuperation of energy from landfills in the R<sub>3</sub> term. Since the recuperation of methane emitted from apparel or footwear products in landfill is not known, it is not included in the PEFCR.

<sup>&</sup>lt;sup>30</sup> This refers to the material losses occurring in the transformation of the recyclable product into recycled material.

- Erec and ErecEoL shall be defined as the impacts of the collection, sorting, pre processing, processing and transportation of materials involved in treating
   materials sent to recycling until their use as recycled materials.
- E<sub>v</sub> and E<sup>\*</sup><sub>v</sub> correspond to the impacts of substituted or consumed virgin
   materials, with the same scope as the factors for recycled materials.
- XER,heat and XER,elec, ESE,heat, ESE,elec and ED shall be defined according to the practices and electricity mixes in the applicable geographical zone where the product is disposed of.
- 2374 5.10.2 Recycled content
- 2375 The following part of the Circular Footprint Formula is used to model the recycled2376 content:

2377 
$$(1 - R_1)E_v + R_1(AE_{recycled} + (1 - A)E_v \frac{Q_{sin}}{Q_n})$$

The R<sub>1</sub> values applied shall be supply-chain specific or R<sub>1</sub>=0 should be used as default, in relation with the DNM. Material-specific values based on supply market statistics are not accepted as a proxy and therefore shall not be used. The applied R1 values shall be subject to PEF study verification.

When using supply-chain specific R<sub>1</sub> values other than 0, traceability throughout the supply chain is necessary. The following guidelines shall be followed when using supply-chain specific R<sub>1</sub> values:

- The supplier information (through e.g. statement of conformity or delivery note)
   shall be maintained during all stages of production and delivery at the converter;
- Once the material is delivered to the converter for production of the end
   products, the converter shall handle information through their regular
   administrative procedures;
- The converter for production of the end products claiming recycled content shall
   demonstrate through its management system the [%] of recycled input material
   into the respective end product(s).
- The latter demonstration shall be transferred upon request to the user of the
   end product. In case a PEF profile is calculated and reported, this shall be
   stated as additional technical information of the PEF profile.

- Company-owned traceability systems may be applied as long as they cover the
   general guidelines outlined above.
- According to the PEF method (Section 4.4.8.6.), the default value for  $R_1$  is 0%. This is also in line with a study on the European market on the potential for recycled fashion from the Confederation of British Industry (2020), which shows that the use of recycled apparel and footwear products is still negligible. Traceability for a specific  $R_1$  must be from recycling plant down to the point of sale, with a valid and trustworthy chain of custody system and a verification by a third-party body.
- The default parameters for raw materials in the CFF are defined in Table 21. Depending on the fibre or material type used as secondary product, the table indicates the  $E_v$  to be chosen, the scope of  $E_{rec}$ , as well as the parameters A and  $Q_{sin}/Q_p$  to be introduced in the formula. It shall be noted that the scope of  $E_{rec}$  doesn't specify in detail all necessary steps to transform the waste input into the secondary material. The user of this PEFCR shall make sure to include them.
- 2410 For pathways marked with an asterisk (\*), there was too little evidence for defining
- 2411 Q<sub>sin</sub>/Q<sub>p</sub> for these pathways at the time this PEFCR was written. The user of the PEFCR
- shall determine them according to Section 4.4.8.5 of the PEF method.

## Table 21 - Definition of the CFF parameters for the raw materials

Fiber or material type	Scope for Ev	Flow of recycled material	Origin of recycled material	A	Qsin/Qp	Erec
			PET bottles	0.5	1	Impacts of collection, sorting and recycling PET bottles into polyester fibres
Synthetic	Production of virgin polyester	Recycled polyester	Textile PET fibres (via mechanical recycling)	0.8	0.75	Impacts of collection, sorting, clothes preparation for recycling, shredding and recycling textile PET fibres into polyester fibres
poryester	fibres	fibres	Recyclate PET from textile (via chemical recycling)	0.8	1	Impacts of collection, sorting, clothes preparation for recycling and chemical recycling of polyester fibres from textile sources
Synthetic	Production of	Recycled	Textile synthetic fibres	0.8	0.75	Impacts of collection, sorting, clothes preparation for recycling, shredding and recycling textile synthetic fibres into fibres
Fiber or         material         type         Synthetic         polyester         Synthetic         polyester         V         Synthetic         (polyester         v         Natural         fibres         F         V         Footwear         materials         F         V	virgin synthetic fibres	fibers	Recyclate polymer from textile	0.8	1	Impacts of collection, sorting, clothes preparation for recycling and chemical recycling of polyester fibres from textile sources
Fiber or material typeSynthetic polyesterP vi filSynthetic polyesterP vi filSynthetic (polyester excluded)P vi filNatural fibresP vi filNatural fibresP vi filFootwear materialsP vi vi P vi	Production of cellulosic virgin fibres	Recycled cellulosic fibres	Textile product	0.8	0.5	Impacts of collection, sorting, clothes preparation for recycling shredding of textiles and recycling into recycled cellulosic fibres
	Production of virgin clean wool	Recycled wool	Textile product	0.8	0.65	Impacts of collection, sorting, clothes preparation for recycling shredding of textiles and recycling into recycled wool fibres
	Production of	Recycled	Other feedstock	0.5	0.75	Impacts of collection, sorting, shredding and recycling into recycled rubber
	virgin rubber	rubber	Footwear	0.5	To be defined*	Impacts of collection, sorting, shredding of used footwear and recycling into recycled rubber
Footwear materials	Production of	Recycled	Other feedstock	0.5	0.9	Impacts of collection, sorting, shredding and recycling into recycled polymer
	virgin polymer	lymer polymer	Footwear	0.5	To be defined*	Impacts of collection, sorting, shredding of used footwear and recycling into recycled polymer
	Production of virgin foam	Recycled foam	Other feedstock	0.5	0.75	Impacts of collection, sorting, shredding and recycling into recycled foam

			Footwear	0.5	To be defined*	Impacts of collection, sorting, shredding of used footwear and recycling into recycled foam
Leftover fabrics	Production of the virgin fabric	Leftover fabric	Manufacturing leftovers	0.8	1	Impacts of collection, sorting and preparing leftovers for recycling (to be defined by the user of the PEFCR)

\*Guidance on the definition of Qsin and Qsout can be found in the PEF method in Section 4.4.8.5.

According to the PEF Method, the  $Q_{Sout}/Q_p$  and  $Q_{Sin}/Q_p$  ratios are capped at 1. The ratios are relevant if the substituted primary material and the recycled material are similar materials. In cases where the recycled material substitutes a different material, the quality ratio is set as 1 and the difference in the quantity of material used shall be accounted in the  $E^*_v$  parameter. The  $E^*_v$  parameter shall be scoped for the quantity of virgin material needed to fulfil the same function as the quantity of recycled material (see also Table 22).

## 2422 5.10.3 End-of-life scenarios

Figure 8 details the general post-consumer scenario rates. These scenarios and the corresponding  $R_2$  and  $R_3$  values presented in Figure 8 and Table 22 are from the Synthesis of the Environmental Assessment of the Value Chain of Used Textiles (RDC Environment and EcoTLC, 2019), with the added assumption that materials recycled as insulation replace mineral wool. R2 values do not apply for pathways with a recyclability disruptor (Table 24 to Table 26).





2430 R2 = Recycling or reuse; R3 = Energy Recovery

For footwear, as detailed in Figure 9, it is difficult to find statistics on recycling<sup>31</sup>, which is thus assumed to be negligible. A 12% collection rate and a 10% reuse rate<sup>32</sup> are

<sup>&</sup>lt;sup>31</sup> Better Shoe Foundation, http://www.bettershoes.org/home/post-consumer-life, last accessed 2021/01/12

<sup>&</sup>lt;sup>32</sup> EcoTLC (Refashion), 2019, Roads to innovation, https://refashion.fr/pro/sites/default/files/fichiers/Chemins-Innovation2019\_EN\_BD.pdf) (accessed 2021/17/02)

- 2433 used, the European rate of landfill / incineration (Part C of Annex II, PEF method) with
- energy recovery is applied to the 88% of footwear disposed with municipal waste.
- 2435 Figure 9 Post-consumer footwear scenarios & definition of R2 and R3 parameters for the CFF



<sup>2436</sup> R2 = Recycling or reuse; R3 = Energy Recovery

2437 The percentages shown in Figure 8 and Figure 9 are scaled to 100% excluding the 2438 reuse share. The general parameters for end-of-life in the CFF are defined in Table 2439 22 and Table 23, references for these parameters are listed in the paragraphs above (the A factor is defined in Table 21). For the end of life of trims, the corresponding 2440 2441 waste management datasets for the incineration and landfill scenarios of the same 2442 materials shall be used. For the recycling scenario, the end-of-life treatment of trims 2443 is considered to be included in the recycling process for the wipers and insulation 2444 scenarios. In case company-specific datasets representing the textile-to-textile 2445 recycling pathway are developed, the specific waste treatment of trims (e.g. recycled, 2446 incinerated or landfilled) shall be considered, and the defined R<sub>2</sub> shall take into 2447 account the losses through trim separation where relevant.

2448

Table 22 - Definition of the CFF parameters for the end-of-life for apparel

Recycling pathway	Scope for E* <sub>v</sub>	R₂ for pathway	Q <sub>Sout</sub> /Q <sub>p</sub>	E <sub>rec</sub>	R₃
Mechanical re	ecycling				
Wipers	Production of wipers from virgin cotton	5%	0.3 <sup>33</sup> ,	Collection, sorting, clothes preparation for recycling and production of wipers from used clothes	
Insulation	Production of virgin mineral wool	12%	1 <sup>34</sup>	Collection, sorting, clothes preparation for recycling and production of insulation from used clothes	39 %
Apparel	Virgin fibres (which are replaced)	0%	0.5 <sup>35</sup>	Collection, sorting, clothes preparation for recycling and production of recycled fibres through mechanical recycling	
	Total:	17%			
Chemical rec	ycling				
Apparel and other applications	Virgin synthetic fibres	0%	1 <sup>36</sup>	Collection, sorting, clothes preparation for recycling,	39
	Virgin manmade cellulosics	0%	0.5 <sup>37</sup>	production of recycled fibres through chemical recycling	%
	Total:	0%			

### 2449

2450

Table 23 - Definition of the CFF parameters for the end-of-life for shoes

Recycling pathway	Scope for E* <sub>v</sub>	R₂ for pathway	Q <sub>Sout</sub> /Q <sub>p</sub>	E <sub>rec</sub>	R₃	
Footwear	Thermopla stic material	0%	0.9	Collection, sorting, preparation of shoes for recycling, grinding and extrusion	46%	
	PU foam and other reticulated materials	0%	0.9	Collection, sorting, preparation of shoes for recycling, recycling process		
	Total:	0%	6			

2451

<sup>&</sup>lt;sup>33</sup> Based on prices from MSC Industrial Direct, this ratio goes from 0.2 for jean-based rags, to 0.5 for good state white t-shirt-based rags, with mixed reclaimed wipers having a ratio of 0.3. Considering most garments are reused in the European context, the value recommended is 0.3.

<sup>&</sup>lt;sup>34</sup> Mineral wool has a lower insulation quality. As per the PEF Method 2021 (p.52), the quality ratio is set to 1

 $<sup>^{35}</sup>$  Expert opinion extrapolated from case studies. This includes the loss of short fibres in the process.

<sup>&</sup>lt;sup>36</sup> Chemically recycled synthetic fibres are assumed to have the same characteristics as virgin fibres.

<sup>&</sup>lt;sup>37</sup> Expert opinion extrapolated from case studies. This includes the loss of short fibres in the process.

## 2452 **5.10.3 Calculation of R2 and recyclability disruptors**

In case a recycling scenario is not covered in this PEFCR (either in Table 22 to Table
26 or in Section 5.10 above), the PEF method (Section 4.4.8.9) provides additional
information on the recycling output rate (R<sub>2</sub> value).

The product design and composition will determine if the material in the specific product is actually suitable for recycling. Therefore, before selecting the appropriate R<sub>2</sub> value, an evaluation of the recyclability of the material shall be made and the PEF study shall include a statement on the recyclability of the materials/ products:

The statement on recyclability shall be provided together with an evaluation for recyclability that includes evidence for the following three criteria (as described by ISO 14021:2016, Section 7.7.4 'Evaluation methodology'):

- 2463
  1. The collection, sorting and delivery systems to transfer the materials from the
  source to the recycling facility are conveniently available to a reasonable
  proportion of the purchasers, potential purchasers and users of the product;
- 2466 2. The recycling facilities are available to accommodate the collected materials;
- 2467 3. Evidence is available that the product for which recyclability is claimed is being
  2468 collected and recycled. For PET bottles the EPBP guidelines should be used
  2469 (https://www.epbp.org/design-guidelines), while for generic plastics the
  2470 recyclability by design should be used (www.recoup.org).

If one criterion is not fulfilled, or the sector-specific recyclability guidelines indicate limited recyclability, an R<sub>2</sub> value of 0% shall be applied. Point 1 and 3 may be proven by recycling statistics (country specific) derived from industry associations or national bodies. Approximation to evidence at point 3 may be provided by applying for example the design for recyclability evaluation outlined in EN 13430 Material recycling (Annexes A and B) or other sector-specific recyclability guidelines if available.

2477 Default application-specific R<sub>2</sub> values are available in Annex C. The following2478 procedure shall be followed to select the R<sub>2</sub> value to be used in a PEF study:

- Company-specific values shall be used when available and following the
   evaluation of recyclability.
- If no company-specific values are available and the criteria for the evaluation
   of recyclability are fulfilled (see above), application-specific R<sub>2</sub> values shall be
   used selecting the appropriate value available in Annex C:

- 2484 o If an R<sub>2</sub> value is not available for a specific country, then the European average shall be used;
- 2486 o If an R<sub>2</sub> value is not available for a specific application, the R<sub>2</sub> values of
  2487 the material shall be used (e.g. materials' average);
- 2488 o In case no R<sub>2</sub> values are available, R<sub>2</sub> shall be set equal to 0 or new
   2489 statistics may be generated in order to assign an R<sub>2</sub> value in the specific
   2490 situation.
- 2491 The applied R<sub>2</sub> values shall be subject to the PEF study verification.
- Background information to calculate the R<sub>2</sub> values for packaging materials is availablein Annex C of the PEF Method.
- 2494 Collection period for R<sub>2</sub>: Annual administrative period as a basis for the data2495 collection.
- For both garments and footwear, the user may use case-specific data to model endof-life scenarios such as composting, mechanical or chemical recycling.
- Recyclability disruptors are components or characteristics of the apparel or footwear product which will hinder recyclability and therefore induce a factor  $R_2=0$ . Indeed, the product composition and design as well as its finishing, applications and printing affect its recyclability. Accordingly, for this type of recycling stream, the second part of the formula for "Material" will be equal to 0. The occurrence of a single disruptor is sufficient to lead to a value of 0. Recyclability disruptors and the corresponding  $R_2$ values for specific pathways are listed in Table 24 to Table 26. These tables aim to:
- Identify disruptors, which should prevent a product which is clearly not 2506 recyclable getting credits from recycling (by setting  $R_2 = 0$  for these cases)
- Provide information and guidance for the industry to develop more recyclable
   products. While textile-to-textile or footwear-to-footwear pathways are not
   considered in the default pathways of this PEFCR, the information on disruptors
   was deemed useful by the TS
- These tables shall be read at product level. Any disruptor on a product/component leads to an  $R_2 = 0$  value for the entire product. These tables will have to be updated in the next version of the PEFCR to ensure that they correctly reflect the evolving technologies and their requirements.

# 

# 

## Table 24 - Recyclability disruptors and corresponding R<sub>2</sub> values for wiper and insulation pathways (apparel)

Product type	Main disruptors	R₂ (wiper pathway)	R₂ (insulation pathway)	
Apparel	Less than 80% cotton	0	Default R <sub>2</sub>	
	Products with more than 5% elastane	Default R <sub>2</sub>	0	
	Coating, flocking, imprint, glue	Doradit Hz		
	Products with electrical and electronic equipment	0	0	
	Products with metallic fibres			
	Multicomposition of the textile part (>2 materials)			
	Particular knitting (jacquard, warp)	0	Default R <sub>2</sub>	

### Table 25 - Recyclability disruptors and corresponding R2 values for textile-to-textile pathways (mechanical and chemical)

Recycling main steps	Disruptors	R <sub>2</sub> - Textile to textile pathway - Mechanical recycling	R <sub>2</sub> - Textile to textile pathway - thermomechanical recycling	$R_{\rm 2}$ - Textile to textile pathway - Chemical recycling	
Global	Products with electrical and electronic equipment	0	0	0	
Sorting / dismantling (Feedstock preparation)	Multicomposition of the textile part (>2 materials)**	0	0	0	
Recycling	Less than 90% cotton at product level	0	0	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$	
	Less than 50% wool at product level	0	0	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0* $$	
	Less than 90% linen / hemp / silk at product level	0	0	0	
	Less than 85% polyester / nylon at product level ***	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0*			
	More than 5% of elasthane at product level***		For these character	istics, verifiable evidence of recyclability must be provided for using R2 >0*	
	All over prints	0	0	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0* $$	
	Placed prints $\geq 10 \text{ cm}^2$	0	0	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0* $$	
	Coatings****	0	0	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0* $$	
	Lamination****	0	0	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{\ast}$	
	Adhesives		For these characteri	stics, verifiable evidence of recyclability must be provided for using R2 >0*	
	Products with metallic fibers	0	0	0	
	Products with hard embellishments	0	0	0	

\* verifiable evidence of recyclability is detailed in subsequent paragraph

\*\* Current development shows that a maximum of 2 spectra are required for good near infrared sorting performance

\*\*\* Mechanical recycling is possible but can generate esthetic problematics after regeneration and dyeing as the dye will only be fixed on polyester and not on cotton/elasthane. Recycling of a garment with less than 85% polyester / nylon or more than 5% of elasthane is possible if there are no issues on the esthetic perception.

\*\*\*\* Lamination consists of bonding pre-prepared polymer film or membrane with one or more textile substrates using adhesives, heat, or pressure. Coating is the process of applying a viscous liquid (fluid) or formulated compound on a textile substrate.

## Table 26 - Recyclability disruptors and corresponding $R_2$ values for closed mid and low shoes

Recycling main steps	Disruptors	R2 - Closed mid and low shoes		
Global	Products with electrical and electronic equipment	0		
	Foam midsole	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
Dismantling (upper sole separation)	Sewn assembly	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
	Open-toe shoe	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0*		
Shredding	Metal hard points	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
	Elastane > 5% - upper	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
	Inserts in the sole (wood, composite materials, metal, non elasthomere plastics)	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
Oversorting	Density difference < 0,2g / cm <sup>3</sup> between materials that are not compatible	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
	Laminated component - Upper	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
	Coated component - Upper	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
	Glued component - Upper	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0* $$		
	Overmolded component - Upper	For these characteristics, verifiable evidence of recyclability must be provided for using R2 >0 $^{*}$		
Recycling	Flame retardants	0		

\* verifiable evidence of recyclability is detailed in subsequent paragraph

2530 Verifiable evidence of recyclability in case of products containing an identified 2531 disruptor should meet the above 3 criteria from the PEF method, with additional 2532 requirements:

- Specific collection and/or sorting system which overcomes the issue of the
   disruptor.
- 25352. Specific infrastructure which allows for the dismantling and recycling ofproducts with such disruptors.
- 2537 3. The sorting and recycling infrastructures shall justify that the type of concerned
  products is indeed collected, sorted and recycled at industrial scale (and not
  lab scale).

2540

# 2541 6 Life cycle stages

2542 This section provides guidance on the modelling of the different life cycle stages.

2543 Should the user of the PEFCR wish to use company-specific data to replace the 2544 default data provided in this Section, the company-specific data shall be as 2545 representative of the product as possible (e.g., if the product is produced over three 2546 months of the year, primary data should be representative of these three months). 2547 Company-specific data shall follow the same approach as the one used to define the 2548 default data it replaces (e.g. energy consumption for the storage of products shall be 2549 based on the volume of the product and where it is stored, as well as the time spent 2550 in storage) or any other approach equally or more accurate. In any case, the DQR of 2551 the data/processes shall be calculated accordingly and comply with the PEFCR 2552 requirement (see section 5.3.1). In case of no exact match (type of material, 2553 technology of process, geographic representativeness, etc.) between the dataset and 2554 the system modelled, guidance is provided in Section 3.8.2.3 to help the user of the 2555 PEFCR find the best proxy.

The default datasets to use to model transportation modes, packaging, use phases and end of life are available in ANNEX VII – Inventory modelling and default datasets ("Default datasets & DQR" tab).

# 2559 6.1 Raw materials acquisition and pre-processing

The user of the PEFCR shall report the DQR values (for each criterion + total) for allthe datasets used.

The raw materials acquisition and pre-processing life cycle stage includes the processes starting with the extraction of the resources up to the gate of the material's production facility or pre-processing plant, according to Table 10. The raw materials acquisition and the pre-processing stages are considered to be most relevant life cycle stages for all product sub-categories and thus shall be included for all PEF studies (PEF method). This life cycle stage usually includes the extraction and processing of fibres. The following production, pre-processing and transport processes are included in the raw materials datasets provided in the most recent version of the EF database:

- Mining, extraction, and refining of resources (e.g. including raw oil);
- Pre-processing of all material inputs to the studied product, including recycled
   materials;
- Agricultural and forestry activities;
- Transportation within and between extraction and pre-processing facilities, and
   to the component's production facility (manufacturing plant) according to Table
   10; and
- Packaging production.

The PEF study report shall provide a table starting from the final product weight and identifying all upstream losses, either based on company-specific data or on default data, until the gross amount of raw materials needed for the product, calculated according to the guidance in sections 6.1.1 and 6.1.2. The table should include following columns:

- 2584 Unique component of BOM
- 2585 Life cycle stage
- 2586 Process step
- 2587 Input value with unit
- 2588 Losses with unit
- Source of loss rate (default data, company-specific data)
- 2590

## 6.1.1 Raw materials and unsold consumer products

2591 Unsold consumer products, like losses, decrease the efficiency of the supply chain and therefore shall be included in the modelling. They will not only affect the amount 2592 2593 of raw materials needed for one final garment at the consumer, but will also generate 2594 additional amounts processed and transported. Unsold consumer products are 2595 defined as "any consumer product that has not been sold including surplus, excessive 2596 inventory, overstock and deadstock, including products returned by a consumer in 2597 view of their right of withdrawal in accordance with Article 9 of Directive (EU) 2598 2011/83/EU, or, where applicable, during any longer withdrawal period provided by

2599	the trader", as defined in Ecodesign for Sustainable Products Regulation (ESPR)
2600	compromise text, published on 19 December 2023 <sup>3839</sup> . It shall include:
2601	• Surplus, excessive inventory, overstock and deadstock at any point of the
2602	distribution scheme;
2603	• Defective products only once they have reached the brand's distribution
2604	scheme;
2605	Product returns by consumer in view of their right of withdrawal in accordance
2606	with Article 9 of Directive (EU) 2011/83/EU.
2607	It shall <b>exclude</b> :
2608	Prototypes;
2609	Samples;
2610	<ul> <li>Manufacturing leftovers (e.g. deadstock fabrics);</li> </ul>
2611	Manufacturing losses;
2612	• Defective products in manufacturing, before reaching the brand's distribution
2613	scheme;
2614	<u>Resale (e.g. Through outlets, wholesalers)</u> .
2615	Items that could not be sold are defined as items that have either been written off from
2616	the company's inventory or have remained in stock in a warehouse for more than 3
2617	annual administration periods.
2618	Unsold consumer products shall be accounted for in the following life cycle stages:
2619	<ul> <li>LCS 1 – raw materials acquisition and processing</li> </ul>
2620	LCS 2 – manufacturing

- LCS 3 distribution
- LCS 5 end-of-life

<sup>&</sup>lt;sup>38</sup> The ESPR definition should be applied to qualify unsold consumer products and may be updated if further precision is provided by the Implementing or Delegated Act adopted by the Commission. Its scope is therefore to include all consumer product fit for sale that were not sold, with the following interpretation.
<sup>39</sup> For guidance, Article 20 1 c) refers to management modes on unsold consumer products as :: "whether directly

<sup>&</sup>lt;sup>39</sup> For guidance, Article 20 1 c) refers to management modes on unsold consumer products as ::"whether directly or through a third party, to each of the following activities preparing for re use, remanufacturing, recycling, other recovery including energy recovery and disposal operations in accordance with the waste hierarchy as defined by Article 4 of Directive 2008 98 /EC

The average unsold consumer products rate of the last three administration periods for the product sub-category shall be used, or if not available, at product category level (apparel and footwear).

In the raw materials acquisition and pre-processing stage, unsold consumer products and all other losses (distribution losses, manufacturing losses, manufacturing leftovers, etc.) shall be used as a direct multiplier of the input of raw materials as reported in Section 6.1.2. The end of life of unsold consumer products shall take place in LCS5. The end of life of unsold consumer products shall be modelled according to the product's end of life (Section 5.10), unless primary data are used.

### 2632 6.1.2 Amount of raw materials

The amount of raw materials needed to create one product shall take into account all the losses that occur throughout the product's life cycle (pre-processing losses, manufacturing leftovers, manufacturing losses (including assembly losses), unsold consumer products and distribution losses).

This means that each pre-processing and manufacturing process must be disaggregated in single steps, including specific losses for each step. Only if a new, complete EF dataset of the aggregated manufacturing processes is created, then a global loss rate can be applied. More information on pre-processing and manufacturing losses is available in Section 6.1.2.1 and Section 6.2.1.1.

2642 For each raw material, the relevant amount shall be calculated using Equation 21.

2643 
$$RawMat = mBOM * \left( \prod_{i=1}^{NPrePro} (1 + PreProLoss_i) \right) * (1 + ManuLeft) * \left( \prod_{j=1}^{NManuPro} (1 + ManuLoss_j) \right)$$
2644 
$$* (1 + UnsoldProducts) * (1 + DistribLoss)$$
2645 Equation 21
2646
2647 with the following parameters:
2648 • RawMat : is the total mass of the raw material produced (kg).
2649 • mPOM: is the mass of the raw material in the POM based on grading as defined.

*mBOM*: is the mass of the raw material in the BOM based on grading as defined
 in Section 3.3.1 (kg).
2651 • *PreProLossi* is the fraction of the raw material lost during pre-processing step 2652 *I*, and *NprePro* is the number of pre-processing steps. If the material goes 2653 through one pre-processing step only, *NprePro* = 1 and the equation considers only *PreProLoss*<sub>1</sub>. If *NprePro* > 1, the product of  $(1 + PreProLoss_i)$  is made for 2654 2655 each pre-processing step / to obtain the total losses for all NprePro preprocessessing steps (%). The losses for each specific pre-processing step as 2656 2657 specified in the single datasets shall be considered unless specific data are 2658 available.

2659

2660

• *ManuLeft*.: is the fraction of the raw material lost through manufacturing leftovers (%).

*ManuLossi*: is the fraction of the raw material lost during manufacturing process
 j, and *NmanuPro* is the number of manufacturing processes. If the material
 goes through one manufacturing process only, *NmanuPro* = 1 and the equation
 considers only *ManuLoss1*. If *NmanuPro* > 1, the product of (1+ *ManuLossj*) is
 made for each manufacturing process *j* to obtain the total losses for all
 *NmanuPro* manufacturing processes (%). The losses for each specific
 manufacturing process as specified in the single datasets shall be considered.

- *UnsoldProducts*: is the fraction of the raw material used to create unsold
   consumer products (see Section 6.3 for more details).
- *DistribLoss*: is the fraction of the raw material lost through distribution losses
   (see Section 6.3 for more details)

Note: Equation 21 is used for the calculation of the amounts at each step of the manufacturing chain to select the correct value per processing dataset by deleting the term  $(\prod_{i=1}^{NPrePro}(1 + PreProLoss_i))$  – see Equation 25.

2675 In case manual processes are used, the user of the PEFCR shall consider material2676 losses.

- 2677 Equation 21 shall be fully or partially applied depending on the mass that shall be 2678 calculated:
- Case 1: It shall be fully applied to calculate the amount of unprocessed raw
   material required.

- Case 2: It shall be applied up to the pre-processing step assessed (*PreProLossi*)
   to calculate the amount of partially pre-processed raw material.
- Case 3: It shall be applied without pre-processing losses to calculate the mass
   of raw material transported (Section 6.1.6).
- 2685 To illustrate for a skirt with the following parameters:
- mBOM weighs 150g;
- The raw material goes through two LCS1 pre-processing steps with the
   following pre-processing losses, PreProLoss1 = 3%; PreProLoss2 = 1%;
- The material goes through three LCS2 processes with the following losses
   *ManuLoss* 1 = 1%; *ManuLoss* 2 = 5%, *ManuLoss* 3 = 8%;
- 10% manufacturing leftovers are created, *ManuLeft*. = 10%;
- 12% of products remain unsold to consumers UnsoldProducts = 12%
- And losses during distribution are *DistribLoss* = 1%.
- 2694 The mass of unprocessed raw materials to produce is:

2695 0.15 \* [(1+0.03)\*(1+0.01)] \* (1+0.10) \* [(1+0.01)\*(1+0.05)\*(1+0.08)] \* (1+0.12) \*2696 (1+0.01) = 0.222 kg of raw material.

In case multiple parts of the product are made of the same material but not going
through the exact same pre-processing steps, the calculation for that raw material
shall be done for each series of pre-processing steps, and the results summed up at
the end.

2701 **The mass of pre-processed raw material** getting out of pre-processing step 1 is:

2702 0.15 \* [(1+0.01)] \* (1+0.10) \* [(1+0.01)\*(1+0.05)\*(1+0.08)] \* (1+0.12) \* (1+0.01) =2703 0.216 kg of raw material.

2704 **The mass of pre-processed raw material** to use for the calculation of the raw 2705 material distribution (Section 6.1.6) is:

2706 0.15 (1+0.10) \* [(1+0.01)\*(1+0.05)\*(1+0.08)] \* (1+0.12) \* (1+0.01) = 0.214 kg of raw
2707 material.

#### 2708 6.1.2.1 Pre-processing losses

2709 For raw materials pre-processing losses, the input and output amounts shall be 2710 calculated based on the bill of materials according to Section 6.1.2. Pre-processing 2711 losses shall be understood as the waste produced during a pre-processing step.

2712 If no company-specific information is available for the losses associated to a pre-2713 processing step, the default loss rate documented in the EF dataset shall be used. If 2714 the dataset documentation is unclear, or if the loss rate isn't documented, a default 2715 loss rate of 15% shall be used (Quantis expertise). The end of life of these losses shall

2716 be considered in LCS1 according to the CFF (Section 5.10).

2717 The following hypothesis shall be considered: the amount of input material for process

2718 *n* is equal to the amount of output material for process *n*-1 (T-shirt PEFCR, 2019).

2719 Therefore, the output material and the processing losses can be used to calculate the 2720 amount of input raw material. Equation 22 shall be used to determine the amount of 2721 input material:

Amount of input material<sub>n</sub> = Amount of output material<sub>n</sub> +  $Waste_n =$ 

- 2722
- 2723
- 2724

Amount of output material<sub>n</sub> \* (1 + LossRate<sub>n</sub>) Equation 22 2725 Where the input and output are measured in kg and the waste is measured as a

2726 percentage. For example, assuming that the pre-processing step n produces 15% 2727 waste, 1 kg of pre-processed cotton requires 1.15 kg of cotton from process step n-1 2728 according to Equation 22 above.

2729 6.1.2.2 Humidity variations

2730 In case there is a variation of humidity between the input and output and that the data 2731 are available, the previous results shall be scaled-up. Equation 23 provides guidelines 2732 on how to make the adaptation.

2733

Facor of adaptation =  $\frac{(1 - Humidity out_n)}{(1 - Humidity in_n)}$ 

2734

2735 To illustrate, for the same pre-processing step with a 15% loss rate, if the pre-2736 processed cotton has a 5% humidity content, and the humidity of the cotton at step n-147

Equation 23

2737 *1* is 8%, 1 kg of pre-processed cotton will not require 1.18 kg of cotton from process 2738 step *n*-1 but 1.18 \* (1-5%) / (1-8%) = 1.22 kg.

2739 One last calculation step occurs when choosing a dataset to model the inventory of 2740 the process step n-1 with a different humidity content to the one of the input of process 2741 *n*. In this case the factor shall be adapted according to Equation 24.

2742 Facor of adaptation = 
$$\frac{(1 - Humidity reported in the dataset_{n-1})}{(1 - Humidity desired_n)}$$

Equation 24

2744 If the humidity of the dataset for process step n-1 is 10% although the actual humidity 2745 of the input of process n is 8%, the dataset shall be scaled with a factor of 1.22 \* (1-2746 10%)/(1-8%) = 1.19 to model the inventory. If no information is available for the 2747 humidity of the output of the dataset for process n-1, it shall be considered as equal to 2748 the one of process step n.

#### 2749 6.1.3 Production of raw materials

- 2750 For both apparel and footwear products, the following processes shall be considered:
- Production of raw textile materials (plant-based and synthetic);
- Production of fibrous and non-fibrous animal-based materials;
- Trims production;
- Packaging materials production and processing; and
- Transportation between the extraction and pre-processing facilities and to the
   production facility (manufacturing plant).

In background EF-compliant datasets of products derived from native forest, the metadata either indicate the LUC emissions calculated, or indicate the carbon content of the product and that corresponding LUC emissions that shall be integrated in the study shall be modelled with '(land use change)' elementary flows. For non-compliant datasets from another database or that were created for the specific PEF, LUC must be modelled as described in the PEF method.

### 2763 6.1.4 Circularity of raw materials

2764 Circularity of raw materials is addressed in the following two cases:

- The apparel or footwear product uses recycled materials, which can be of textile
   or non-textile origin; or
- The apparel or footwear product is recycled after use; this includes recycling
   apparel and footwear into raw materials for chemicals or other materials such
   as rubber, plastic, composites, etc.

In these two cases, the credits and impacts associated to these flows are modelled
and allocated to the raw material using the Circular Footprint Formula (CFF),
presented in detail in Section 5.10. Additional details regarding the CFF are described
in Section 4.4.8.1 of the PEF method.

#### 2774 6.1.5 Packaging production and distribution

2775 Different packaging types need to be produced to ensure safe shipping and storage 2776 of:

- 2777 Raw materials, semi-finished & intermediate products; and
- 2778 Apparel and footwear products.

If the packaging of raw materials, semi-finished & intermediate products is already considered in the EF datasets used for the study, it shall not be modelled separately to prevent double counting. If the packaging isn't included in the dataset, or if the documentation of the dataset is unclear, packaging shall be modelled as described below, even if it may lead to double counting.

- Packaging materials may include recycled material. The company shall use the default
  R1 parameter in the latest version of Part C of Annex II of the PEF method, unless
- 2786 primary data are used.
- 2787 6.1.5.1 Transport of packaging

It is assumed that all packaging comes from the same continent as the plant where itis used, unless primary data are used. The transportation modes listed below areadditive.

Packaging transport is assumed to be weight-limited for all packaging types. The
default parameters (from the PEF method) for packaging transport in Table 27 below
shall be used unless primary data are used. These parameters shall also be used to
model the return of reusable packaging such as pallets, unless primary data are used.

Table 27 - Default transport parameters for all packaging materials

Supply chain	Distance (km)	Utilisation ratio	Share of product mass transported (%)	Transportation mode
Supplier located within the continent of the	230	64%		Truck (>32 t, EURO 4)
	280	n/a	100%	Train (average freight train)
manufacturing plant	360	n/a		Ship (barge)

- 2796 6.1.5.2 Raw materials' packaging
- 2797 Raw materials' packaging is excluded from the system boundaries (see Section 3.4 2798 for more information).
- 2799 6.1.5.3 Semi-finished & intermediate products' packaging

2800 Unless primary data are used, the default packaging amounts and materials reported 2801 in Table 28 shall be used, based on secondary and tertiary packaging of apparel and 2802 footwear products divided by the average RP weight and a volume factor of 4 to 2803 account for transport volume inefficiencies (proxy based on ambient volume storage 2804 volume factor, OEFSR Retail, 2018). If a dataset already contains packaging, 10% of 2805 the default quantities shall be removed for each process (up to 100% if all datasets 2806 contain packaging). If it is unclear whether the dataset contains packaging or not, it 2807 shall be assumed that packaging is not included.

2808 Table 28 - Default packaging materials per kilogram of semi-finished and intermediate product 2809 transported

Packaging	Mass kg/kg semi-finished and intermediate products	Material
Corrugated cardboard	0.040	Corrugated cardboard
Pallets	0.00002*	Pallets
Shrink film	0.001	Shrink film

2810

\* including default reuse factor (PEF method, 2021, 4.4.9.5 Average reuse rates for third party operated pools).

2811 The default pallet mass value shall be used to account for the production impact of the 2812 pallets, but it shall be multiplied by the default reuse factor to obtain the total weight 2813 necessary to calculate the transport impact for one product as calculated in Table 28. 2814 The total mass of semi-finished & intermediate products transported shall be 2815 calculated at the gate of the assembly step as explained in Section 6.2.1.

2795

2816 The end of life of the semi-finished & intermediate products packaging shall be 2817 accounted for in LCS2. Packaging circularity is discussed in Section 6.1.5.5.

2818 6.1.5.4 Apparel and footwear products packaging

2819 Three kinds of packaging (primary, secondary and tertiary) shall be differentiated as2820 follows:

- Primary packaging: Material that immediately covers the product. For
   example, primary packaging can consist of a plastic film or bag, or paper
   wrapping. The hangtag is also considered to be primary packaging as well as
   cellulose paper for footwear.
- Secondary packaging: Packaging or containment of a primary package.
   Packaging for multiple products and their labels are also considered to be secondary packaging.

Tertiary packaging: Packaging conceived to facilitate handling and transport
 of a number of sales units, or grouped packaging to prevent physical handling
 and transport damage.

Unless primary data are used, the default packaging materials per different business scenarios (Figure 10) reported in Table 29, Table 30 and Table 31 shall be used for all apparel and footwear sub-categories (expert judgement and Sandin, 2019). The transport steps for apparel and footwear products are detailed in Table 37.

2835 Table 29 - Default packaging materials per piece of garment, for retail / in-store business scenario

Sub-category	Packaging type	Raw material	Amount	Unit
Apparel		Polybag <sup>40</sup>	0.020	kg
	Primary	Polybag <sup>40</sup>	0.010	kg
		Paper bag	0.022	kg
		Paper (hangtag)	0.001	kg
		Plastic (hangtag)	0.001	kg
	Secondary	Corrugated cardboard	0.060	kg
	Tertiary	Wood pallets	0.001*	kg

<sup>&</sup>lt;sup>40</sup> One polybag is for the film directly around the product and the other polybag is a proxy for the bag received in store

Sub-category	Packaging type	Raw material	Amount	Unit
		Shrink film	0.001	kg
		Polybag	0.010	kg
	Primary	Paper bag	0.022	kg
		Corrugated cardboard	0.200	kg
		Paper (hangtag)	0.001	kg
Footwear		Plastic (hangtag)	0.001	kg
		Cellulose paper	0.100	kg
	Secondary	Corrugated cardboard	0.060	kg
	Tantian	Wood pallets	0.001*	kg
	renary	Shrink film	0.001	kg

### 2836 \* Including default reuse factor (PEF method, 2021, 4.4.9.5 Average reuse rates for third party operated pools).

2837 Table 30 - Default packaging materials per piece of garment, for e-commerce business scenario

Sub-category	Packaging type	Raw material	Amount	Unit
		Corrugated cardboard	0.060	kg
		Polybag	0.020	kg
	Primary	Paper bag <sup>41</sup>	0.022	kg
Apparel		Paper (hangtag)	0.001	kg
		Plastic (hangtag)	0.001	kg
	Secondary	Corrugated cardboard	0.060	kg
	Tertiary	Wood pallets	0.001*	kg
		Shrink film	0.001	kg
		Corrugated cardboard	0.200	kg
		Paper bag <sup>41</sup>	0.022	kg
	Primary	Paper (hangtag)	0.001	kg
Footwoor		Plastic (hangtag)	0.001	kg
Footwear		Cellulose paper	0.100	kg
	Secondary	Corrugated cardboard	0.060	kg
	Tortion	Wood pallets	0.001*	kg
	Tendary	Shrink film	0.001	kg

<sup>&</sup>lt;sup>41</sup> Refers to online outer bags

#### \* Including default reuse factor (PEF method, 2021, 4.4.9.5 Average reuse rates for third party operated pools).

2839

Table 31 - Default packaging materials per piece of garment, for F2C business scenario

Sub-category	Packaging type	Raw material	Amount	Unit
		Polybag	0.020	kg
	Primary	Paper (hangtag)	0.001	kg
Apparel		Plastic (hangtag)	0.001	kg
Аррагеі	Secondary	Corrugated cardboard	0.060	kg
	Totion	Wood pallets	0.001*	kg
	Tentary	Shrink film	0.001	kg
Footwear		Corrugated cardboard	0.200	kg
	Primary	Paper (hangtag)	0.001	kg
		Plastic (hangtag)	0.001	kg
		Cellulose paper	0.100	kg
	Secondary	Corrugated cardboard	0.060	kg
	Totion	Wood pallets	0.001*	kg
	Tertiary	Shrink film	0.001	kg

\* Including default reuse factor (PEF method, 2021, 4.4.9.5 Average reuse rates for third party operated pools).

The default pallet mass value shall be used to account for the production impact of the pallets, but it shall be multiplied by the default reuse factor to obtain the total weight necessary to calculate the transport impact for one product as calculated in Table 31.

If packaging contains several apparel or footwear products (e.g. one corrugated cardboard box contains 30 t-shirts), the total packaging weight shall be divided by the number of products enclosed. The end of life of primary packaging shall be accounted for in LCS5, and the end of life of secondary and tertiary packaging shall be accounted for in LCS3. The default datasets proposed in the Annex VII already include the collection of the packaging at the end of life.

2850 Packaging circularity is discussed in Section 6.1.5.5.

2851 6.1.5.5 Packaging circularity

2852 If the packaging contains recycled materials or if it is sent to recycling or energy2853 recovery at its end of life, the burdens and credits shall be allocated using the CFF,

presented in Section 5.10, using the default parameters available in the latest versionof Part C of Annex II of the PEF method for the relevant packaging materials.

In the case of reusable packaging, the expected number of reuses of the packaging
shall be used to allocate packaging production and end of life to the apparel or
footwear product life cycle. Guidance on evaluating the number of reuses of the
packaging is given in the PEF method in Section 4.4.9.3.

2860

#### 6.1.6 Transport of raw materials

# Note Default raw materials and packaging transport processes can be found in ANNEX VII – Inventory modelling and default datasets ("Default datasets & DQR" tab).

2861 The transportation of raw materials used for apparel and footwear products from a 2862 supplier to the manufacturing plant shall be included in the raw materials life cycle 2863 stage (LCS 1). The transportation of raw materials requires the production of 2864 packaging (see Section 6.1.5) as well as its distribution. In case the raw material is bought as a global commodity<sup>42</sup>-the transport shall be modelled as if the supplier is 2865 2866 located outside the continent of the processing plant (ship). The impact of the 2867 transport shall be calculated per tonne kilometre (tkm), which is equivalent to the 2868 transport of 1 tonne (t) of product over 1 kilometre (km). The distance and 2869 transportation mode for each material coming to the manufacturing plant shall be 2870 based on specific data as indicated in Section 5.1.2, and weight-limited transport shall 2871 be considered for all materials transported. In the case of a data gap, the default 2872 values given in Table 32 shall be used (adapted from the PEF method 2021; Eurostat, 2873 2015a, the shares of product mass transported for each origin from TS expertise). Note that in the case of multi-sourcing for the same item, the allocation of resources 2874 2875 and emissions should be done by mass allocation.

- 2876 For better clarity on how to use Table 32 for raw materials:
- 2877 2878

• As a default, a single transportation step shall be modelled for raw materials, representing all necessary transport legs.

<sup>&</sup>lt;sup>42</sup> See Definitions Section

2879 As a proxy, that single transportation step is represented as the transport 2880 between the last pre-processing step and the first manufacturing step. 2881 The mass transported shall consider the mass of the raw materials at the entry 2882 gate of the first process step in LCS2, as explained in Section 6.1.2. The mass transported shall be multiplied by the distance (column 3) and the 2883 • 2884 share of product mass transported (column 4) for the relevant transportation mode (column 6). Column 5 gives an example of the calculation. 2885 2886 The parameters (distances, shares of product mass transported, and utilisation 2887 ratio) shall only be updated with primary specific data if the following data points are all available: 2888 2889 • The origin of raw materials. The distances for all transport legs. The distances shall be determined 2890 using the recommended calculators<sup>43 & 44</sup>, or tools equally or more 2891 2892 accurate. The transport modes and the shares of product mass transported. The 2893 0 user of the PEFCR shall ensure that the sum of all the shares of product 2894 mass transported is equal to 100%. The utilisation ratio<sup>45</sup> shall be 2895 2896 adapted in the EF database dataset if available, otherwise default data 2897 shall be used. 2898 The default datasets to use to model the transportation mode are available in 2899 ANNEX VII – Inventory modelling and default datasets ("Default datasets & DQR" tab). 2900

290	901 Table 32 - Default transport scenarios for raw materials, semi-finished & intermediate products							
	Supply chain location	Utilisatio n ratio	Distanc e (km)	Share of product mass transporte d (%)	Calculation (Mass (t) x distance (km) x Share of product mass transported (%))	Transportation mode		
	Supplier	64%	1'000		Mass transported x 1'000 x 0.4	Truck (>32 t, EURO 4)		
	same continent as	n/a	1'000	40%	Mass transported x 1'000 x 0.4	Train (average freight train)		

<sup>&</sup>lt;sup>43</sup> <u>https://www.searates.com/services/distances-time/</u> or https://co2.myclimate.org/en/flight\_calculators/new/

<sup>44</sup> https://co2.myclimate.org/en/flight\_calculators/new/

<sup>&</sup>lt;sup>45</sup> Real load transported divided by the mass of the payload considering empty returns (ratio of the distance travelled to collect the next load after unloading the product to the distance travelled to transport the product)

Supply chain location	Utilisatio n ratio	Distanc e (km)	Share of product mass transporte d (%)	Calculation (Mass (t) x distance (km) x Share of product mass transported (%))	Transportation mode
the processing plant	n/a	800		Mass transported x 800 x 0.4	Ship (barge)
Supplier located outside the continent of the processing plant (ship)	64%	1'000	55%	Mass transported x 1'000 x 0.55	Truck (>32 t, EURO 4)
	n/a	18'000		Mass transported x 18'000 x 0.55	Ship (transoceanic container)
Supplier located outside the continent of the processing plant (plane)	64%	1'000	5%	Mass transported x 1'000 x 0.05	Truck (>32 t, EURO 4)
	n/a	10'000		Mass transported x 10'000 x 0.05	Air freight (cargo plane)

2902 In case of multiple sources, a weighted average of the distances shall be calculated

at product level if data are available, otherwise, at company level. For example, if 50%

is coming from location 1 with a distance of 1'000 km and 50% from location 2 with a

distance of 3'000 km, the weighted average distance is 50% x 1'000 km + 50% x 3'000

2906 km = 2'000 km.

## 6.2 Manufacturing

If the user of the PEFCR is an SME without access to specific data, the country energy mix of the datasets can be updated using a global energy mix. Otherwise, primary data regarding the location of the manufacturing step, or, if available, data related to the specific energy mix of the supplier shall be used to model the energy inputs during the manufacturing stage. The electricity mix (i.e. national consumption) used shall be a production-weighted average when data from multiple sites are used.

2914 Details on how to address multi-functionality of the manufacturing processes are 2915 provided in Section 5.7.

When the documentation of an EF dataset doesn't detail clearly if the dataset represents a single step or multiple step process, the user shall consider that it only applies to a single step. For example, for a cutting process dataset, the dataset shall be considered to represent one cutting operation.

The manufacturing waste shall be included in all modelling steps up to the output of the manufacturing stage. Manufacturing wastes shall be modelled in LCS2 according to the CFF (PEF method Section 4.4.2) and following the same end of life scenarios as the final products (apparels or footwear).

Note	Default manufacturing processes can be found in ANNEX VII -
	Inventory modelling and default datasets ("Default datasets & DQR"
	tab).

The user of the PEFCR shall report the DQR values (for each criterion + total) for all the datasets used.

#### 2926 6.2.1 Amount of semi-finished & intermediate products

The amount of semi-finished & intermediate products needed to create one product shall take into account all the losses that occur throughout the product's life cycle (preprocessing losses, manufacturing leftovers, manufacturing losses (including assembly losses), unsold consumer products and distribution losses). This means that each manufacturing process must be disaggregated in single steps, including specific losses for each step. Only if a new, complete EF dataset of the aggregated manufacturing processes is created can a global loss rate be applied. More information on manufacturing losses is available in Section 6.2.1.1.

For each semi-finished & intermediate product, the relevant amount for input for the service process<sup>46</sup> shall be calculated using Equation 25.

2937 
$$SFIP_{i} = mBOM_{i} * (1 + ManuLeft) * \left(\prod_{j=1}^{NManuPro} (1 + ManuLoss_{j})\right) * (1 + UnsoldProducts)$$
2938 \* (1 + DistribLoss)
2939 Equation 25

2940 Where:

- *SFIP*: is the total mass of the considered Semi-Finished & Intermediate
   Products (kg)
- *mBOMi*: is the mass of the considered SFIP in the BOM based on grading as
   defined in Section 3.3.1 (kg)
- *ManuLeft*: is the fraction of the raw material lost through manufacturing
   leftovers (%).
- 2947 *ManuLossi* is the fraction of the raw material lost during manufacturing process 2948 j, and *NManuPro* is the number of manufacturing processes starting from the BOM based on grading up until the considered service process. If the material 2949 2950 goes through one manufacturing process only, *NManuPro* = 1 and the equation 2951 considers only *ManuLoss1*. If *NManuPro* > 1, the product of (1+ *ManuLossi*) is 2952 made for each manufacturing process *j* to obtain the total losses for all NManuPro manufacturing processes (%). The losses for each specific 2953 2954 manufacturing process as specified in the single datasets shall be considered.
- *UnsoldProducts*: is the fraction of the raw material used to create unsold
   consumer products (see Section 6.3 for more details).
- *DistribLoss*: is the fraction of the raw material lost through distribution losses
   (see Section 6.3 for more details)

<sup>&</sup>lt;sup>46</sup> Service activities have inputs and outputs required to perform a service on another product, without the actual input and output of the product receiving the service. Services are therefore defined as immaterial exchanges, i.e., without a physical good changing ownership (https://support.ecoinvent.org/activities-products).

2959 In case manual processes are used, the user of the PEFCR shall consider material2960 losses.

Equation 25 shall be fully or partially applied depending on the mass that shall be calculated:

- Case 1: It shall be fully applied to calculate the input amount of semi-finished
   and intermediate product for the scaling of the service process.
- Case 2: It shall be applied up to the manufacturing step assessed (*ManuLossi*.)
   to calculate how much input that manufacturing process requires.
- Case 3: It shall not consider the manufacturing losses to calculate the mass of
   semi-finished and intermediate products transported (Section 6.2.3).

For textile processes that require a conversion between  $m^2$  and kg, the user of the PEFCR shall use either specific grammage of the fabric or use the default value of 200g/m<sup>2</sup>.

- 2972 To illustrate for a skirt with the following parameters:
- mBOM<sub>i</sub> weighs 150g;
- 10% manufacturing leftovers are created, *ManuLeft*. = 10%;
- The material goes through three LCS2 processes with the following losses
   *ManuLoss* 1 = 1%; *ManuLoss* 2 = 5%, *ManuLoss* 3 = 8%;
- 12% of products remain unsold to consumers *UnsoldProducts* = 12%
- Losses during distribution are *DistribLoss* = 1%.

2979 Case 1 – The amount of input SFIP<sub>i</sub> for manufacturing process 1 is 0.15 \* (1+0.10) \*2980 [(1+0.01)\*(1+0.05)\*(1+0.08)] \* (1+0.12) \* (1+0.01) = 0.214 kg. Same as case 3 of 2981 Section 6.1.2.

2982 Case 2a – The mass of input SFIP<sub>i</sub> for manufacturing step 2 and output SFIP<sub>i</sub> for 2983 manufacturing process 1 is: 0.15 \* (1+0.10) \* [1+0.05)\*(1+0.08)] \* (1+0.12) \* (1+0.01)2984 = 0.212 kg

2985 Case 2b – The mass of input SFIP<sub>i</sub> for manufacturing step 3 and output SFIP<sub>i</sub> for 2986 manufacturing step 2 is: 0.15 \* (1+0.10) \* [(1+0.08)] \* (1+0.12) \* (1+0.01) = 0.202 kg 2987 Case 2c – The mass of output SFIP<sub>i</sub> for manufacturing step 3 is: 0.15 \* (1+0.10) \* (1+0.12) \* (1+0.01) = 0.187 kg. Same as case 3 below.

2989 Case 3 - The mass of SFIP<sub>i</sub> to use for the calculation of the SFIP<sub>i</sub> transport (Section 2990 6.2.3) is: 0.15 \* (1+0.10) \* (1+0.12) \* (1+0.01) = 0.187 kg.

- 2991 6.2.1.1 Manufacturing losses
- 2992 Manufacturing losses are of two kinds:
- Processing losses
- Assembly losses and manufacturing leftovers

The calculation of the manufacturing losses of the semi-finished & intermediate products shall be performed according to Equation 22, Equation 23 and Equation 24 from Section 6.1.2.1.

If no company-specific information for a manufacturing process is available neither a
default loss rate in the EF dataset used to model this step, a default loss rate of 15%
shall be used (Quantis expertise). The end of life of these losses shall be considered
in LCS2 according to the CFF (Section 5.10), unless company-specific data are used.

3002 6.2.1.2 Assembly losses and manufacturing leftovers

The mass of the assembly losses shall be determined as the difference between the mass of the BOM for one product and the mass of the product. This is a mandatory primary data point if the BOM is not available (Section5.1.3.1) The end of life of these losses shall be considered in LCS2 according to the CFF (Section 5.10).

In this life cycle stage, intermediary products that were not used, here defined as leftovers, are taken into account with an additional input of raw materials included in LCS1 and additional amounts manufactured, taken into account in LCS2. The end of life of leftovers shall take place in LCS2, and the default end of life scenarios correspond to the product's end of life scenarios (Section 6.5). A 5% rate of manufacturing leftovers shall be used (TS expertise judgement), unless primary data are used.

#### 3014 6.2.2 Manufacturing of the final product

3015 Considerations for the manufacturing life cycle stage are different between apparel 3016 and footwear products and thus include different manufacturing processes, which are 3017 described separately below. In both cases, the supply chains have been broken into 3018 a system of "tiers" based on closeness to the apparel and footwear manufacturer (tier 3019 1 being directly in contact with the manufacturer).

3020 Apparel manufacturing (including apparel accessories) includes the following 3021 processes:

- Processing of raw materials, both from virgin and recycled content. This
   includes various processes such as pre-spinning processes (scouring, carding,
   combing, hackling, etc.), spinning fibres into yarn as well as processing non fibrous products (for example leather, down or foam) into other intermediate
   products (for example padding).
- Manufacturing processes, such as knitting and weaving textiles, preparation,
   dyeing (fibre, yarn, fabric) and finishing of fabric.
- Component consolidation and final assembly of the product. This includes
   various processes such as cutting, assembly (cutting/sewing), garment wet
   processing/washing, dry treatment processes (e.g. laser), and the packaging
   for sale.
- 3033 Footwear manufacturing includes the following processes:
- Component manufacturing including manufacturing of the individual parts of the
   shoe (bottom, mid and upper parts) as well as compound forming (sole
   production), in-sole production, die-cutting and sewing.
- Component consolidation and final assembly of the product. Processes
   included are: stockfitting, assembly and the packaging for sale.

3039 Footwear manufacturing can be very complex and variable, with different 3040 manufacturing pathways found for the same type of shoe and brand. The processes 3041 above have been selected due to their applicability for most types of footwear products 3042 and manufacturing pathways, covering the most environmentally intensive processes.

3043 In case the user of the PEFCR does not have access to the product-specific 3044 manufacturing information such as yarn size, yarn count or dyeing technology, 3045 manufacturing (including both pre-processing and manufacturing processes) shall be 3046 modelled using the same processes included in the RP-study and detailed in LCS2 of 3047 Table 10 as well as in Annex VII ("Default datasets & DQR" tab). These steps may not 3048 occur in the manufacturing chain of a single product but are a good representation of 3049 the average impact of manufacturing. Should the user of the PEFCR have access to partial product-specific manufacturing process information, relevant processes from 3050 3051 the RP-study and detailed in LCS2 of Table 10 shall be selected, paying particular 3052 attention to the selection of a fair number of processes to neither overestimate nor 3053 underestimate the impact of the manufacturing stage, and covering the complete pre-3054 processing and manufacturing stages.

In case the products valorise manufacturing leftovers of a previous apparel or footwear
lifecycle, this shall be accounted according to the CFF (Section 5.10) and especially
with CFF parameters reported in Table 21.

3058

#### 6.2.3 Transport of semi-finished and intermediate products

## Note Default transport and packaging processes can be found in ANNEX VII – Inventory modelling and default datasets ("Default datasets & DQR" tab).

The production of the packaging required for the transportation of semi-finished & intermediate products shall be accounted for in LCS1 (see Section 6.1.5), while its end of life shall be accounted for in LCS2. The packaging distribution (freight train, truck, ship or plane) is the same as the distribution of the raw materials (see Section 6.1.6), but it shall be accounted for in LCS2.

The distance and transportation mode for semi-finished and intermediate products between manufacturing plants shall be based on the specific data listed in Section 5.1.3.2, and weight-limited transport shall be considered for all materials transported. In the case of a data gap, the default values given in Table 32 shall be used (adapted from the PEF method 2021; Eurostat, 2015a).

3069 For better clarity on how to use Table 32 for semi-finished and intermediate products:

- A single transportation step shall be modelled for semi-finished and
   intermediate products, representing all necessary transport steps.
- As a proxy, that single transportation step is represented as the transport
   between the last manufacturing step and assembly.
- The mass transported shall consider the mass of the semi-finished &
   intermediate products at the entry gate of the assembly step (see Section
   6.2.1), as well as their packaging mass (see Section 6.1.5.4).
- The mass transported shall be multiplied by the distance (column 3) and the
   the share of product mass transported (column 4) for the relevant transportation
   mode (column 6). Column 5 gives an example of the calculation.
- The parameters (distances, shares of product mass transported, and utilisation
   ratio) shall only be updated with primary specific data if the following data points
   are all available:
- 3083 The origin of all manufacturing steps
- 3084 o The distances shall be determined using the recommended calculators<sup>47</sup>
   3085 <sup>& 48</sup>, or tools equally or more accurate.
- 3086•The transport modes and the shares of product mass transported for3087each transport leg. The user of the PEFCR shall ensure that the sum of3088all the shares of product mass transported is equal to 100% for each3089transport leg. The utilisation ratio<sup>49</sup> shall be adapted in the EF database3090dataset if available, otherwise default data shall be used.
- The default datasets to use to model the transportation mode are available in
   ANNEX VII Inventory modelling and default datasets ("Default datasets &
   DQR" tab).

### 3094 6.3 Distribution stage

3095 The transport of the final product from factory to final client (including consumer 3096 transport) shall be modelled within this life cycle stage. The final client is defined as

<sup>&</sup>lt;sup>47</sup> <u>https://www.searates.com/services/distances-time/</u> or https://co2.myclimate.org/en/flight\_calculators/new/

<sup>48</sup> https://co2.myclimate.org/en/flight\_calculators/new/

<sup>&</sup>lt;sup>49</sup> Real load transported divided by the mass of the payload considering empty returns (ratio of the distance travelled to collect the next load after unloading the product to the distance travelled to transport the product)

3097 the individual purchaser of the apparel or footwear product. In case supply-chain-3098 specific information is available for one or several transport parameters, they may be 3099 applied following the Data Needs Matrix.

> Note Default distribution processes can be found in ANNEX VII – Inventory modelling and default datasets ("Default datasets & DQR" tab).

The user of the PEFCR shall report the DQR values (for each criterion + total) for allthe datasets used.

3102 The waste of products during distribution and retail shall be included in the modelling.

The distribution life cycle stage is representative of a product sold on the European market (Section 3). It includes the impacts related to the transport of final apparel and footwear products to the final client, including the impacts related to intermediate storage and distribution losses. The final client is defined as a private individual. Considerations for the distribution stage are similar for all product categories because the transport modes and distances are not necessarily product specific.

#### 3109 6.3.1 Distribution models and transport legs

- 3110 6.3.1.1 Distribution models
- 3111 Three distribution models are included in this PEFCR (Figure 10):
- The factory-to-consumer e-commerce scenario, referred to as 'F2C' below:
  [1a1] + [1a3] (see Figure 11);
- The 'classic' e-commerce scenario, using classic distribution pathways
  (warehouses and distribution centers), but no stores, referred to as 'classic ecommerce' below: [2a1] + [3a] + [3b1] + [3b3] (see Figure 12);
- The retail scenario, where consumers visit brick and mortar stores, referred to as 'retail' below: [2a2] + [4a] + [4b1] + [4b3] (see Figure 13).

- 3119 The numbers in brackets refer to the transport legs described in Section 6.3.2 further
- 3120 below.



### 3121

- 3122
- 3123

Figure 10 - Transport legs and scenarios for distribution (TS expertise).

The functional unit in Figure 10 refers to a final product sold to consumers, which is the sum of the shares of the different distribution scenarios (factory-to-consumer as per Figure 11, classic e-commerce as per Figure 12 and retail as per Figure 13). Due to unsold consumer products and distribution losses, more than 1 product will need to be manufactured to have 1 final product reach the consumer.





3134 For F2C, factories are considered as the point of sale and therefore no distribution losses occur. Percentages may not add up due to rounding.





3142 The e-commerce scenario includes the transport of the final product from outside or 3143 inside Europe (factory) to a warehouse or distribution centre (located in Europe and/or 3144 local), the storage at the warehouse or distribution centre, and further transportation 3145 from the warehouse or distribution centre to the final client (see Figure 12); F2C e-3146 commerce is a growing part of online sales which involves a high share of international 3147 supply chains for products sold in Europe (see Figure 11). This includes both 3148 customised and non-customised products that are sent from the factory directly to the 3149 consumer. Customised products are defined as products that are specifically tailored 3150 to an individual's or organization's specifications and meets precise requirements for 3151 fit, style, and function and are not available off-the-shelf.

3152 In the retail sales scenario, the product is first transported from the factory to a 3153 warehouse or distribution centre (located in Europe), then from the warehouse or 3154 distribution centre to a retail/ store, and finally transported to the final clients' home by 3155 the consumer (see Figure 13). To have 1 final product reach the consumer, more than 3156 1 product will need to be manufactured due to manufacturing losses, unsold consumer 3157 products, and distribution losses. Company-specific data is required for the total share 3158 of unsold consumer products (UnsoldProducts, see Section 6.1.1), which include 3159 unrestocked returns (returned products that are not restocked for resale) and inventory 3160 glut (items that are made for a brand/retailer and sent to their distribution centre, such 3161 as surplus, excessive inventory, overstock and deadstock).

The distribution stage impacts depend mainly on supply chain specifics (e.g. local, intracontinental and international supply chains), corresponding transport modes and utilisation ratios, and distances covered, as well as product weights and volumes.

3165 6.3.1.2 Product returns and unsold consumer products

Returns are taken into account by multiplying the distances from warehouse to final client by the percentage of the returns. The distribution of unsold consumer products as defined in Section 6.1.1 shall be included in this life cycle stage (see Table 33 for default values and Table 34 for primary data calculation). Unsold consumer products in this life cycle stage takes the form of unrestocked items (e.g. items that were sold, brought back by the consumer and never restocked, see Section 6.1.1) and inventory 3172 glut (Items that are made for a brand/retailer and sent to their distribution centre, such 3173 as surplus, excessive inventory, overstock and deadstock). It can be retained either at 3174 the point of sale (local warehouse or retail store, InventoryGlut<sub>POS</sub>) or at the European 3175 distribution centre (InventoryGlut<sub>DC</sub>). For example, a 16.3% unsold consumer products 3176 rate will mean that the weight of the final product transported will be multiplied by 1.163 3177 per product for the transport steps up to where the unsold consumer products remain. 3178 The end of life of unsold consumer products shall take place in LCS3 and be modelled 3179 using the end-of-life scenarios described in Section 5.10, unless company-specific 3180 data are used.

3181 Returns that are restocked and sold are considered part of the functional unit. 3182 Unrestocked returns fall under the unsold consumer products definition (see also 3183 Section 6.1.1).

3184 6.3.1.3 Distribution losses

A default loss rate DistribLoss of 1% (TS expertise) shall be used for the distribution
stages until the point of sale for all apparel and footwear sub-categories, unless
primary data are used.

3188 Company-specific losses are modelled based on the total quantity of product that 3189 leaves the factory compared to the quantity that arrives in sellable condition at the 3190 point of sale.

The end of life of distribution losses shall take place in LCS3 and be modelled using the end-of-life scenarios described in Section 5.10, unless company-specific data are used.

3194 6.3.2 Shares of transport legs

The final product will be distributed through the three distribution models with Share<sub>Retail</sub> the share of products sold through retail stores, Share<sub>ClassicECom</sub> the share of products sold through classic e-commerce and Share<sub>F2C</sub> the share of products sold through e-commerce directly delivered to the final client (F2C). The sum of the shares of the three distribution models shall add up to 100%, including returns that are sold again.

#### 3201 6.3.2.1 Shares of transport legs for the F2C scenario

3202 The following transport legs (adapted from the PEF method) are considered for 3203 apparel and footwear, with the number in brackets matching Figure 11 above:

- From factory to the final client (F2C) [1a1];
- From final client to local warehouse/ DC for F2C returns [1a2];
- From local warehouse/ DC to final client for restocked F2C returns [1a3];

3207 It is assumed that the non-restocked share of consumer returns to point of sale ([1c]),
3208 is directly sent to end-of-life. This transport shall be modelled according to Section
3209 5.10.

**Share**<sub>F2C</sub> ([1a]) is the sum of the share of products sold to consumers through factoryto-consumer, minus the share of F2C products returned at a return rate of ReturnRate<sub>ClassicECom</sub> ([1a2]), plus the share of returned products restocked at a rate of RestockRate and sold again through classic e-commerce ([1a3]). The F2C shall only be considered for non-customised products, and customised F2C products shall consider a return rate of 0%.

3216 6.3.2.2 Shares of transport legs for the classic e-commerce scenario

3217 The following transport legs (adapted from the PEF method) are considered for 3218 apparel and footwear, with the number in brackets matching Figure 12 above:

- From factory to warehouse/ distribution centre (DC) located in Europe [2a1];
- From a warehouse/ distribution centre located in Europe to a local warehouse/
  distribution centre [3a];
- From local warehouse/ distribution centre to final client [3b1] and [3b3];
- From final client to local warehouse/ distribution centre for returns [3b2];

3224 It is assumed that the non-restocked share of consumer returns to point of sale ([3c]),
3225 the inventory glut ([2b1] and [3d]) and the distribution losses ([2c1]) are directly sent
3226 to end-of-life. This transport shall be modelled according to Section 5.10.

3227

**Share**<sub>classicEcom</sub> ([3b]) is the sum of the share of products sold to consumers through classic e-commerce ([3b1]), minus the share of classic e-commerce products returned at a return rate of ReturnRate<sub>classicECom</sub> ([3b2]), plus the share of returned products restocked at a rate of RestockRate and sold again through classic e-commerce ([3b3]).

3232 6.3.2.3 Shares of transport legs for the retail scenario

3233 The following transport legs (adapted from the PEF method) are considered for 3234 apparel and footwear, with the number in brackets matching Figure 13 above:

- From factory to warehouse/ distribution centre (DC) located in Europe [2a2];
- From warehouse/ distribution centre located in Europe to retail/ stores [4a];
- From retail/ stores to the final client (consumer travel) [4b1] and [4b3]; and
- From the final client to the retail/ stores for returns (consumer travel) [4b2].

3239 It is assumed that the non-restocked share of consumer returns to point of sale ([4c]),
3240 the inventory glut ([2b2] and [4d]) and the distribution losses ([2c2]) are directly sent
3241 to end-of-life. This transport shall be modelled according to Section 5.10.

- **Share**<sub>Retail</sub> ([4b]) is the sum of the share of products sold to consumers through retail ([4b1]), minus the share of retail products returned at a return rate of ReturnRate<sub>Retail</sub> ([4b2]), plus the share of returned products restocked at a rate of RestockRate and sold again through retail ([4b3]).
- 3246 6.3.2.4 Default shares of transport legs

To have 1 final product reach the consumer, more than 1 product will need to be manufactured due to losses, considering unrestocked returns, inventory glut and distribution losses. UnrestockedReturns represents the share of unrestocked returns ([1c] for factory-to-consumer, [3c] for classic e-commerce and [4c] for retail). InventoryGlut represents the share of inventory glut ([2b1] for InventoryGlut<sub>DC</sub> + [3d] for InventoryGlut<sub>POS</sub> for the classic e-commerce scenario and [2b2] for InventoryGlut<sub>DC</sub> + [4d] for InventoryGlut<sub>POS</sub> for the retail scenario).

The share of unsold consumer products is company-specific data and it is used to calculate inventory glut. Due to the lack of data (Cascale, 2022) on the split of inventory glut between these locations ([2b1] vs [3d] and [2b2] vs [4d]), the user of the 3257 PEFCR shall assume that inventory glut only occurs at the European distribution 3258 centre (meaning that InventoryGlut<sub>POS</sub> = 0 and therefore [3d] = [4d] = 0), unless 3259 primary data for InventoryGlut<sub>POS</sub> and InventoryGlut<sub>DC</sub> are used.

- The default shares of transport legs in Table 33 shall be used (Cascale 2022), unless primary data are used. These values were obtained using default data (Cascale 2022) and the formulas in Table 34, which contains the detailed calculations.
- 3263

Table 33 - Default shares of product per transport leg

Transport leg	Default share of manufactured product transported per transport leg, including distribution losses (%)
[1]	3.8%
[1a1]	4.4%
[1a2]	1.2%
[1a3]	0.6%
[1c]	0.6%
[2a1]	$[3a] * \left(1 + \frac{InventoryGlut_{DC}}{1 - InventoryGlut_{DC}}\right)$
[2a2]	$[4a] * \left(1 + \frac{InventoryGlut_{DC}}{1 - InventoryGlut_{DC}}\right)$
[2b1]	$[3a] * \frac{InventoryGlut_{DC}}{1 - InventoryGlut_{DC}}$
[2b2]	$[4a] * \frac{InventoryGlut_{DC}}{1 - InventorvGlut_{DC}}$
[2c1]	0.4%
[2c2]	0.7%
[3a]	40.2%
[3b]	34.2%
[3b1]	39.8%
[3b2]	11.1%
[3b3]	5.6%
[3c]	5.6%
[4a]	64.9%
[4b]	62.0%
[4b1]	64.2%
[4b2]	4.5%
[4b3]	2.2%
[4c]	2.2%
[3d]	0%
[4d]	0%

3264

3265 6.3.2.5 Calculation of shares of transport legs using primary data

To have 1 final product reach the consumer, more than 1 product will need to be manufactured due to losses, considering unrestocked returns, inventory glut and distribution losses. UnrestockedReturns represents the share of unrestocked returns ([1c] for factory-to-consumer, [3c] for classic e-commerce and [4c] for retail). 3270 InventoryGlut represents the share of inventory glut ([2b1] for InventoryGlut<sub>DC</sub> + [3d] 3271 for InventoryGlut<sub>POS</sub> for the classic e-commerce scenario and [2b2] for InventoryGlut<sub>DC</sub>

3272 + [4d] for InventoryGlut<sub>POS</sub> for the retail scenario).

3273

3274 If only primary data for shares of distribution models Share<sub>F2C</sub>, Share<sub>ClassicECom</sub> and
3275 Share<sub>Retail</sub> are used, the user of the PEFCR shall adapt the default values in Table 33
3276 using Equation 26.

3277 
$$Share_{CSDM}[X] = Share[X] * \frac{Share_{CS-DM}}{Share_{CS-F2C} + Share_{CS-ClassicECom} + Share_{CS-Retail}}$$

3278

Equation 26

3279 With the following parameters:

3280 Sharecsdm[X] (%): Company-specific share of product mass transported per transport
3281 leg X for distribution model DM.

- 3282 Share[X] (%): Default share of product mass transported per transport leg X. See3283 Table 33 for default values.
- 3284 **Share**<sub>CS-DM</sub> (%): Company-specific share of distribution model DM (this is either 3285 Share<sub>CS-F2C</sub>, Share<sub>CS-ClassicECom</sub> or , Share<sub>CS-Retail</sub> depending on which transport leg is 3286 being calculated)
- 3287 **Sharecs-F2C (%):** Company-specific share of F2C distribution model
- 3288 **Share**cs-classicEcom (%): Company-specific share of classic e-commerce distribution 3289 model
- 3290 Sharecs-Retail (%): Company-specific share of retail distribution model
- 3291

The shares of a product relative to each transport leg are calculated using primary data according to Table 34.The default value of 50% shall be used for RestockRate (i.e. one out of every two returns are resold), the default value of 7% shall be used for ReturnRate<sub>Retail</sub>, and the default value of 28% shall be used for ReturnRate<sub>ClassicECom</sub> (Cascale, 2022), unless primary data are used.

3297 The share of unsold consumer products is company-specific data and it is used to 3298 calculate inventory glut. Due to the lack of data (Cascale, 2022) on the split of inventory glut between these locations ([2b1] vs [3d] and [2b2] vs [4d]), the user of the PEFCR shall assume that inventory glut only occurs at the European distribution centre (meaning that InventoryGlut<sub>POS</sub> = 0 and therefore [3d] = [4d] = 0), unless primary data for InventoryGlut<sub>POS</sub> and InventoryGlut<sub>DC</sub> are used.

#### 3303 The calculation for total unsold consumer products is shown in Equation 27:

$$3304 \qquad UnsoldProducts = InventoryGlut_{DC} + UnrestockedReturns + InventoryGlut_{POS}$$

$$3305 = [2b1] + [2b2] + [1c] + [3c] + [4c] + [3d] + [4d]$$

3306 
$$\xrightarrow{\text{with default values}} ([3a] + [4a]) * \frac{\text{InventoryGlut}_{DC}}{1 - \text{InventoryGlut}_{DC}} + [1c] + [3c] + [4c]$$

3307 
$$= (39.8\% + 64.2\%) * \frac{InventoryGlut_{DC}}{1 - InventoryGlut_{DC}} + 0.6\% + 5.6\% + 2.2\%$$

$$3308 = 104.0\% * \frac{InventoryGlut_{DC}}{1 - InventoryGlut_{DC}} + 8.4\%$$

3310 Default values as shown in Equation 28 shall be used, unless primary data for return

rates, restock rate, inventory glut at DC and inventory glut at POS are used.

3312 InventoryGlut<sub>DC</sub> = 
$$\frac{Y}{Y+1}$$
, where  $Y = \frac{(UnsoldProducts - 8.4\%)}{104.0\%}$   
3313 Equation 28

If UnsoldProducts is less than 8.4%, InventoryGlutDC shall have a default value of 0
and the default values of ReturnRate<sub>ClassicECom</sub>, ReturnRate<sub>Retail</sub> and RestockRate shall
be used.

3317

Table 34 - Share of product per transport leg for primary data

Transport leg	Share of manufactured product transported per transport leg (%)
[1]	$= [1a1] - [1a2] + [1a3] = [1a1] * (1 - ReturnRate_{ClassicECom} * (1 - RestockRate))$
	= Share <sub>CS-F2C</sub>
[1a1]	_ [1]
	$-\frac{1}{1-ReturnRate_{ClassicECom} * (1-RestockRate)}$
	$\_$ Share <sub>CS-F2C</sub>
	$-\frac{1}{1-ReturnRate_{ClassicECom} * (1-RestockRate)}$
[1a2]	$= [1_{\alpha}1] + Potum Pata = Share_{F2C} * Return Rate_{ClassicECom}$
	$= [1u1] * ReturnRate_{ClassicECom} - \frac{1}{1 - ReturnRate_{ClassicECom}} * (1 - RestockRate)$
[1a3]	= [1a2] * RestockRate
[1c]	= [1a2] * (1 - RestockRate)
[2a1]	= [3a] + [2b1]
[2a2]	= [4a] + [2b2]

Transport leg	Share of manufactured product transported per transport leg (%)
[2b1]	InventoryGlut <sub>DC</sub>
	$= [3a] * \frac{1}{1 - InventoryGlut_{DC}}$
[2b2]	Inventory Glut <sub>DC</sub>
	$= [4a] * \frac{1}{1 - InventorvGlut_{pc}}$
[2c1]	= [3a] * DistribLoss
[2c2]	= [4a] * DistribLoss
[3a]	= [3b] + [3c] + [3d] + [2c1]
	$Share_{CS-ClassicECom}$ 1
	$=\frac{1}{1-ReturnRate_{ClassicECom} * (1-RestockRate)} * \frac{1}{1-InventoryGlut_{POS}}$
	* (1 + DistribLoss)
[3b]	$= Share_{CS-ClassicECom} = [3b1] - [3b2] + [3b3]$
	$= [3b1] * (1 - ReturnRate_{ClassicECom} * (1 - RestockRate))$
[3b1]	Share <sub>CS-ClassicECom</sub>
	$= [3a] - [3a] = \frac{1}{1 - ReturnRate_{ClassicECom} * (1 - RestockRate)}$
[3b2]	$= [3b1] * ReturnRate_{classicECom}$
	$Share_{CS-ClassicECom} * ReturnRate_{ClassicECom}$
	$-\frac{1}{1 - ReturnRate_{ClassicECom} * (1 - RestockRate)}$
[3b3]	= [3b2] * RestockRate
[3c]	= [3b2] * (1 - RestockRate)
[4a]	= [4b] + [4c] + [4d] + [2c2]
	$=$ $\frac{Share_{CS-Retail}}{*}$
	$1 - ReturnRate_{Retail} * (1 - RestockRate)^{+} 1 - InventoryGlut_{POS}$
	* (1 + DistribLoss)
[4b]	$= Share_{Retail} = [4b1] - [4b2] + [4b3]$
E 41. 43	$= [4a] * (1 - ReturnRate_{Retail} * (1 - RestockRate))$
[4b1]	$= [4a] - [4d] = \frac{Share_{CS-Retail}}{(4a)^2}$
	$1 - ReturnRate_{Retail} * (1 - RestockRate)$
[46:0]	- [4h1] · Doteurs Data
[402]	$= [4D1] * ReturnRute_{Retail}$
	Share Return Rate Return
	$= \frac{1 - Return Rate}{1 - Return Rate} + (1 - Restock Rate)$
	$1 = ReturnRate_{Retail} * (1 = RestockRate)$
[4b3]	= [4b2] * RestockRate
[4c]	= [4b2] * (1 - RestockRate)
[3d]	$= [3a] * InventoryGlut_{POS}$
	$= \frac{Share_{CS-ClassicECom}}{*} \frac{InventoryGlut_{POS}}{*}$
	$1 - ReturnRate_{ClassicECom} * (1 - RestockRate) 1 - InventoryGlut_{POS}$
[4d]	$= [4a] * InventoryGlut_{POS} =$
	$Share_{CS-Retail}$ Inventory $Glut_{POS}$
	$1 - ReturnRate_{Retail} * (1 - RestockRate) * 1 - InventoryGlut_{POS}$

### 3318 6.3.3 Distribution impacts

3319 The distribution impacts are based on:

- a) the mass or the volume of the product being transported including primary,
- 3321 secondary and tertiary packaging, considering the distribution losses and the
- 3322 unsold consumer products mass.
- b) the distance travelled and the mode of transport.

The transport of unsold consumer products for disposal includes inventory glut ([2b1], [2b2], [3d] and [4d]) and unrestocked returns ([1c], [3c] and [4c]). The transport of distribution losses for disposal includes [2c1] and [2c2]. The end-of-life transport of these product losses shall be modelled according to Section 5.10 and shall be accounted for in LCS3.

3329 6.3.3.1 Mass and volume transported

The weight transported is defined as the sum of the product weight (**Weight**<sub>Product</sub>) plus the weight of all removable accessories such as hangtags (price label, brand tags, etc.), primary (**Weight**<sub>Pack1</sub>), secondary (**Weight**<sub>Pack2</sub>) and tertiary (**Weight**<sub>Pack3</sub>) packaging, considering the distribution losses and unsold consumer products.

The product volume transported is defined as the volume of the product including primary packaging (**Volume**<sub>Product</sub>), and the default values in Table 35 shall be used unless primary data are used (primary data provided by ADEME, Nov. 2020). To account for the additional volume of secondary and tertiary packaging in the relevant transport legs, the product volume is multiplied by a volume factor (**Volume**<sub>Factor</sub>) and a default volume factor of 4 (OEFSRs retail, 2018) shall be used unless primary data of packaging volume is used.

3341

No.	Sub-category	Default product volume (m <sup>3</sup> )
1	T-shirts	0.0018
2	Shirts and blouses	0.006
3	Sweaters and midlayers	0.0102
4	Jackets and coats	0.015
5	Pants and shorts	0.004
6	Dresses, skirts and jumpsuits	0.007
7	Leggings, stockings, tights and socks	0.0006
8	Underwear	0.0006
9	Swimwear	0.0006
10	Apparel accessories	0.0012
11	Open-toed shoes	0.0048
12	Closed-toed shoes	0.018
13	Boots	0.024

	Table 35 - Default	representative	product volumes
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The weights and volumes relative to each transport leg are given in Table 36. When both weights and volumes are indicated, the formula **in bold** indicates the one relevant for the calculation, depending on if the transport is weight-limited (e.g. transport in 177 trucks or ships) or volume-limited (e.g. passenger car or van). For packaging, the default values in Table 29 (for the retail scenario), Table 30 (for the classic ecommerce scenario), and Table 31 (for the F2C scenario) shall be used unless primary data are used. The transport of unsold consumer products (inventory glut and unrestocked returns) and distribution losses disposal transport marked with (\*) is approximated by weight-limited product disposal transport (see Section 5.10).

3351

#### Table 36 - Weights and volumes transported per transport leg

Transport leg	Packaging included	Weight transported (kg/product) Weight[X]	Volume transported to/by final client (m³/product) Volume[X]
[1a1]	Primary + Secondary + Tertiary	Weight <sub>Product</sub> + Weight <sub>Pack1</sub> + Weight <sub>Pack2</sub> + Weight <sub>Pack3</sub>	N/A (weight-limited transport)
[1a2]	Primary + Secondary	N/A (volume-limited transport)	<i>Volume</i> <sub>Product</sub>
[1a3]	Primary + Secondary	N/A (volume-limited transport)	<i>Volume</i> <sub>Product</sub>
[1c]*	N/A	$Weight_{Product}$	N/A (weight-limited transport)
[2a1] [2a2]	Primary + Secondary + Tertiary	Weight <sub>Product</sub> + Weight <sub>Pack1</sub> + Weight <sub>Pack2</sub> + Weight <sub>Pack3</sub>	N/A (weight-limited transport)
[2b1]* [2b2]*	N/A	Weight <sub>Product</sub>	N/A (weight-limited transport)
[2c1]* [2c2]*	N/A	Weight <sub>Product</sub>	N/A (weight-limited transport)
[3a]	Primary + Secondary + Tertiary	Weight <sub>Product</sub> + Weight <sub>Pack1</sub> + Weight <sub>Pack2</sub> + Weight <sub>Pack3</sub>	N/A (weight-limited transport)
[3b1] [3b3]	Primary + Secondary	N/A (volume-limited transport)	<i>Volume</i> <sub>Product</sub>
[3b2]	Primary + Secondary	N/A (volume-limited transport)	Volume <sub>Product</sub>
[3c]*	N/A	$Weight_{Product}$	N/A (weight-limited transport)
[3d]*	N/A	$Weight_{Product}$	N/A (weight-limited transport)
[4a]	Primary + Secondary + Tertiary	Weight <sub>Product</sub> + Weight <sub>Pack1</sub> + Weight <sub>Pack2</sub> + Weight <sub>Pack3</sub>	N/A (weight-limited transport)

Transport leg	Packaging	Weight transported	Volume transported to/by final client
	included	(kg/product)	(m³/product)
		Weight[X]	Volume[X]
[4b1] [4b3]	Primary	N/A (volume-limited transport)	<i>Volume</i> <sub>Product</sub>
[4b2]	Primary	N/A (volume-limited transport)	<i>Volume</i> <sub>Product</sub>
[4c]*	N/A	$Weight_{Product}$	N/A (weight-limited transport)
[4d]*	N/A	Weight <sub>Product</sub>	N/A (weight-limited transport)

#### 3352 6.3.3.2 Distance travelled

Company-specific data, i.e. the distance and the share of product mass transported, is mandatory for cargo plane transport in transport steps [1a1], [2a1], [2a2], and [3a]. It shall be determined at company level, using data from the most recent annual administration period.

3357 The transport parameters (distances, shares of product mass transported, and 3358 utilisation ratio) shall be updated with primary specific data if data are available:

- The utilisation ratio<sup>50</sup> shall be adapted in the EF database dataset.
- The distances shall be determined using the recommended calculators<sup>51 & 52</sup>,
   or tools equally or more accurate.
- The user of the PEFCR shall ensure that the sum of all the shares of product
   mass transported is equal to 100% for each transport leg.

The default datasets to use to model the transportation mode are available in ANNEX VII – Inventory modelling and default datasets ("Default datasets & DQR" tab). For suppliers outside of Europe, ROW w/o EU+EFTA datasets shall be used. For truck transport, if a EURO 4 ROW w/o EU+EFTA dataset is not available, a EU+EFTA+UK (>32t, EURO 4) dataset should be used as an acceptable proxy.

In case of multiple sources, a weighted average of the distances shall be calculated
at product level if data are available, otherwise, at company level. For example, if 50%
is coming from location 1 with a distance of 1'000 km and 50% from location 2 with a

<sup>&</sup>lt;sup>50</sup> Real load transported divided by the mass of the payload considering empty returns (ratio of the distance travelled to collect the next load after unloading the product to the distance travelled to transport the product)
<sup>51</sup> <u>https://www.searates.com/services/distances-time/</u> or https://co2.myclimate.org/en/flight\_calculators/new/

<sup>52</sup> https://co2.myclimate.org/en/flight\_calculators/new/

- distance of 3'000 km, the weighted average distance is 50% x 1'000 km + 50% x 3'000
- 3373 km = 2'000 km.
- 3374 The default values for the transport processes from retail/ stores to the final client in
- 3375 Table 37 are given as roundtrip distances and datasets for consumer travel are per
- 3376 kilometre.
|            |                                                    | Default per functional unit             |                                     |                      |                                                             |                               |  |  |
|------------|----------------------------------------------------|-----------------------------------------|-------------------------------------|----------------------|-------------------------------------------------------------|-------------------------------|--|--|
| No.        | Transport leg [X]                                  | Supply chain<br>location [Z]            | Distance (km)                       | Utilisation<br>ratio | Share of product mass<br>transported for each origin<br>(%) | Transport mode [Y]            |  |  |
|            |                                                    | Local                                   | 1'200                               | 64%                  | 25% * (100 – SharePlane <sub>F2C</sub> )                    | Truck (>32t, EURO 4)          |  |  |
|            |                                                    | Intracontinental                        | 3'500                               | 64%                  | 75%* (100 – SharePlane <sub>F2C</sub> )                     | Truck (>32t, EURO 4)          |  |  |
|            | Eastany to final alight                            |                                         | 1'000                               | 64%                  |                                                             | Truck (>32t, EURO 4)          |  |  |
| 1a1        | (factory-to-consumer)                              | International (ship)                    | 18'000                              | n/a                  | 0%                                                          | Ship (transoceanic container) |  |  |
|            |                                                    | International                           | 1'000                               | 64%                  | Ohana Diana t                                               | Truck (>32t, EURO 4)          |  |  |
|            |                                                    | (plane)                                 | Distance <sub>F2C</sub> +           | n/a                  | SnarePlane <sub>F2C</sub> *                                 | Cargo plane                   |  |  |
| 1a2        | From final client to local warehouse/ DC (returns) | Local                                   | 250 (round trip)                    | 50%++                | 100%                                                        | Van (lorry <1.2t, EURO<br>3)  |  |  |
| 1a3        | From local warehouse/<br>DC to final client        | Local                                   | 250 (round trip)                    | 50%++                | 100%                                                        | Van (lorry <1.2t, EURO<br>3)  |  |  |
|            |                                                    | Local                                   | 1'200                               | 64%                  | 5.6% * (100 -<br>SharePlane <sub>WarehouseEU</sub> )        | Truck (>32t, EURO 4)          |  |  |
|            |                                                    | Intracontinental<br>(barge)             | 2'500                               | 64%                  | 3.3% * (100 -                                               | Truck (>32t, EURO 4)          |  |  |
|            |                                                    |                                         | 800                                 | n/a                  | SharePlanewarehouseEU)                                      | Ship (barge)                  |  |  |
|            |                                                    | Intracontinental<br>(train)             | 800                                 | 64%                  | 15.6% * (100 -                                              | Truck (>32t, EURO 4)          |  |  |
| 221        | Factory to warehouse/                              |                                         | 2'500                               | n/a                  | SharePlanewarehouseEU)                                      | Train (average freight train) |  |  |
| 2a1<br>2a2 | DC located in Europe                               | Clocated in Europe International (ship) | 1'000                               | 64%                  | 73 3% * (100 -                                              | Truck (>32t, EURO 4)          |  |  |
| 202        | Do located in Europe                               |                                         | 18'000                              | n/a                  | SharePlanewarehouseEU)                                      | Ship (transoceanic container) |  |  |
|            |                                                    | International                           | 1'000                               | 64%                  | SharePlanewerkers                                           | Truck (>32t, EURO 4)          |  |  |
|            |                                                    | (plane)                                 | DistancewarehouseEU <sup>+</sup>    | n/a                  |                                                             | Cargo plane                   |  |  |
|            |                                                    |                                         | 1'000                               | 64%                  | 2 2% * (100 -                                               | Truck (>32t, EURO 4)          |  |  |
|            |                                                    | International (train)                   | 10'000                              | n/a                  | SharePlane <sub>WarehouseEU</sub> )                         | Train (average freight train) |  |  |
|            |                                                    | Intracontinental                        | 500                                 | 64%                  | SharaPlanow , , , , , +                                     | Truck (>32t, EURO 4)          |  |  |
| 20         | From warehouse/ DC                                 | (plane)                                 | DistancewarehouseLocal <sup>+</sup> | n/a                  | ShareFlaneWarehouseLocal                                    | Cargo plane                   |  |  |
| 3а         | warehouse/ DC                                      | Intracontinental<br>(train)             | 1000                                | 64%                  | 74% * (100 -<br>SharePlanewarehouseLocal <sup>+</sup> )     | Truck (>32t, EURO 4)          |  |  |

### Table 37 - Default transport parameters per product

		Default per functional unit				
No.	Transport leg [X]	Supply chain location [Z]	Distance (km)	Utilisation ratio	Share of product mass transported for each origin (%)	Transport mode [Y]
			3000	n/a	74% * (100 - SharePlane <sub>WarehouseLocal</sub> +)	Train (average freight train)
		Intracontinental (truck)	4000	64%	26% * (100 - SharePlane <sub>WarehouseLocal</sub> +)	Truck (>32t, EURO 4)
3b1 3b3	From local warehouse/ DC to final client	Local	250 (round trip)	50%++	100%	Van (lorry <1.2t, EURO 3)
3b2	From final client to local warehouse/ DC (returns)	Local	250 (round trip)	50%++	100%	Van (lorry <1.2t, EURO 3)
4a	From warehouse/ DC located in Europe to retail/ stores	Local	1'200	64%	100%	Truck (>32t, EURO 4)
			5	See below	62%	Passenger car (average)
4b1 4b3	From retail/ stores to final client (consumer travel)	Local	5	50%++	5%	Van (lorry <1.2t, EURO 3)
			N/A	N/A	33%	No impact modelled (walking, cycling etc)
			5	See below	62%	Passenger car (average)
4b2	stores (customer travel,	Local	5	50%++	5%	Van (lorry <1.2t, EURO 3)
			N/A	N/A	33%	No impact modelled (walking, cycling etc)

\* Company-specific data estimated at company level from the most recent annual administration period

3379 <sup>++</sup> In case there is no dataset for (lorry <1.2t, EURO 3) available, a van (lorry <7.5t, EURO 3) with a 20% utilisation ratio shall be used

#### 3380 Consumer travel

- 3381 The impacts from consumer travel (allocation of the car impact) shall be based on 3382 volume with a single distance of 5 km (or 5000 m, total distance of transport, PEF 3383 Method, 4.4.3.5 Default scenarios – from factory to final client). For an average car, 3384 the maximum volume that can be transported is  $0.2 \text{ m}^3$ , which equals 1/3 of a  $0.6 \text{ m}^3$ 3385 trunk, whereas for products bigger than 0.2 m<sup>3</sup>, the full car transport impact shall be 3386 included. Considering products that are sold through in-store retail, the volume of the 3387 product (including primary packaging) shall be used to allocate the transport burdens, 3388 and the allocation factor shall be calculated as the volume of the product divided by 3389 the maximum volume of 0.2 m<sup>3</sup>.
- 3390 The default value for the volume is specified in Table 35.

3391 6.3.3.3 Calculation of distribution impacts

For weight-limited transport as prescribed by Table 36, the activity quantity (in kgkm)
for the distribution impact calculation per transport mode Y is calculated using
Equation 29:

3395 Activity $W_{XY}$  = Share<sub>[X]</sub> \* Weight<sub>[X]</sub> \* Distance<sub>[XY]</sub> \* ShareProductMass<sub>[XYZ]</sub> 3396 Equation 29

3397 With the following parameters:

3398 **Share[X] (%):** Share of product mass transported per transport leg X. See Table 33 3399 for default values and Table 34 for detailed calculation using primary data.

3400 **Weight[X] (kg/product):** Weight transported per transport leg X. See Table 36 for 3401 detailed calculation.

3402 Distance[XY] (km): Transport distance per transport leg X and transport mode Y. See3403 Table 37 for default values.

3404 ShareProductMass[XYZ] (%): Share of product mass transported for each transport
3405 leg X, transport mode Y and origin Z. See Table 37 for default values.

For volume-limited transport as prescribed by Table 36, the activity quantity (in kilometers) for the distribution impact calculation per transport mode Y is calculated using Equation 30:

- 3409 ActivityV<sub>XY</sub> = Share<sub>[X]</sub> \*  $\frac{\text{Volume}_{[X]}}{\text{VolumeMax}_{[Y]}}$  \* Distance<sub>[XY]</sub> \* ShareProductMass<sub>[XYZ]</sub>
- 3410

Equation 30

3411 With the following parameters:

- 3412 **Share[X] (%):** Share of product mass transported per transport leg X. See Table 33
- 3413 for default values and Table 34 for detailed calculation using primary data.
- 3414 **VolumeMax[Y]** (m<sup>3</sup>): Maximum volume transported by transport mode Y. For 3415 passenger cars, this is 0.2 m<sup>3</sup> (PEF Method, 2021).
- 3416 **Volume[X] (**m<sup>3</sup>**/product):** Volume transported per transport leg X. See Table 36 for 3417 detailed calculation and Table 35 for default values.
- 3418 **Distance[XY] (m):** Transport distance per transport leg X and transport mode Y. see
- 3419 Table 37 for default values.
- 3420 ShareProductMass[XYZ] (%): Share of product mass transported for each transport
  3421 leg X, transport mode Y and origin Z. See Table 37 for default values.

# 3422 6.3.4 Storage at warehouse/ DC and retail/ store

3423 Storage shall be modelled for the scenarios including warehouse/distribution centres 3424 and retail/ stores as defined in Figure 11 for the F2C scenario, Figure 12 for the classic 3425 e-commerce scenario and Figure 13 for the retail scenario. For the F2C e-commerce 3426 scenario, this is only applicable for the returned products. The storage characteristics 3427 (capacity, time, etc.) required for each transport leg can be found in Table 38.

3428 The impacts generated by the storage of final products in warehouses or retail 3429 locations/stores are related to energy for heating and lighting, and waste associated 3430 with lost products and packaging.

No energy and waste differentiation are needed between apparel and footwear product sub-categories as usually a variety of products are stored and sold in the same warehouse or retail setting (ambient storage). This gives consistency of the energy inputs per unit sold within the chosen reference flow.

The emissions and resources used by storage systems shall be allocated to the product stored, and the allocation shall be based on the space (in m<sup>3</sup>) and time (in weeks) occupied by the product. Time-based allocation is based on the storage capacity of the storage location (52 weeks in a year) and the time the product is stored in this location. Default storage durations in Table 38 shall be used, unless primarydata are used.

3441 Space-based allocation is based on the volume of the storage location, which is either 3442 a warehouse (Volumewarehouse) or retail store (VolumeRetail), as well as the average 3443 storage shelf height (ShelfHeight) and the shelf coverage of the storage location 3444 surface (ShelfCoverage). The default values of 48'000 m<sup>3</sup> for Volume<sub>Warehouse</sub>, 2'000 m<sup>3</sup> 3445 for Volume<sub>Retail</sub>, 2 m for ShelfHeight and 50% for ShelfCoverage (PEF 2019, 4.4.5 3446 Storage at distribution centre or retail) shall be used unless primary data are used. 3447 The product volume stored is defined as the volume of the product including primary 3448 packaging (Volume<sub>Product</sub>) and the default values in Table 35 shall be used unless 3449 primary data are used. Additionally, a storage volume factor (VolumeFactor) of 4 is 3450 used for ambient storage (OEFSRs retail, 2018) to account for the additional space 3451 the product takes in the storage facility, meaning the product volume will be multiplied 3452 by 4.

The default data (from the PEF method) for electricity consumption, 30 kWh/ m<sup>2</sup>\*year for warehouses (Consumption<sub>ElectricityWarehouse</sub>) and 150 kWh/m<sup>2</sup>/year for retail stores (Consumption<sub>ElectricityRetail</sub>), and gas consumption, 360 MJ/m<sup>2</sup>/year for warehouses (Consumption<sub>GasWarehouse</sub>) shall be used for all apparel and footwear sub-categories, unless primary data are used.

3458 If primary data is only partially available for a given distribution scenario process (e.g.3459 storage at retail stores), default data shall be used instead.

The energy consumption shall also take into account the impacts generated by the digital infrastructure (DigitalInfrastructure) used for online shopping in the two ecommerce scenarios (classic e-commerce and F2C). For each product ordered, 0.030 kWh of electricity (European grid mix) are needed based on expert judgement.

The impact linked to energy consumption for storage and distribution for each transport leg [X] is calculated according to Equation 31, using the equation parameters in Table 38.

3467	ConsumptionEnergy[X]
3468	= $\frac{Share[X] * Volume stored[X] * StorageTime[X] * StorageSurface[X]}{StorageCapacity[X]}$
3469	* (Consumption <sub>Energy</sub> [X])
3470	Equation 31
3471	Equation 31 shall be repeated for the calculation of the electricity and the natural gas

consumption according to Table 38. The energy consumption for the "other" column

3473 shall be added to the electricity consumption where relevant.

Table 38 - Default storage capacity and energy consumption for warehouse/DC and retail/stores

Transport leg	Volume stored ( /product) VolumeStored[X]	Default storage time (weeks) StorageTime[X]	Storage capacity (                                 * weeks / year) StorageCapacity[X]	Storage surface (m2) StorageSurface[X]	Storage energy consumption (kWh/m2/year or MJ/m2/year) Consumption[X]	Other (kWh / product) Other[X]
[1a1]	N/A	N/A	N/A	N/A	N/A	DigitalInfrastructure
[1a3]						
[1a2]	<i>Volume</i> <sub>Product</sub>	7 / 2 = 3.5	Volume <sub>Warehouse</sub>	Volume <sub>Warehouse</sub> * ShelfCoverage	$Consumption_{Electricity_{Warehouse}}$	N/A
	* VolumeFactor	weeks+	* 52 weeks / year	ShelfHeight	+ $Consumption_{Gas_{Warehouse}}$	
[1c]	N/A	N/A	N/A	N/A	N/A	N/A
[2a1]	Volume <sub>Product</sub>	7 / 2 = 3.5	Volume <sub>Warehouse</sub>	Volume <sub>Warehouse</sub> * ShelfCoverage	Consumption <sub>ElectricityWarehouse</sub>	N/A
[2a2]	* VolumeFactor	weeks+	* 52 weeks / year	ShelfHeight	+ $Consumption_{Gas_{Warehouse}}$	
[2b1]	Volume <sub>Product</sub>	3 years = 156	Volume <sub>Warehouse</sub>	Volume <sub>Warehouse</sub> * ShelfCoverage	$Consumption_{Electricity_{Warehouse}}$	N/A
[2b2]	* VolumeFactor	weeks++	* 52 weeks / year	ShelfHeight	+ $Consumption_{Gas_{Warehouse}}$	
[2c1]	N/A	N/A	N/A	N/A	N/A	N/A
[2c2]						
[3a]	Volume <sub>Product</sub>	7 / 2 = 3.5	Volume <sub>Warehouse</sub>	Volume <sub>Warehouse</sub> * ShelfCoverage	Consumption <sub>ElectricityWarehouse</sub>	N/A
	* VolumeFactor	weeks+	* 52 weeks / year	ShelfHeight	+ $Consumption_{Gas_{Warehouse}}$	
[3b]	N/A	N/A	N/A	N/A	N/A	N/A
[3c]	N/A	N/A	N/A	N/A	N/A	N/A
[3d]	N/A	N/A	N/A	N/A	N/A	N/A
[4a]	Volume <sub>Product</sub>	7 / 2 = 3.5	Volume <sub>Retail</sub>	Volume <sub>Retail</sub> * ShelfCoverage	$Consumption_{Electricity_{Retail}}$	N/A
	* VolumeFactor	weeks+	* 52 weeks / year	ShelfHeight		
[4b]	N/A	N/A	N/A	N/A	N/A	DigitalInfrastructure
[4c]	N/A	N/A	N/A	N/A	N/A	N/A
[4d]	N/A	N/A	N/A	N/A	N/A	N/A

3475 \* Based on OEFSRs retail, 2018, and data received

3476 \*\* According to unsold consumer products definition from Section 6.1.1

### 3477 6.3.5 Repair distribution

When a repairability multiplier as defined in Section 3.3.4 is used, transport shall be calculated according to transport legs [4b2] + [4b3] described in Section 6.3.1, accounting for the return trip of the retail to consumer transportation.

- 3481 As a proxy, the percentage of products being repaired shall match the repairability3482 multiplier.
- For example, if the repairability multiplier is 1.05 (105%), additional transportationimpacts for 10% (5% transported one way then the other) shall be included.

# 3485 6.3.6 Packaging production, reuse and end of life

The production of packaging shall be modelled in LCS1. The type and amount of packaging materials shall be determined according to Section 6.1.5. The end of life of the primary packaging shall be accounted for in LCS5, while it shall be accounted for in LCS3 for secondary and tertiary packaging. The burdens and credits of the end of life of packaging shall be allocated using the CFF, presented in Section 5.10, using the default parameters available in the latest version of Part C of Annex II of the PEF method.

# 3493 6.4 Use stage

- The user of the PEFCR shall report the DQR values (for each criterion + total) for allthe datasets used.
- This PEFCR uses the main function approach. The use stage for apparel considersimpacts related to the following steps for most of the sub-categories:
- Washing and cleaning
- 3499 Drying

- Ironing and steaming
- 3501 These processes of the apparel use stage are product dependent.
- 3502 The impacts related to the following steps are considered for footwear:
- 3503 Care

The product weight considered for the use phase shall only include the weight of the product. Further details on material-specific requirements for the use stage per each representative product are described below.

For apparel products, the care label typically provides washing instructions. While the care label shows instructions such as the maximum temperature a product can withstand, this does not necessarily mean that the product is washed at that temperature, it may in fact be washed at a lower temperature. Similarly, a product may not be ironed even if the care label indicates an ironing temperature. For this reason, the use stage shall be modelled using the default values presented in the sections below.

For the use stage the consumption grid mix shall be used. The electricity mix shall reflect the ratios of sales between EU countries/ regions. To determine the ratio a physical unit shall be used (e.g. kg of product). Where such data are not available, the average EU consumption mix (EU27 + UK + EFTA), or region-representative consumption mix, shall be used.

3519 Default datasets for the use stage can be found in ANNEX VII – Inventory modelling
3520 and default datasets ("Default datasets & DQR" tab).

#### 3521 6.4.1 Washing / cleaning

According to the PEFCR for leather (Leather PEFCR, 2020), specific garment use instructions shall be followed for genuine leather and genuine fur products and modelled accordingly. In general, genuine leather and genuine fur articles will not be washed, dried, ironed or steamed. Delicate garments are defined as items requiring dry cleaning only based on their care label (FHCM, 2019).

#### 3527 Washing types and temperatures

The default washing types and typical washing temperatures provided in Table 39 below (Laitala, 2020, Cotton Incorporated, 2020) shall be used for all apparel subcategories, except for delicate garments where 100% dry cleaning shall be modelled.

The default temperature corresponds to the temperature of the main washing type, for example for underwear with the main washing type being washing machine and the default temperature being set to 60°C. In case of blends, please refer to the material having the highest share in the mix. If
no material is identified as such, then the "all materials" product details section shall
be used.

Table 39 - Default washing types and specific instructions

No.	Product sub- category	Product details	Temp. (°C)	% Hand- washing	% Machine washing	% Dry cleanin g
		All materials	40°C	6%	89%	5%
		Cotton and blends	40°C	8%	90%	2%
1	T-shirts	Wool, blends and silk	30°C	18%	57%	25%
		Synthetics	40°C	9%	88%	3%
		Regen. cellulose	40°C	22%	73%	5%
2	Shirts and blouses	All materials	40°C	8%	81%	11%
3	Sweaters and midlayers	All materials	30°C	22%	64%	14%
		All materials	40°C	20%	60%	20%
		Cotton and blends	40°C	13%	63%	25%
4	Jackets and coats	Wool, blends and silk	30°C	13%	24%	64%
		Synthetics	40°C	13%	61%	26%
		Regen. cellulose	40°C	16%	65%	18%
		All materials	40°C	6%	75%	19%
	Pants and shorts	Cotton and blends	40°C	13%	63%	25%
5		Wool, blends and silk	30°C	13%	24%	64%
		Synthetics	40°C	13%	61%	26%
		Regen. cellulose	40°C	16%	65%	18%
6	Dresses, skirts and jumpsuits	All materials	40°C	17%	69%	14%
		All materials	40°C	10%	85%	5%
	Leggings,	Cotton and blends	40°C	16%	83%	1%
7	stockings, tights and	Wool, blends and silk	30°C	25%	66%	10%
	socks	Synthetics	40°C	24%	75%	1%
		Regen. cellulose	40°C	47%	50%	2%
8	Underwear	All materials	60°C	12%	86%	2%
9	Swimwear	All materials	30°C	100%	0%	0%
10		All materials	30°C	29%	47%	24%

No.	Product sub- category	Product details	Temp. (°C)	% Hand- washing	% Machine washing	% Dry cleanin g
		Hat	30°C	29%	56%	14%
	Apparel	Scarves	30°C	28%	33%	39%
	s	Gloves	30°C	28%	59%	13%
		Belts	n/a	n/a	n/a	n/a

- 3538 Numbers may not always add up to 100% because of rounding.
- 3539 This table does not apply to genuine leather and genuine fur products.
- 3540 The default washing datasets from the EF database reported in ANNEX VII Inventory
- 3541 modelling and default datasets ("Default datasets & DQR" tab) shall be used.

### 3542 Washing frequency

- The default frequency of washing presented in Table 40 below (key data for a standard
- consumer, based on data from Laitala (2020), Sandin (2019), and Daystar (2019))
- 3545 shall be used.

#### 3547

Table 40 - Number of uses between washes. For the segmentation between sport and non-sport, please refer to Section 3.3.3.1

#### Average uses Average uses Average uses prior to No. prior to washing Sub-category Fibre type prior to washing washing for for sport segment delicates > 50% animal 3 1 fibre RP 1 **T-shirts** 3 Other fibres 2 1 RP 2 Shirts and blouses 2 All types 1.5 5 > 50% animal 10 1.5 fibre RP 3 Sweaters and midlayers 10 Other fibres 6 1.5 RP 4 Jackets and coats All fibres 20 1.5 5 > 50% animal 7 1.5 fibre RP 5 7 Pants and shorts 5 1.5 Other fibres RP 6 Dresses, skirts and jumpsuits All fibres 3 1.5 5 > 50% animal 3 1.5 Leggings, stockings, tights fibre RP 7 3 and socks 2 Other fibres 1.5 RP 8 Underwear All fibres 1 1 1 RP 9 Swimwear All fibres 1 1 5 RP 20 20 20 Apparel accessories All fibres 10

#### 3548

This table does not apply to genuine leather and genuine fur products. Products in the sport segment are intended primarily for use in an organized or individual capacity related to physical activity and designed with functional elements specifically for the intended use and practiced activity. Product appearance shall not be the sole characteristic evaluated to determine the inclusion in this segment.

### 3554 **6.4.2 Drying**

The default frequency of drying indicated in Table 41 (Laitala, 2018a, 2020, Gore 2016) shall be used for all apparel sub-categories, even for products whose care label would not recommend tumble drying. This table is built on average tumble-drying rates, taking into account garments that are only air dried (e.g. made of wool, delicates, etc).

- 3560
- 3561

### Table 41 - Data for drying per product sub-category

No	Sub-category	Air drying	Tumble drying
1	T-shirts	70%	30%
2	Shirts and blouses	88%	12%
3	Sweaters and midwear	70%	30%
4	Jackets and coats	75%	25%
5	Pants and shorts	70%	30%
6	Dresses, skirts and jumpsuits	88%	12%
7	Leggings, stockings, tights and socks	88%	12%
8	Underwear	65%	35%
9	Swimwear	88%	12%
10	Apparel accessories	88%	12%

3563 This table does not apply to genuine leather and genuine fur products.

# 3564 6.4.3 Ironing / steaming

The default ironing and steaming data presented in Table 42 (Laitala, 2018a; Daystar, 2019; Sandin, 2019) shall be used for all apparel sub-categories, even for products whose care label would not recommend ironing or steaming. Values provided in the table below are representative of ironing per cleaning cycle, taking into account garments that are not ironed (e.g. made of wool, delicates, etc). Therefore ironing is assumed after each wash.

The default ironing / steaming datasets from the EF database reported in ANNEX VII — Inventory modelling and default datasets ("Default datasets & DQR" tab) shall be used.

Fable 42 - Data fo	<sup>.</sup> ironing a	and steaming
--------------------	------------------------	--------------

No.	Sub-category	% of garments ironed or steamed per use	Time spent per garment (min)
1	T-shirts	40%	2.6
2	Shirts and blouses	70%	2.6
3	Sweaters and midlayers	0%	n/a
4	Jackets and coats	5%	4
5	Pants and shorts	63%	4.3
6	Dresses, skirts and jumpsuits	18%	4.5
7	Leggings, stockings, tights and socks	5%	3.4
8	Underwear	1%	1

No.	Sub-category	% of garments ironed or steamed per use	Time spent per garment (min)
9	Swimwear	0%	n/a
10	Apparel accessories	25%	2.0

3575 This table does not apply to genuine leather and genuine fur products.

### **6.4.4 Footwear care**

Footwear care is twofold: washing and waxing. Washing concerns all
footwears labelled as textiles (EU Footwear Labelling Directive) while waxing
concerns non-textile closed-toed shoes and boots only.

While washing footwear in a washing machine is discouraged by footwear brands, it is assumed that consumers wash their shoes once during the shoe's lifetime (Cascale and thinkstep, 2016), using a dedicated delicate cycle. Footwear products are considered to be left to air dry, hence no tumble drying shall be modelled.

No data on the frequency of waxing being available, a conservative approach has been used and 100% of closed-toed shoes and boots are receiving care every 10 uses (expert judgement). 0.002 kg of wax/ kg of footwear shall be used for the modelling.

3587

Type of care	Frequency	Value	Dataset
Washing (RP 11, 12 & 13)	Once per lifetime	Mass of the footwear	Washing, 30°, average washing, cold to warm water production mix, at plant service
Waxing (RP 12 & 13)	Every 10 uses	0.002 kg/ kg of footwear	Wax production technology mix production mix, at plant 100% active substance

Table 43 - Data for footwear care

3588

# 3589 6.4.5 Repairability and use stage modelling

3590 When a repairability multiplier as defined in Section 3.3.4 is used, the impact of the

3591 repair shall be modelled using the apparel or footwear repair for reuse dataset.

As a proxy, the percentage of products being repaired shall match the repairability multiplier.

3594 For example, if the repairability multiplier is 1.05 (105%), repair impacts shall be 3595 included for 5% of the product.

### 3596 6.4.6 Extended lifetime and circularity

According to Section 4.4.9 of the PEF method (2021), if a product is re-used with the same specifications (same function), this re-use shall be considered as an extension of the use stage of the product. The aspects related to this lifetime extension are discussed in Section 3.3.2

- 3601 According to the PEF method:
- 3602 The following processes are excluded from the use stage:

(d) If a product is reused (see also Section 4.4.9.2), the processes needed to collect
the product and make it ready for the new use cycle are excluded (e.g. the impacts
from collection and cleaning reusable bottles). These processes are included in the
EoL stage if the product is reused into a product with different specifications (see
Section 4.4.9 for further details). If the product lifetime is extended into a product with
original product specifications (providing the same function) these processes shall be
included in the FU and reference flow.

# 3610 6.5 End of life

3611 The end of life stage begins when the product in scope and its packaging is discarded

by the user and ends when the product is returned to nature as a waste product orenters another product's life cycle (i.e. as a recycled input). In general, it includes the

- 3614 waste of the product in scope, such as the food waste, and primary packaging.
- 3615 Other waste (different from the product in scope) generated during the manufacturing, 3616 distribution, retail, use stage or after use shall be included in the life cycle of the 3617 product and modelled at the life cycle stage where it occurs.
- 3618 Default datasets for the end-of-life stage can be found in ANNEX VII Inventory
  3619 modelling and default datasets ("Default datasets & DQR" tab).
- 3620 The user of the PEFCR shall report the DQR values (for each criterion + total) for all3621 the datasets used.
- The end of life shall be modelled using the Circular Footprint Formula and rules provided in chapter 'End of life modelling' of this PEFCR and in the PEF method, together with the default parameters listed in Table 21 to Table 23.
- 3625 Before selecting the appropriate R2 value, the user of the PEFCR shall carry out an 3626 evaluation for recyclability of the material. The PEF study shall include a statement on 3627 the recyclability of the materials/ products. The statement on recyclability shall be 3628 provided together with an evaluation for recyclability that includes evidence for the 3629 following three criteria (as described by ISO 14021:1999, Section 7.7.4 'Evaluation 3630 methodology'):
- The collection, sorting and delivery systems to transfer the materials from the
   source to the recycling facility are conveniently available to a reasonable
   proportion of the purchasers, potential purchasers and users of the product;
- 3634 2. The recycling facilities are available to accommodate the collected materials;
- 3635 3. Evidence is available that the product for which recyclability is claimed is being3636 collected and recycled.

Point 1 and 3 can be proven by recycling statistics (country specific) derived fromindustry associations or national bodies. Approximation to evidence at point 3 can be

- provided by applying for example the design for recyclability evaluation outlined in EN
  13430 Material recycling (Annexes A and B) or other sector-specific recyclability
  guidelines if available.
- Following the evaluation for recyclability, the appropriate R2 values (supply-chain specific or default) shall be used. If one criterion is not fulfilled or the sector-specific recyclability guidelines indicate limited recyclability, an R2 value of 0% shall be applied.
- 3646 Company-specific R2 values (measured at the output of the recycling plant) shall be 3647 used, if available. If no company-specific values are available and the criteria for the 3648 evaluation of recyclability are fulfilled (see below), application-specific R2 values shall 3649 be used as listed in Table 21 to Table 23.
- If an R2 value is not available for a specific country, the European average shall
   be used.
- If an R2 value is not available for a specific application, the R2 values of the
   material shall be used (e.g. materials average).
- In case no R2 values are available, R2 shall be set equal to 0 or new statistics
   may be generated in order to assign an R2 value in the specific situation.
- 3656 The applied R2 values shall be subject to the PEF study verification.
- 3657 Instructions on end-of-life modelling can mostly be found in other sections of the3658 PEFCR:
- An extension of lifetime (for example through reuse) is not considered to be an
   end-of-life scenario. More information can be found in Section 3.3.2;
- The modelling of the end-of-life scenario should include the transportation,
   collection and sorting when applicable, and follow the CFF formula, as
   presented in Section 5.10.

The end-of-life fate of unsold consumer products (Section 6.2.3) shall be modelled using the default end-of-life assumptions for the product illustrated in Figure 8 and Figure 9 of Section 5.10. In case a take back program is in place, the user of the PEFCR shall adapt all the end of life parameters of the CFF (R2, R3, A and B) as well as the datasets if relevant (transport modes, distance of collect, Erec, Ev, Ev\*, etc.) according to the rules defined in Section 5.10. In case some end-of-life parameters of the CFF or datasets cannot be updated because lack of data, the user of the CFF shall use the default end of life scenario from Figure 8 and Figure 9.

# 3673 6.5.1 Collection and transport

- The default datasets proposed in Annex VII for the disposal of primary packaging already include the collection of the packaging at the end of life.
- 3676 At the end of life, apparel and footwear products are either directly disposed of through 3677 municipal waste collection or collected prior to being sorted and treated as shown in
- Sorr municipal waste collection of collected prior to being sorted and treated as shown in
- 3678 Figure 14 for apparel and Figure 15 for footwear.





Figure 14 - End-of-life fate scenarios for apparel



3682

Figure 15 - End-of-life fate scenarios for footwear

3683 For the transport from the client to the recycling collection point, the allocation factor

3684 is calculated as the volume of the product divided by the maximum volume ( $0.2 \text{ m}^3$  for

a passenger car), as presented in Table 44.

No.	Sub-category	Default product volume (m³)	Allocation
1	T-shirts	0.0018	0.009
2	Shirts and blouses	0.006	0.03
3	Sweaters and midlayers	0.0102	0.051
4	Jackets and coats	0.015	0.075
5	Pants and shorts	0.004	0.02
6	Dresses, skirts and jumpsuits	0.007	0.035
7	Leggings, stockings, tights and socks	0.0006	0.003
8	Underwear	0.0006	0.003
9	Swimwear	0.0006	0.003
10	Apparel accessories	0.0012	0.006
11	Open-toed shoes	0.0048	0.024
12	Closed-toed shoes	0.018	0.09
13	Boots	0.024	0.12

The default transport means and distances presented in Table 45 for apparel and Table 46 for footwear shall be used (PEF method) unless primary data are used. The collection rate is based on the percentages specified in the tables integrated in Figure 8 and Figure 9 (column "end-of-life excluding the reuse rate").

3691

Table 45 - Default transport parameters for apparel end of life. See Figure 14 for more details.

Supply chain	Distance (km)	Utilisation ratio	Share of product mass transported for each transport leg (%)	Transportation mode
Municipal waste coll	ection			
Final client to landfill	30	64%	80.5%	Truck (>32 t, EURO 4)
Final client to incineration	30	64%	80.5%	Truck (>32 t, EURO 4)
Recycling collection	1			
Final client to collection point	1	n/a	19.5%	Passenger car
	130	64%		Truck (>32 t, EURO 4)
Collection point to	240	n/a	19.5%	Train (average freight train)
	270	n/a		Ship (barge)
Sorting point to recycling	100	64%	16.9%	Truck (>32 t, EURO 4)
Sorting point to incineration	30	64%	2.6%	Truck (>32 t, EURO 4)

3693 Table 46 - Default transport parameters for footwear end of life. See Figure 15 for more details.

Supply chain	Distance (km)	Utilisation ratio	Share of product mass transported for each transport leg (%)	Transportation mode
Municipal waste coll	lection			
Final client to landfill	30	64%	98%	Truck (>32 t, EURO 4)
Final client to incineration	30	64%	98%	Truck (>32 t, EURO 4)
Recycling collection	1			
Final client to collection point	1	n/a	2%	Passenger car
	130	64%		Truck (>32 t, EURO 4)
Collection point to	240	n/a	2%	Train (average freight train)
	270	n/a		Ship (barge)
Sorting point to recycling	100	64%	0%	Truck (>32 t, EURO 4)
Sorting point to incineration	30	64%	2%	Truck (>32 t, EURO 4)

# 3695 7 PEF results

# 3696 7.1 Benchmark values

The characterised, normalised, and weighted results including the weighted results as a single score for the 13 representative products (RPs) are presented in Table 47 through Table 59 for each impact category. To reduce the number of tables and improve the readability of this PEFCR, all results per each representative product were summarized in one table.

The sub-categories 'climate change –fossil', 'climate change – biogenic' and 'climate change - land use and land use change', are reported separately if they show a contribution of more than 5% each to the total score of climate change.

The data used for the models of the representative product were the best available data at the time of modelling them for the PEFCR. The definition of the sub-categories leads to variability of the products, with different functions within each sub-category. Accordingly, as is the case for all LCA methodologies, the conclusions drawn from a comparison to the benchmark have a degree of uncertainty and should, therefore, be seen as indications with some limitations.

	Charac	terised resu	ılts	Normalised results			Weighted results			
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	
Climate change	kg CO <sub>2</sub> eq	1.73E-01	1.93E-01	Person-years	2.30E-05	2.56E-05	Points	4.84E-06	5.39E-06	
Climate change - Fossil	kg CO <sub>2</sub> eq	1.70E-01	1.88E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Biogenic	kg CO <sub>2</sub> eq	8.02E-04	1.19E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	2.79E-03	4.46E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Ozone depletion	kg CFC-11 eq	1.82E-09	2.87E-09	Person-years	3.48E-08	5.49E-08	Points	2.19E-09	3.46E-09	
Human toxicity, cancer	CTUh	2.59E-10	2.84E-10	Person-years	1.50E-05	1.65E-05	Points	3.19E-07	3.51E-07	
Human toxicity, non-cancer	CTUh	2.87E-09	3.12E-09	Person-years	2.23E-05	2.42E-05	Points	4.11E-07	4.45E-07	
Particulate matter	disease inc.	3.05E-08	3.18E-08	Person-years	5.12E-05	5.34E-05	Points	4.58E-06	4.78E-06	
Ionising radiation	kBq U-235 eq	9.59E-03	1.45E-02	Person-years	2.27E-06	3.45E-06	Points	1.14E-07	1.73E-07	
Photochemical ozone formation	kg NMVOC eq	6.71E-04	7.17E-04	Person-years	1.64E-05	1.75E-05	Points	7.85E-07	8.39E-07	
Acidification	mol H⁺ eq	1.34E-03	1.41E-03	Person-years	2.41E-05	2.54E-05	Points	1.49E-06	1.58E-06	
Eutrophication, terrestrial	mol N eq	3.98E-03	4.17E-03	Person-years	2.25E-05	2.36E-05	Points	8.36E-07	8.76E-07	
Eutrophication, freshwater	kg P eq	4.52E-05	4.71E-05	Person-years	2.81E-05	2.93E-05	Points	7.88E-07	8.21E-07	
Eutrophication, marine	kg N eq	6.39E-04	6.74E-04	Person-years	3.27E-05	3.45E-05	Points	9.68E-07	1.02E-06	
Ecotoxicity, freshwater	CTUe	2.08E+00	2.30E+00	Person-years	3.67E-05	4.05E-05	Points	7.05E-07	7.78E-07	
Land use	Pt	6.09E+00	6.54E+00	Person-years	7.43E-06	7.99E-06	Points	5.90E-07	6.34E-07	
Water use	m <sup>3</sup> depriv.	7.09E-01	7.24E-01	Person-years	6.18E-05	6.31E-05	Points	5.26E-06	5.37E-06	
Resource use, minerals and metals	kg Sb eq	1.25E-06	1.57E-06	Person-years	1.97E-05	2.47E-05	Points	1.49E-06	1.87E-06	
Resource use, fossils	MJ	2.33E+00	2.62E+00	Person-years	3.59E-05	4.03E-05	Points	2.99E-06	3.35E-06	
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	2.62E-05	2.83E-05	

Table 47 - Characterised, normalised and weighted results including the single score per use for t-shirts (RP1)

	-	_	-	-						
	Charac	terised resu	ılts	Normalised results			Weighted results			
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	
Climate change	kg CO <sub>2</sub> eq	3.05E-01	3.31E-01	Person-years	4.03E-05	4.38E-05	Points	8.49E-06	9.22E-06	
Climate change - Fossil	kg CO <sub>2</sub> eq	3.00E-01	3.23E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Biogenic	kg CO <sub>2</sub> eq	1.39E-03	1.93E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	3.64E-03	5.88E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Ozone depletion	kg CFC-11 eq	2.72E-09	5.91E-09	Person-years	5.20E-08	1.13E-07	Points	3.28E-09	7.12E-09	
Human toxicity, cancer	CTUh	4.16E-10	4.55E-10	Person-years	2.41E-05	2.64E-05	Points	5.14E-07	5.61E-07	
Human toxicity, non-cancer	CTUh	4.18E-09	4.53E-09	Person-years	3.25E-05	3.52E-05	Points	5.98E-07	6.47E-07	
Particulate matter	disease inc.	5.47E-08	5.65E-08	Person-years	9.19E-05	9.49E-05	Points	8.23E-06	8.50E-06	
Ionising radiation	kBq U-235 eq	1.91E-02	2.56E-02	Person-years	4.53E-06	6.06E-06	Points	2.27E-07	3.03E-07	
Photochemical ozone formation	kg NMVOC eq	1.10E-03	1.16E-03	Person-years	2.68E-05	2.84E-05	Points	1.28E-06	1.36E-06	
Acidification	mol H⁺ eq	2.20E-03	2.31E-03	Person-years	3.96E-05	4.15E-05	Points	2.46E-06	2.57E-06	
Eutrophication, terrestrial	mol N eq	5.99E-03	6.25E-03	Person-years	3.39E-05	3.54E-05	Points	1.26E-06	1.31E-06	
Eutrophication, freshwater	kg P eq	5.83E-05	6.07E-05	Person-years	3.63E-05	3.78E-05	Points	1.02E-06	1.06E-06	
Eutrophication, marine	kg N eq	8.88E-04	9.40E-04	Person-years	4.54E-05	4.81E-05	Points	1.35E-06	1.42E-06	
Ecotoxicity, freshwater	CTUe	3.09E+00	3.39E+00	Person-years	5.45E-05	5.98E-05	Points	1.05E-06	1.15E-06	
Land use	Pt	8.19E+00	8.84E+00	Person-years	1.00E-05	1.08E-05	Points	7.94E-07	8.56E-07	
Water use	m <sup>3</sup> depriv.	9.18E-01	9.40E-01	Person-years	8.01E-05	8.19E-05	Points	6.81E-06	6.97E-06	
Resource use, minerals and metals	kg Sb eq	2.17E-06	2.51E-06	Person-years	3.41E-05	3.95E-05	Points	2.57E-06	2.98E-06	
Resource use, fossils	MJ	4.17E+00	4.54E+00	Person-years	6.42E-05	6.98E-05	Points	5.34E-06	5.81E-06	
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	4.20E-05	4.47E-05	

Table 48 - Characterised, normalised and weighted results including the single score per use for shirts and blouses (RP2)

	Characterised results			Normalised results			Weighted results			
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	
Climate change	kg CO₂ eq	8.67E-01	8.85E-01	Person-years	1.15E-04	1.17E-04	Points	2.42E-05	2.47E-05	
Climate change - Fossil	kg CO <sub>2</sub> eq	5.32E-01	5.49E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Biogenic	kg CO <sub>2</sub> eq	2.43E-01	2.43E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	9.16E-02	9.28E-02	Person-years	n/a	n/a	Points	n/a	n/a	
Ozone depletion	kg CFC-11 eq	3.09E-09	5.78E-09	Person-years	5.91E-08	1.11E-07	Points	3.73E-09	6.97E-09	
Human toxicity, cancer	CTUh	4.86E-10	5.18E-10	Person-years	2.81E-05	3.00E-05	Points	6.00E-07	6.39E-07	
Human toxicity, non-cancer	CTUh	1.11E-08	1.14E-08	Person-years	8.61E-05	8.84E-05	Points	1.58E-06	1.63E-06	
Particulate matter	disease inc.	1.56E-07	1.57E-07	Person-years	2.62E-04	2.64E-04	Points	2.35E-05	2.37E-05	
Ionising radiation	kBq U-235 eq	1.87E-02	2.27E-02	Person-years	4.43E-06	5.39E-06	Points	2.22E-07	2.70E-07	
Photochemical ozone formation	kg NMVOC eq	2.00E-03	2.05E-03	Person-years	4.90E-05	5.02E-05	Points	2.34E-06	2.40E-06	
Acidification	mol H⁺ eq	1.61E-02	1.61E-02	Person-years	2.89E-04	2.91E-04	Points	1.79E-05	1.80E-05	
Eutrophication, terrestrial	mol N eq	6.20E-02	6.22E-02	Person-years	3.51E-04	3.52E-04	Points	1.30E-05	1.31E-05	
Eutrophication, freshwater	kg P eq	1.63E-04	1.65E-04	Person-years	1.01E-04	1.03E-04	Points	2.84E-06	2.88E-06	
Eutrophication, marine	kg N eq	8.90E-03	8.94E-03	Person-years	4.55E-04	4.57E-04	Points	1.35E-05	1.35E-05	
Ecotoxicity, freshwater	CTUe	5.38E+01	5.41E+01	Person-years	9.49E-04	9.53E-04	Points	1.82E-05	1.83E-05	
Land use	Pt	1.41E+02	1.41E+02	Person-years	1.72E-04	1.73E-04	Points	1.37E-05	1.37E-05	
Water use	m <sup>3</sup> depriv.	1.76E+00	1.78E+00	Person-years	1.53E-04	1.55E-04	Points	1.31E-05	1.32E-05	
Resource use, minerals and metals	kg Sb eq	2.67E-06	2.94E-06	Person-years	4.19E-05	4.62E-05	Points	3.16E-06	3.49E-06	
Resource use, fossils	MJ	5.24E+00	5.51E+00	Person-years	8.06E-05	8.47E-05	Points	6.71E-06	7.05E-06	
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	1.54E-04	1.56E-04	

Table 49 - Characterised, normalised and weighted results including the single score per use for sweaters and midlayers (RP3)

	Characterised results			Normalised results			Weighted results			
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	
Climate change	kg CO <sub>2</sub> eq	7.39E-01	7.50E-01	Person-years	9.79E-05	9.93E-05	Points	2.06E-05	2.09E-05	
Climate change - Fossil	kg CO <sub>2</sub> eq	5.69E-01	5.80E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Biogenic	kg CO <sub>2</sub> eq	1.18E-01	1.19E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	5.14E-02	5.20E-02	Person-years	n/a	n/a	Points	n/a	n/a	
Ozone depletion	kg CFC-11 eq	4.59E-09	6.75E-09	Person-years	8.77E-08	1.29E-07	Points	5.53E-09	8.13E-09	
Human toxicity, cancer	CTUh	6.50E-10	6.69E-10	Person-years	3.77E-05	3.88E-05	Points	8.03E-07	8.26E-07	
Human toxicity, non-cancer	CTUh	8.67E-09	8.84E-09	Person-years	6.74E-05	6.86E-05	Points	1.24E-06	1.26E-06	
Particulate matter	disease inc.	1.36E-07	1.36E-07	Person-years	2.28E-04	2.29E-04	Points	2.04E-05	2.05E-05	
Ionising radiation	kBq U-235 eq	2.80E-02	3.07E-02	Person-years	6.64E-06	7.28E-06	Points	3.33E-07	3.65E-07	
Photochemical ozone formation	kg NMVOC eq	2.06E-03	2.09E-03	Person-years	5.04E-05	5.12E-05	Points	2.41E-06	2.45E-06	
Acidification	mol H⁺ eq	1.09E-02	1.09E-02	Person-years	1.96E-04	1.96E-04	Points	1.21E-05	1.22E-05	
Eutrophication, terrestrial	mol N eq	3.79E-02	3.80E-02	Person-years	2.14E-04	2.15E-04	Points	7.95E-06	7.97E-06	
Eutrophication, freshwater	kg P eq	1.00E-04	1.01E-04	Person-years	6.24E-05	6.30E-05	Points	1.75E-06	1.76E-06	
Eutrophication, marine	kg N eq	5.04E-03	5.07E-03	Person-years	2.58E-04	2.59E-04	Points	7.64E-06	7.67E-06	
Ecotoxicity, freshwater	CTUe	3.00E+01	3.01E+01	Person-years	5.29E-04	5.31E-04	Points	1.01E-05	1.02E-05	
Land use	Pt	6.30E+01	6.33E+01	Person-years	7.69E-05	7.72E-05	Points	6.11E-06	6.13E-06	
Water use	m <sup>3</sup> depriv.	1.18E+00	1.19E+00	Person-years	1.03E-04	1.03E-04	Points	8.73E-06	8.80E-06	
Resource use, minerals and metals	kg Sb eq	5.35E-06	5.49E-06	Person-years	8.41E-05	8.63E-05	Points	6.35E-06	6.51E-06	
Resource use, fossils	MJ	7.16E+00	7.32E+00	Person-years	1.10E-04	1.13E-04	Points	9.16E-06	9.37E-06	
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	1.16E-04	1.17E-04	

Table 50 - Characterised, normalised and weighted results including the single score per use for jackets and coats (RP4)

	Characterised results			Normalised results			Weighted results			
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	
Climate change	kg CO₂ eq	2.97E-01	3.21E-01	Person-years	3.93E-05	4.25E-05	Points	8.27E-06	8.95E-06	
Climate change - Fossil	kg CO <sub>2</sub> eq	2.90E-01	3.12E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Biogenic	kg CO <sub>2</sub> eq	3.02E-03	3.41E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	3.72E-03	5.22E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Ozone depletion	kg CFC-11 eq	3.32E-09	7.20E-09	Person-years	6.34E-08	1.37E-07	Points	4.00E-09	8.67E-09	
Human toxicity, cancer	CTUh	4.15E-10	4.50E-10	Person-years	2.41E-05	2.61E-05	Points	5.12E-07	5.56E-07	
Human toxicity, non-cancer	CTUh	4.12E-09	4.42E-09	Person-years	3.20E-05	3.43E-05	Points	5.89E-07	6.31E-07	
Particulate matter	disease inc.	5.33E-08	5.49E-08	Person-years	8.95E-05	9.22E-05	Points	8.02E-06	8.26E-06	
Ionising radiation	kBq U-235 eq	1.74E-02	2.40E-02	Person-years	4.13E-06	5.70E-06	Points	2.07E-07	2.85E-07	
Photochemical ozone formation	kg NMVOC eq	1.10E-03	1.16E-03	Person-years	2.69E-05	2.83E-05	Points	1.29E-06	1.35E-06	
Acidification	mol H⁺ eq	2.29E-03	2.38E-03	Person-years	4.12E-05	4.29E-05	Points	2.55E-06	2.66E-06	
Eutrophication, terrestrial	mol N eq	6.35E-03	6.59E-03	Person-years	3.59E-05	3.73E-05	Points	1.33E-06	1.38E-06	
Eutrophication, freshwater	kg P eq	5.38E-05	5.57E-05	Person-years	3.35E-05	3.47E-05	Points	9.37E-07	9.70E-07	
Eutrophication, marine	kg N eq	8.88E-04	9.28E-04	Person-years	4.54E-05	4.75E-05	Points	1.34E-06	1.41E-06	
Ecotoxicity, freshwater	CTUe	3.45E+00	3.71E+00	Person-years	6.08E-05	6.54E-05	Points	1.17E-06	1.26E-06	
Land use	Pt	7.88E+00	8.35E+00	Person-years	9.62E-06	1.02E-05	Points	7.63E-07	8.09E-07	
Water use	m <sup>3</sup> depriv.	8.29E-01	8.46E-01	Person-years	7.23E-05	7.38E-05	Points	6.15E-06	6.28E-06	
Resource use, minerals and metals	kg Sb eq	2.81E-06	3.13E-06	Person-years	4.42E-05	4.92E-05	Points	3.34E-06	3.71E-06	
Resource use, fossils	MJ	4.14E+00	4.51E+00	Person-years	6.37E-05	6.94E-05	Points	5.30E-06	5.77E-06	
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	4.18E-05	4.43E-05	

Table 51 - Characterised, norn	nalised and weighted results	including the single score	per use for pants and shorts	(RP5)
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	Characterised results				Normalised results			Weighted results		
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	
Climate change	kg CO <sub>2</sub> eq	2.28E-01	2.48E-01	Person-years	3.01E-05	3.28E-05	Points	6.35E-06	6.91E-06	
Climate change - Fossil	kg CO <sub>2</sub> eq	2.13E-01	2.31E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Biogenic	kg CO <sub>2</sub> eq	8.61E-03	9.02E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	6.59E-03	8.13E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Ozone depletion	kg CFC-11 eq	1.94E-09	5.15E-09	Person-years	3.70E-08	9.84E-08	Points	2.33E-09	6.21E-09	
Human toxicity, cancer	CTUh	2.87E-10	3.20E-10	Person-years	1.66E-05	1.85E-05	Points	3.54E-07	3.95E-07	
Human toxicity, non-cancer	CTUh	3.18E-09	3.48E-09	Person-years	2.47E-05	2.70E-05	Points	4.55E-07	4.97E-07	
Particulate matter	disease inc.	4.17E-08	4.32E-08	Person-years	7.00E-05	7.25E-05	Points	6.28E-06	6.50E-06	
Ionising radiation	kBq U-235 eq	1.28E-02	1.75E-02	Person-years	3.02E-06	4.15E-06	Points	1.52E-07	2.08E-07	
Photochemical ozone formation	kg NMVOC eq	7.83E-04	8.38E-04	Person-years	1.92E-05	2.05E-05	Points	9.16E-07	9.80E-07	
Acidification	mol H⁺ eq	2.13E-03	2.22E-03	Person-years	3.83E-05	3.99E-05	Points	2.37E-06	2.47E-06	
Eutrophication, terrestrial	mol N eq	6.49E-03	6.72E-03	Person-years	3.67E-05	3.80E-05	Points	1.36E-06	1.41E-06	
Eutrophication, freshwater	kg P eq	4.44E-05	4.64E-05	Person-years	2.76E-05	2.89E-05	Points	7.74E-07	8.08E-07	
Eutrophication, marine	kg N eq	9.26E-04	9.71E-04	Person-years	4.74E-05	4.97E-05	Points	1.40E-06	1.47E-06	
Ecotoxicity, freshwater	CTUe	3.96E+00	4.21E+00	Person-years	6.98E-05	7.42E-05	Points	1.34E-06	1.43E-06	
Land use	Pt	7.95E+00	8.46E+00	Person-years	9.71E-06	1.03E-05	Points	7.71E-07	8.20E-07	
Water use	m <sup>3</sup> depriv.	6.74E-01	6.92E-01	Person-years	5.87E-05	6.03E-05	Points	5.00E-06	5.13E-06	
Resource use, minerals and metals	kg Sb eq	1.51E-06	1.76E-06	Person-years	2.38E-05	2.77E-05	Points	1.79E-06	2.09E-06	
Resource use, fossils	MJ	2.89E+00	3.18E+00	Person-years	4.44E-05	4.89E-05	Points	3.70E-06	4.07E-06	
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	3.30E-05	3.52E-05	

Table 52 - Characterised, normalised and weighted results including the single score per use for dresses, skirts and jumpsuits (RP6)

Characterised results				Normalised results			Weighted results		
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts
Climate change	kg CO <sub>2</sub> eq	1.18E-01	1.30E-01	Person-years	1.56E-05	1.72E-05	Points	3.29E-06	3.62E-06
Climate change - Fossil	kg CO <sub>2</sub> eq	1.10E-01	1.20E-01	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Biogenic	kg CO <sub>2</sub> eq	5.13E-03	5.41E-03	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	3.09E-03	4.31E-03	Person-years	n/a	n/a	Points	n/a	n/a
Ozone depletion	kg CFC-11 eq	1.07E-09	1.87E-09	Person-years	2.04E-08	3.57E-08	Points	1.29E-09	2.26E-09
Human toxicity, cancer	CTUh	1.57E-10	1.75E-10	Person-years	9.13E-06	1.01E-05	Points	1.94E-07	2.16E-07
Human toxicity, non-cancer	CTUh	1.29E-09	1.46E-09	Person-years	1.00E-05	1.13E-05	Points	1.84E-07	2.08E-07
Particulate matter	disease inc.	2.03E-08	2.11E-08	Person-years	3.41E-05	3.55E-05	Points	3.05E-06	3.18E-06
Ionising radiation	kBq U-235 eq	5.89E-03	8.49E-03	Person-years	1.40E-06	2.01E-06	Points	6.99E-08	1.01E-07
Photochemical ozone formation	kg NMVOC eq	4.35E-04	4.64E-04	Person-years	1.06E-05	1.14E-05	Points	5.09E-07	5.43E-07
Acidification	mol H⁺ eq	1.12E-03	1.17E-03	Person-years	2.02E-05	2.11E-05	Points	1.25E-06	1.31E-06
Eutrophication, terrestrial	mol N eq	3.29E-03	3.42E-03	Person-years	1.86E-05	1.93E-05	Points	6.91E-07	7.17E-07
Eutrophication, freshwater	kg P eq	1.44E-05	1.57E-05	Person-years	8.98E-06	9.79E-06	Points	2.52E-07	2.74E-07
Eutrophication, marine	kg N eq	4.35E-04	4.61E-04	Person-years	2.23E-05	2.36E-05	Points	6.59E-07	6.98E-07
Ecotoxicity, freshwater	CTUe	2.16E+00	2.31E+00	Person-years	3.81E-05	4.07E-05	Points	7.32E-07	7.81E-07
Land use	Pt	2.96E+00	3.30E+00	Person-years	3.61E-06	4.02E-06	Points	2.87E-07	3.19E-07
Water use	m <sup>3</sup> depriv.	2.10E-01	2.21E-01	Person-years	1.83E-05	1.92E-05	Points	1.56E-06	1.64E-06
Resource use, minerals and metals	kg Sb eq	7.28E-07	9.12E-07	Person-years	1.14E-05	1.43E-05	Points	8.64E-07	1.08E-06
Resource use, fossils	MJ	1.60E+00	1.76E+00	Person-years	2.47E-05	2.71E-05	Points	2.05E-06	2.26E-06
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	1.57E-05	1.69E-05

Table 53 - Characterised, normalised and weighted results including the single score per use for leggings, stockings, tights and socks (RP7)

	Characterised results				Normalised results			Weighted results		
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	
Climate change	kg CO₂ eq	7.06E-02	9.14E-02	Person-years	9.35E-06	1.21E-05	Points	1.97E-06	2.55E-06	
Climate change - Fossil	kg CO <sub>2</sub> eq	6.93E-02	8.82E-02	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Biogenic	kg CO <sub>2</sub> eq	3.13E-04	6.88E-04	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	9.99E-04	2.53E-03	Person-years	n/a	n/a	Points	n/a	n/a	
Ozone depletion	kg CFC-11 eq	6.91E-10	1.16E-09	Person-years	1.32E-08	2.22E-08	Points	8.33E-10	1.40E-09	
Human toxicity, cancer	CTUh	1.04E-10	1.28E-10	Person-years	6.01E-06	7.44E-06	Points	1.28E-07	1.58E-07	
Human toxicity, non-cancer	CTUh	1.07E-09	1.31E-09	Person-years	8.33E-06	1.02E-05	Points	1.53E-07	1.88E-07	
Particulate matter	disease inc.	1.24E-08	1.37E-08	Person-years	2.08E-05	2.31E-05	Points	1.86E-06	2.07E-06	
Ionising radiation	kBq U-235 eq	3.80E-03	9.28E-03	Person-years	9.00E-07	2.20E-06	Points	4.51E-08	1.10E-07	
Photochemical ozone formation	kg NMVOC eq	2.81E-04	3.29E-04	Person-years	6.88E-06	8.05E-06	Points	3.29E-07	3.85E-07	
Acidification	mol H⁺ eq	5.45E-04	6.26E-04	Person-years	9.80E-06	1.13E-05	Points	6.08E-07	6.98E-07	
Eutrophication, terrestrial	mol N eq	1.57E-03	1.77E-03	Person-years	8.85E-06	9.99E-06	Points	3.28E-07	3.71E-07	
Eutrophication, freshwater	kg P eq	1.59E-05	1.78E-05	Person-years	9.88E-06	1.11E-05	Points	2.77E-07	3.10E-07	
Eutrophication, marine	kg N eq	2.43E-04	2.79E-04	Person-years	1.24E-05	1.43E-05	Points	3.68E-07	4.23E-07	
Ecotoxicity, freshwater	CTUe	8.42E-01	1.07E+00	Person-years	1.48E-05	1.88E-05	Points	2.85E-07	3.61E-07	
Land use	Pt	2.14E+00	2.58E+00	Person-years	2.61E-06	3.15E-06	Points	2.07E-07	2.50E-07	
Water use	m <sup>3</sup> depriv.	2.50E-01	2.65E-01	Person-years	2.18E-05	2.31E-05	Points	1.85E-06	1.97E-06	
Resource use, minerals and metals	kg Sb eq	3.01E-07	6.16E-07	Person-years	4.73E-06	9.68E-06	Points	3.57E-07	7.31E-07	
Resource use, fossils	MJ	9.65E-01	1.28E+00	Person-years	1.48E-05	1.96E-05	Points	1.24E-06	1.63E-06	
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	1.00E-05	1.22E-05	

Table 54 - Characterised, normalised and weighted results including the single score per use for underwear (RP8)

	Characterised results			Normalised results			Weighted results		
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts
Climate change	kg CO <sub>2</sub> eq	1.69E-01	1.92E-01	Person-years	2.24E-05	2.55E-05	Points	4.72E-06	5.37E-06
Climate change - Fossil	kg CO <sub>2</sub> eq	1.68E-01	1.91E-01	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Biogenic	kg CO <sub>2</sub> eq	1.13E-03	1.59E-03	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	2.33E-04	3.11E-04	Person-years	n/a	n/a	Points	n/a	n/a
Ozone depletion	kg CFC-11 eq	7.81E-10	1.09E-09	Person-years	1.49E-08	2.07E-08	Points	9.41E-10	1.31E-09
Human toxicity, cancer	CTUh	2.53E-10	2.96E-10	Person-years	1.46E-05	1.71E-05	Points	3.12E-07	3.65E-07
Human toxicity, non-cancer	CTUh	1.13E-09	1.61E-09	Person-years	8.81E-06	1.25E-05	Points	1.62E-07	2.30E-07
Particulate matter	disease inc.	2.66E-08	2.90E-08	Person-years	4.47E-05	4.87E-05	Points	4.00E-06	4.37E-06
Ionising radiation	kBq U-235 eq	1.00E-02	1.44E-02	Person-years	2.37E-06	3.40E-06	Points	1.19E-07	1.71E-07
Photochemical ozone formation	kg NMVOC eq	6.31E-04	7.22E-04	Person-years	1.54E-05	1.77E-05	Points	7.38E-07	8.45E-07
Acidification	mol H⁺ eq	1.16E-03	1.32E-03	Person-years	2.08E-05	2.38E-05	Points	1.29E-06	1.47E-06
Eutrophication, terrestrial	mol N eq	2.48E-03	2.97E-03	Person-years	1.40E-05	1.68E-05	Points	5.21E-07	6.23E-07
Eutrophication, freshwater	kg P eq	5.32E-06	8.03E-06	Person-years	3.31E-06	5.00E-06	Points	9.27E-08	1.40E-07
Eutrophication, marine	kg N eq	2.85E-04	3.84E-04	Person-years	1.46E-05	1.96E-05	Points	4.32E-07	5.81E-07
Ecotoxicity, freshwater	CTUe	1.60E+00	2.05E+00	Person-years	2.82E-05	3.61E-05	Points	5.42E-07	6.94E-07
Land use	Pt	2.41E-01	9.27E-01	Person-years	2.94E-07	1.13E-06	Points	2.34E-08	8.98E-08
Water use	m <sup>3</sup> depriv.	9.37E-02	1.28E-01	Person-years	8.17E-06	1.11E-05	Points	6.96E-07	9.48E-07
Resource use, minerals and metals	kg Sb eq	1.75E-06	1.89E-06	Person-years	2.75E-05	2.97E-05	Points	2.08E-06	2.24E-06
Resource use, fossils	MJ	2.75E+00	3.12E+00	Person-years	4.23E-05	4.81E-05	Points	3.52E-06	4.00E-06
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	1.93E-05	2.21E-05

Table 55 - Characterised, normalised and	d weighted results includin	ng the single score per use	e for swimwear (RP9)
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	Characterised results			Normalised results			Weighted results		
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts
Climate change	kg CO <sub>2</sub> eq	1.31E-01	1.33E-01	Person-years	1.74E-05	1.75E-05	Points	3.66E-06	3.69E-06
Climate change - Fossil	kg CO <sub>2</sub> eq	9.12E-02	9.25E-02	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Biogenic	kg CO <sub>2</sub> eq	2.60E-02	2.60E-02	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	1.40E-02	1.40E-02	Person-years	n/a	n/a	Points	n/a	n/a
Ozone depletion	kg CFC-11 eq	1.37E-09	1.67E-09	Person-years	2.63E-08	3.20E-08	Points	1.66E-09	2.02E-09
Human toxicity, cancer	CTUh	1.13E-10	1.15E-10	Person-years	6.55E-06	6.69E-06	Points	1.39E-07	1.43E-07
Human toxicity, non-cancer	CTUh	2.19E-09	2.21E-09	Person-years	1.70E-05	1.71E-05	Points	3.12E-07	3.16E-07
Particulate matter	disease inc.	2.57E-08	2.58E-08	Person-years	4.32E-05	4.34E-05	Points	3.87E-06	3.89E-06
Ionising radiation	kBq U-235 eq	3.30E-03	3.62E-03	Person-years	7.81E-07	8.58E-07	Points	3.91E-08	4.30E-08
Photochemical ozone formation	kg NMVOC eq	3.85E-04	3.89E-04	Person-years	9.42E-06	9.51E-06	Points	4.50E-07	4.55E-07
Acidification	mol H⁺ eq	2.56E-03	2.56E-03	Person-years	4.60E-05	4.61E-05	Points	2.85E-06	2.86E-06
Eutrophication, terrestrial	mol N eq	9.54E-03	9.56E-03	Person-years	5.40E-05	5.41E-05	Points	2.00E-06	2.01E-06
Eutrophication, freshwater	kg P eq	2.21E-05	2.23E-05	Person-years	1.38E-05	1.39E-05	Points	3.86E-07	3.88E-07
Eutrophication, marine	kg N eq	1.20E-03	1.20E-03	Person-years	6.12E-05	6.13E-05	Points	1.81E-06	1.82E-06
Ecotoxicity, freshwater	CTUe	7.02E+00	7.04E+00	Person-years	1.24E-04	1.24E-04	Points	2.38E-06	2.38E-06
Land use	Pt	1.01E+01	1.01E+01	Person-years	1.23E-05	1.23E-05	Points	9.75E-07	9.78E-07
Water use	m <sup>3</sup> depriv.	2.48E-01	2.50E-01	Person-years	2.17E-05	2.18E-05	Points	1.84E-06	1.85E-06
Resource use, minerals and metals	kg Sb eq	4.82E-07	4.98E-07	Person-years	7.58E-06	7.83E-06	Points	5.72E-07	5.92E-07
Resource use, fossils	MJ	1.01E+00	1.03E+00	Person-years	1.55E-05	1.58E-05	Points	1.29E-06	1.31E-06
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	2.26E-05	2.27E-05

Table 56 - Characterised, normalised and weighted results including the single score per use for apparel accessories (RP10)

	Characterised results			Norma	alised result	S	Weighted results			
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	
Climate change	kg CO₂ eq	2.98E-01	2.98E-01	Person-years	3.94E-05	3.95E-05	Points	8.30E-06	8.31E-06	
Climate change - Fossil	kg CO <sub>2</sub> eq	2.56E-01	2.56E-01	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Biogenic	kg CO <sub>2</sub> eq	3.08E-02	3.08E-02	Person-years	n/a	n/a	Points	n/a	n/a	
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	1.12E-02	1.13E-02	Person-years	n/a	n/a	Points	n/a	n/a	
Ozone depletion	kg CFC-11 eq	9.14E-09	9.14E-09	Person-years	1.75E-07	1.75E-07	Points	1.10E-08	1.10E-08	
Human toxicity, cancer	CTUh	6.27E-10	6.28E-10	Person-years	3.63E-05	3.64E-05	Points	7.74E-07	7.75E-07	
Human toxicity, non-cancer	CTUh	1.37E-08	1.37E-08	Person-years	1.06E-04	1.06E-04	Points	1.96E-06	1.96E-06	
Particulate matter	disease inc.	4.77E-08	4.78E-08	Person-years	8.02E-05	8.02E-05	Points	7.18E-06	7.19E-06	
Ionising radiation	kBq U-235 eq	1.03E-02	1.04E-02	Person-years	2.45E-06	2.46E-06	Points	1.23E-07	1.23E-07	
Photochemical ozone formation	kg NMVOC eq	1.51E-03	1.51E-03	Person-years	3.70E-05	3.70E-05	Points	1.77E-06	1.77E-06	
Acidification	mol H⁺ eq	3.88E-03	3.89E-03	Person-years	6.99E-05	6.99E-05	Points	4.33E-06	4.34E-06	
Eutrophication, terrestrial	mol N eq	1.42E-02	1.42E-02	Person-years	8.05E-05	8.06E-05	Points	2.99E-06	2.99E-06	
Eutrophication, freshwater	kg P eq	2.12E-05	2.13E-05	Person-years	1.32E-05	1.32E-05	Points	3.69E-07	3.71E-07	
Eutrophication, marine	kg N eq	1.42E-03	1.42E-03	Person-years	7.24E-05	7.25E-05	Points	2.14E-06	2.15E-06	
Ecotoxicity, freshwater	CTUe	1.05E+01	1.05E+01	Person-years	1.86E-04	1.86E-04	Points	3.57E-06	3.57E-06	
Land use	Pt	1.50E+01	1.50E+01	Person-years	1.83E-05	1.84E-05	Points	1.46E-06	1.46E-06	
Water use	m <sup>3</sup> depriv.	1.72E-01	1.72E-01	Person-years	1.50E-05	1.50E-05	Points	1.27E-06	1.28E-06	
Resource use, minerals and metals	kg Sb eq	2.03E-06	2.04E-06	Person-years	3.19E-05	3.21E-05	Points	2.41E-06	2.42E-06	
Resource use, fossils	MJ	3.74E+00	3.75E+00	Person-years	5.76E-05	5.76E-05	Points	4.79E-06	4.79E-06	
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	4.35E-05	4.35E-05	

Table 57 - Characterised, normalised and weighted results including the single score per use for open-toed shoes (RP11)

	Characterised results			Normalised results			Weighted results		
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts
Climate change	kg CO <sub>2</sub> eq	5.38E-01	5.38E-01	Person-years	7.12E-05	7.13E-05	Points	1.50E-05	1.50E-05
Climate change - Fossil	kg CO <sub>2</sub> eq	4.41E-01	4.42E-01	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Biogenic	kg CO <sub>2</sub> eq	6.46E-02	6.47E-02	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	3.16E-02	3.17E-02	Person-years	n/a	n/a	Points	n/a	n/a
Ozone depletion	kg CFC-11 eq	9.17E-09	9.18E-09	Person-years	1.75E-07	1.75E-07	Points	1.11E-08	1.11E-08
Human toxicity, cancer	CTUh	8.73E-10	8.74E-10	Person-years	5.06E-05	5.06E-05	Points	1.08E-06	1.08E-06
Human toxicity, non-cancer	CTUh	1.44E-08	1.44E-08	Person-years	1.12E-04	1.12E-04	Points	2.06E-06	2.06E-06
Particulate matter	disease inc.	9.33E-08	9.33E-08	Person-years	1.57E-04	1.57E-04	Points	1.40E-05	1.40E-05
Ionising radiation	kBq U-235 eq	2.02E-02	2.02E-02	Person-years	4.78E-06	4.79E-06	Points	2.39E-07	2.40E-07
Photochemical ozone formation	kg NMVOC eq	2.08E-03	2.08E-03	Person-years	5.10E-05	5.10E-05	Points	2.44E-06	2.44E-06
Acidification	mol H⁺ eq	7.54E-03	7.54E-03	Person-years	1.36E-04	1.36E-04	Points	8.41E-06	8.42E-06
Eutrophication, terrestrial	mol N eq	2.67E-02	2.67E-02	Person-years	1.51E-04	1.51E-04	Points	5.61E-06	5.61E-06
Eutrophication, freshwater	kg P eq	5.37E-05	5.38E-05	Person-years	3.34E-05	3.35E-05	Points	9.35E-07	9.37E-07
Eutrophication, marine	kg N eq	3.15E-03	3.15E-03	Person-years	1.61E-04	1.61E-04	Points	4.77E-06	4.78E-06
Ecotoxicity, freshwater	CTUe	2.25E+01	2.25E+01	Person-years	3.97E-04	3.97E-04	Points	7.61E-06	7.62E-06
Land use	Pt	2.83E+01	2.84E+01	Person-years	3.46E-05	3.46E-05	Points	2.75E-06	2.75E-06
Water use	m <sup>3</sup> depriv.	5.92E-01	5.93E-01	Person-years	5.17E-05	5.17E-05	Points	4.40E-06	4.40E-06
Resource use, minerals and metals	kg Sb eq	4.02E-06	4.03E-06	Person-years	6.31E-05	6.33E-05	Points	4.76E-06	4.78E-06
Resource use, fossils	MJ	5.99E+00	6.00E+00	Person-years	9.21E-05	9.23E-05	Points	7.66E-06	7.68E-06
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	8.18E-05	8.19E-05

Table 58 - Characterised, normalised and weighted results including the single score per use for closed-toed shoes (RP12)

	Characterised results			Normalised results			Weighted results		
Impact category	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts	Units	Excludin g use	Total impacts
Climate change	kg CO <sub>2</sub> eq	5.41E-01	5.41E-01	Person-years	7.16E-05	7.17E-05	Points	1.51E-05	1.51E-05
Climate change - Fossil	kg CO <sub>2</sub> eq	4.60E-01	4.61E-01	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Biogenic	kg CO <sub>2</sub> eq	5.93E-02	5.93E-02	Person-years	n/a	n/a	Points	n/a	n/a
Climate change - Land use and land use change	kg CO <sub>2</sub> eq	2.11E-02	2.12E-02	Person-years	n/a	n/a	Points	n/a	n/a
Ozone depletion	kg CFC-11 eq	2.02E-08	2.02E-08	Person-years	3.86E-07	3.86E-07	Points	2.43E-08	2.43E-08
Human toxicity, cancer	CTUh	1.30E-09	1.30E-09	Person-years	7.54E-05	7.55E-05	Points	1.61E-06	1.61E-06
Human toxicity, non-cancer	CTUh	2.47E-08	2.47E-08	Person-years	1.92E-04	1.92E-04	Points	3.54E-06	3.54E-06
Particulate matter	disease inc.	8.95E-08	8.95E-08	Person-years	1.50E-04	1.50E-04	Points	1.35E-05	1.35E-05
Ionising radiation	kBq U-235 eq	2.08E-02	2.08E-02	Person-years	4.92E-06	4.94E-06	Points	2.47E-07	2.47E-07
Photochemical ozone formation	kg NMVOC eq	2.55E-03	2.55E-03	Person-years	6.24E-05	6.24E-05	Points	2.98E-06	2.98E-06
Acidification	mol H⁺ eq	7.29E-03	7.30E-03	Person-years	1.31E-04	1.31E-04	Points	8.14E-06	8.14E-06
Eutrophication, terrestrial	mol N eq	2.67E-02	2.67E-02	Person-years	1.51E-04	1.51E-04	Points	5.60E-06	5.60E-06
Eutrophication, freshwater	kg P eq	4.23E-05	4.25E-05	Person-years	2.63E-05	2.64E-05	Points	7.38E-07	7.40E-07
Eutrophication, marine	kg N eq	2.64E-03	2.64E-03	Person-years	1.35E-04	1.35E-04	Points	4.00E-06	4.00E-06
Ecotoxicity, freshwater	CTUe	1.99E+01	1.99E+01	Person-years	3.51E-04	3.51E-04	Points	6.74E-06	6.74E-06
Land use	Pt	2.54E+01	2.54E+01	Person-years	3.10E-05	3.11E-05	Points	2.46E-06	2.47E-06
Water use	m <sup>3</sup> depriv.	3.63E-01	3.64E-01	Person-years	3.17E-05	3.17E-05	Points	2.69E-06	2.70E-06
Resource use, minerals and metals	kg Sb eq	5.03E-06	5.05E-06	Person-years	7.91E-05	7.93E-05	Points	5.97E-06	5.99E-06
Resource use, fossils	MJ	6.46E+00	6.47E+00	Person-years	9.93E-05	9.96E-05	Points	8.26E-06	8.29E-06
Single overall score	Pt	n/a	n/a	Person-years	n/a	n/a	Points	8.15E-05	8.16E-05

Table 59 - Characterised, normalised and weighted results including the single score per use for boots (RP13)

# 3739 7.2 PEF profile

The user of the PEFCR shall calculate the PEF profile of its product in compliance with all requirements included in this PEFCR. The following information shall be included in the PEF report:

- full life cycle inventory;
- characterised results in absolute values, for all impact categories (as a table);
- normalised results in absolute values, for all impact categories (as a table);
- weighted result in absolute values, for all impact categories (as a table);
- the aggregated single overall score in absolute values. This score shall be
   communicated together with an indication of the IDM and RM methodology
   used to arrive at said score.

Together with the PEF report, the user of the PEFCR shall develop an aggregated EF compliant dataset of its product in scope. This dataset shall be made available to the European Commission. The disaggregated version may remain confidential.

# 3753 7.3 Classes of performance

3754 Given the limitations of this PEFCR, the TS has decided not to create classes of 3755 performance for PEF study results.
## 3757 8 Verification

The TS recognizes that currently, there are several actors developing or enhancing their tools for the environmental footprinting of products according to the rules documented in this PEFCR. Calculation tools can significantly reduce the costs involved in calculating as well as verifying PEF results. It is, however, important to guarantee that tools claiming compliance with this PEFCR meet a list of requirements. Inspired from other PEFCRs<sup>53</sup>, the TS therefore decided to differentiate between two situations for the verification of PEF studies, consisting of several elements:

- 3765 1) PEF studies not conducted in a tool, described in section 8.1
- 3766 o Validation of accuracy and reliance of quantitative information used in
   3767 the calculation of the study, according to the general verification
   3768 requirements

# 3769 2) PEF studies conducted in a pre-verified / PEFCR-compliant tool, described in3770 section 8.2

- 3771 o Verification requirements for the initial verification of the tool (pre3772 verification)
- o further requirements for the recurring verification of the tool
- additional verification requirements for PEF studies conducted in a
   pre-verified tool, validating the accuracy and reliance of quantitative
   information used in the calculation of the study, according to the
   general verification requirements

Besides the general minimum requirements for verifiers as defined in Section 8 in Annex I of the PEF Method, it is recommended that the "Knowledge of the specific sector" criteria of verifiers is equal to 2 points or higher, which equals between 3 and 6 years of experience. This requirement for verifiers is recommended for the verification of PEF studies not conducted in a tool, the initial and recurring verification of a tool as well as the verification of PEF studies conducted in a preverified tool.

<sup>&</sup>lt;sup>53</sup> Product Environmental Footprint Category Rules for Synthetic Turf Sports & Landscape Surfaces (V01 2024) & Product Environmental Footprint Category Rules for Cut flowers and Potted plants (final version 2024)

3785 If asked by the verifier(s), pictures of the product under study or access to the 3786 physical product shall be provided for the verification of the PEF study.

# 8.1 General verification requirements for PEF studies not conducted in a tool

The verification of an EF study/ report carried out in compliance with this PEFCR shall be done according to all the general requirements included in Section 9 of the PEF method, including Part A of its Annex and the requirements listed below.

The verifier(s) shall verify that the PEF study is conducted in compliance with this PEFCR.

In case policies implementing the PEF method define specific requirements regarding
verification and validation of PEF studies, reports and communication vehicles, the
requirements in said policies shall prevail.

The verifier(s) shall validate the accuracy and reliability of the quantitative information used in the calculation of the study. As this can be highly resource intensive, the following requirements shall be followed:

- The verifier shall check if the correct version of all impact assessment methods was used. For each of the most relevant impact categories, at least 50% of the characterisation factors (for each of the most relevant EF impact categories) shall be verified, while all normalisation and weighting factors of all impact categories shall be verified. In particular, the verifier shall check that the characterisation factors correspond to those included in the EF impact assessment method the study declares compliance with;
- 3807 2. The cut-off applied (if any) fulfils the requirements of this PEFCR and the PEF3808 method;
- 3809 3. All the newly created datasets shall be checked on their EF compliance (for3810 the meaning of EF compliant datasets refer
- 3811 <u>http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml</u>). All their underlying
- 3812 data (elementary flows, activity data and sub processes) shall be validated;

- 3813 4. The aggregated EF compliant dataset of the product in scope (meaning, the EF
  3814 study) is made available to the European Commission.
- 3815 5. At least 100% of the "mandatory" and 70% of the "mandatory, if available" data
  3816 (by number of data points) shall be verified.
- 3817 o The verifier shall verify that reasonable effort was done to investigate in data points marked as "mandatory, if available" in this PEFCR: the organization conducting the PEF study shall provide to the verifiers a list of the data points together with the PEF study indicating
  - whether the data was obtained or not,

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- which hotspots of the study are impacted by the data point,
- a description of why a data point was not available and on
   request –
- 3825 a summary of the efforts made to collect the data with a respective
  3826 proof
- 3827 6. For at least 70% of the most relevant processes (by number) in situation 2
  3828 option 2 of the DNM, 70% of the underlying data shall be validated. The 70%
  3829 of data shall include all energy and transport sub-processes for processes in
  3830 situation 2 option 2;
- 3831 7. For at least 60% of the most relevant processes (by number) in situation 3 of
  3832 the DNM, 60% of the underlying data shall be validated;
- 3833 8. For at least 50% of the other processes (by number) in situation 1, 2 and 3 of
  3834 the DNM, 50% of the underlying data shall be validated.
- In particular, verifier(s) shall verify if the DQR of the process satisfies the minimumDQR as specified in the DNM for the selected processes.

3837 These data checks shall include, but should not be limited to, the activity data used, 3838 the selection of secondary sub-processes, the selection of the direct elementary flows 3839 and the CFF parameters. For example, if there are 5 processes and each one of them 3840 includes 5 activity data, 5 secondary datasets and 10 CFF parameters, then the 3841 verifier(s) has to check at least 4 out of 5 processes (70%) and, for each process, 3842 (s)he shall check at least 4 activity data (70% of the total amount of activity data), 4 3843 secondary datasets (70% of the total amount of secondary datasets), and 7 CFF 3844 parameters (70% of the total amount of CFF parameters), i.e. the 70% of each of data 3845 that could be subject to a check.

3846 The verification of the PEF report shall be carried out by randomly checking enough 3847 information to provide reasonable assurance that the PEF report fulfils all the 3848 conditions listed in Section 8 of the PEF method, including part A of this Annex.

### 3849 8.1.1 Further verification requirements on IDM and RM

3850 If a product-specific IDM has been evaluated in the PEF study, the verifier(s) shall3851 verify specifically:

- 3852 o the conditions of the durability testing of the product i.e., that the tests have
  3853 been conducted in an ISO-accredited lab and the testing norms have been
  3854 followed;
- 3855 o the segmentation of the product outlined in section 3.3.3.1 reflects the product
  3856 under study;
- 3857 o that justifications for tests deemed "not applicable", "not possible" or "not
  3858 conducted" are provided;
- o functionality tests (if applicable) are included as described in section 3.3.3.2;
- in case of the use of alternative tests or conducting ISO/EN tests under different
   conditions, that the testing equivalence protocol outlined in Part IV of ANNEX
- 3862 V Detailed requirements regarding intrinsic durability has been followed
- 3863 that the calculation of the IDM is according to the rules in section 3.3.3.3

Furthermore, it shall be verified that the calculation of the RM is according to the rulesoutlined in section 3.3.4.

# 3866 8.2 Verification requirements for PEF studies conducted

in a pre-verified tool

## 38688.2.1 Initial pre-verification of the tool

The aim of the pre-verification of a tool is to check the compliance with this PEFCR. A tool is verified based on the tool itself as well as the first PEF report and the first PEF verification report based on the tool. The tool owner shall arrange for the verification of the tool by a third party. The virtual representative products, i.e. recalculating the RP models in the tool, shall be used for the first verification. The tool shall use a valid version of the EF database.

As stated in the RP study report, durability aspects aren't considered in the PEF-RP study as it analyses average products with an average durability. Therefore, additional verification of the IDM and RM calculation model in the tool shall be conducted separately. The calibration sheet provided in ANNEX XI – Calibration sheet for the pre-verification of the IDM calculation module in tools can be used as a basis for the calibration of the IDM calculation module in the tool.

The tool verification shall be documented by the verifier(s) in a tool verification report and shall be made available to tool users. The verification of the first PEF study developed by the tool shall be part of the pre-verified tool verification.

#### 3884 8.2.2 Recurring verification of the tool

3885 Given the complexity of the model and to ensure the robustness of the tool, a 3886 randomized verification of 5 PEF studies per semester (i.e. 10 PEF studies per year) 3887 conducted through the tool shall be ensured.

Any changes to the tool beyond the variation of user-defined input parameters (e.g., including an updated version of the EF database) shall result in a new version of the tool (so, tool versioning is required). All changes that may affect numeric results of the PEF calculation require a re-verification of the tool, which may be limited to the modules within the tool that were affected by the modification. Only verified versions of the tool shall be used for PEF studies.

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## 8.2.3 Further verification requirements for the pre-verification of the tool and PEF studies conducted in the tool

In case policies implementing the PEF method define specific requirements regarding
verification and validation of PEF studies, reports and communication vehicles, the
requirements in said policies shall prevail.

3899 The verifier(s) shall validate the accuracy and reliability of the quantitative information 3900 used in the calculation of the study. As this can be highly resource intensive, the 3901 following requirements shall be followed (based on the verification requirements 3902 defined in section 8.1):

Table 60 – Verification requirements for PEF studies conducted in a tool

Bullet Nr.	Pre-verification of the tool	Further requirements for conducting PEF studies in a pre-verified tool
1	The verifier shall check if the correct version of all impact assessment methods was used. For each of the most relevant impact categories, at least 50% of the characterisation factors (for each of the most relevant EF impact categories) shall be verified, while all normalisation and weighting factors of all impact categories shall be verified. In particular, the verifier shall check that the characterisation factors correspond to those included in the EF impact assessment method the study declares compliance with.	-
2	-	The cut-off applied (if any) fulfils the requirements of this PEFCR and the PEF method;
3	All secondary datasets included by default in the tool shall be checked against the data requirements (sections 4.6.3 and 4.6.5 of Annex I of the PEF Method)	All other datasets, i.e. secondary datasets not originally included in the tool and newly created datasets, shall be checked against the data requirements (sections 4.6.3 and 4.6.5 of Annex I of the PEF Method)
4	-	The aggregated EF compliant dataset of the product in scope (meaning, the EF study) is made available to the European Commission.
5	The tool shall require the user to populate fields related to the list of mandatory data required in this PEFCR.	<ul> <li>At least, 100% of the "mandatory" and 70% of the "mandatory, if available" data (by number of data points) shall be validated.</li> <li>The verifier shall verify that reasonable effort was done to investigate in data points marked as "mandatory, if available" in this PEFCR: the organization conducting the PEF study shall provide to the verifiers a list of the data points together with the PEF study indicating <ul> <li>whether the data was obtained or not,</li> <li>which hotspots of the study are impacted by the data point,</li> <li>a description of why a data point was not available and – on request –</li> <li>a summary of the efforts made to collect the data with a respective proof</li> </ul> </li> </ul>
6	-	For at least 70% of the most relevant processes (by number) in situation 2 option 2 of the DNM, 70% of the underlying data shall be validated. The 70% of data shall include all

	energy and transport sub-processes for
	processes in situation 2 option 2;
7 -	For at least 60% of the most relevant
	processes (by number) in situation 3 of the
	DNM, 60% of the underlying data shall be
	validated
8 -	For at least 50% of the other processes (by
	number) in situation 1, 2 and 3 of the DNM,
	50% of the underlying data shall be validated.

3907 Besides the verification requirements outlined in Table 60, for PEF studies conducted3908 in a pre-verified tool the following verification requirements apply:

In particular, verifier(s) shall verify if the DQR of the process satisfies the minimumDQR as specified in the DNM for the selected processes.

3911 These data checks shall include, but should not be limited to, the activity data used, 3912 the selection of secondary sub-processes, the selection of the direct elementary flows 3913 and the CFF parameters. For example, if there are 5 processes and each one of them 3914 includes 5 activity data, 5 secondary datasets and 10 CFF parameters, then the 3915 verifier(s) has to check at least 4 out of 5 processes (70%) and, for each process, 3916 (s)he shall check at least 4 activity data (70% of the total amount of activity data), 4 3917 secondary datasets (70% of the total amount of secondary datasets), and 7 CFF 3918 parameters (70% of the total amount of CFF parameters), i.e. the 70% of each of data 3919 that could be subject to a check.

3920 The verification of the PEF report shall be carried out by randomly checking enough 3921 information to provide reasonable assurance that the PEF report fulfils all the 3922 conditions listed in Section 8 of the PEF method, including part A of this Annex.

In addition to the above verification requirements, further requirements on theverification of the IDM and RM shall be verified according to section 8.1.1.

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# 4069 ANNEX I – List of EF normalisation and weighting 4070 factors

- 4071 Global normalisation factors are applied within the EF. The normalisation factors as
- 4072 the global impact per person are used in the EF calculations. The normalisation and
- 4073 weighting factors in Table A.I 1 shall be applied (EF reference package 3.1, 2022).

#### 4074

Table A.I 1 - EF 3.1 normalisation and weighting factors

Impact categories	Normalisation Factor Unit	Normalisation Factor	Weighting Factor [%]
Acidification	mol H+ eq./person	5.56E+01	6.20%
Climate change	kg CO <sub>2</sub> eq./person	7.55E+03	21.06%
Ecotoxicity, freshwater	CTUe/person	5.67E+04	1.92%
EF-particulate matter	disease incidences/person	5.95E-04	8.96%
Eutrophication, freshwater	kg P eq./person	1.61E+00	2.80%
Eutrophication, marine	kg N eq./person	1.95E+01	2.96%
Eutrophication, terrestrial	mol N eq./person	1.77E+02	3.71%
Human toxicity, cancer	CTUh/person	1.73E-05	2.13%
Human toxicity, non- cancer	CTUh/person	1.29E-04	1.84%
lonising radiation	kBq U-235 eq./person	4.22E+03	5.01%
Land use*	pt/person	8.19E+05	7.94%
Ozone depletion	kg CFC-11 eq./person	5.23E-02	6.31%
Photochemical ozone formation	kg NMVOC eq./person	4.09E+01	4.78%
Resource depletion, fossils	MJ/person	6.50E+04	8.32%
Resource depletion, minerals and metals	kg Sb eq./person	6.36E-02	7.55%
Water use*	m <sup>3</sup> water eq of deprived water/person	1.15E+04	8.51%

# 4076 ANNEX II – PEF study template

4077 Annex II is provided as a separate document.

# 4079 ANNEX III – Review reports of the PEFCR and 4080 PEF-RP(s)

4081 Annex III is provided as a separate document.

# 4082 ANNEX IV – Designing the representative product 4083 model

Given the large number of products considered, significant reflection within the TS was
required to determine the product sub-categories. The following high-level principles
for decision making were used:

4087	1. How similar are the product functions?
4088	<ul> <li>For example, no one would choose a sneaker instead of a hat.</li> </ul>
4089	2. Which products could provide the same function but may be selected over
4090	another for a specific reason?
4091	<ul> <li>One would choose to wear leggings to go running and not dress pants.</li> </ul>
4092	<ul> <li>To go to the office, one could choose to wear jeans or dress pants.</li> </ul>
4093	3. Can each product fit only within one sub-category?
4094	<ul> <li>If we had sub-categories for fashion and boots, where would a tall</li> </ul>
4095	leather dress boot fit?
4096	4. How many products are included in one sub-category?
4097	<ul> <li>If one sub-category accounts for a significant market share, sub-</li> </ul>
4098	division may be justified.
4099	5. Would the hotspots be similar for products within the sub-category?
4100	<ul> <li>The aim would be to avoid having one product at one end of the scale</li> </ul>
4101	within a sub-category.
4102	<ul> <li>However, this could lead to splitting the categories by use (e.g.,</li> </ul>
4103	casual, fashion, sports), size or material which increases the workload
4104	exponentially.

After this exercise and discussions, the apparel and footwear PEFCR were classified
into 13 product sub-categories, defined as products that can fulfil equivalent functions
and applications as defined by the PEF method.

- 4108 Due to the relative market sales of accessories compared to other apparel and 4109 footwear products, the TS could not justify separating accessories into unique product 4110 sub-categories as this would significantly increase the workload.
- 4111 Products included in each sub-category and a description of each RP is included in
- 4112 Table 4. For the definition of RP BOMs, each sub-category is divided into two to five

4113 products matching the categorization of market data available from EURATEX for the

4114 identification of product representativeness on the European market as described4115 below.

#### 4116 Bill of materials (BOM)

4117 For each sub-category, key products were identified based on market shares of 4118 apparel and footwear products sold in Europe (EURATEX data, 2018).

The market splits used within this study are representative of apparel and footwear products produced in and imported to Europe, minus products that were exported from Europe, and were calculated based on product volumes. The main product groups identified per sub-category based on the market shares data from EURATEX are shown in Table A.IV 1 below.

Table A.IV 1 - Market sales share of top products per sub-category

No	Sub-category/ representative product	Products included	Market shares
1	T-shirts	T-shirts	99.6%
		Collared short-sleeved shirts	0.4%
2	Shirts and	Long-sleeved shirts	75.8%
	blouses	Blouses	24.2%
3	Sweaters and	Jerseys and pullovers	50.9%
	midlayers	Sweatshirts	17.1%
		Cardigans	22.3%
		Waistcoats	9.7%
4	Jackets and	Blazers/suit jackets	31.4%
	coats	Rain jackets	11.0%
		Overcoats	7.3%
		Outdoor winter jackets	38.0%
		Light short jackets	12.3%
5	Pants and	Pants	80.6%
	shorts	Shorts	19.4%
6	Dresses, skirts	Dresses	60.0%
	and jumpsuits	One-piece suits	14.1%
		Skirts	14.4%
		Robes	11.4%
7	Leggings,	Pantyhose and tights	28.8%
	stockings, tights	Hosiery	49.1%
	and socks	Socks	22.1%
8	Underwear	Underwear	81.2%
		Bras	18.1%
		Body-shaping suits	0.8%
9	Swimwear	Women's swimwear	76.6%

No	Sub-category/ representative product	Products included	Market shares
		Men's swimwear	23.4%
10	Apparel	Hats	42.2%
	accessories	Scarves and ties	2.1%
		Belts	9.9%
		Gloves and mittens	45.9%
11	Open-toed	Casual /fashion sandals	57.0%
shoes		Flip-flops	15.0%
		Open-toed slippers	19.8%
		Athletic sandals	8.2%
12	Closed-toed	Casual /fashion shoes	70.0%
	shoes	Slippers	23.5%
		Protective shoes	1.0%
		Athletic shoes	5.5%
13	Boots	Casual /fashion boots	51.4%
		Protective boots	16.4%
		Polymer boots	14.0%
		Athletic boots	18.2%

Totals per RP may not reach 100% due to rounding.

The shares of each material in the average final product weight (g/product for apparel and g/pair for footwear) per functional unit are given in Table A.IV 2 for apparel (representative products 1-10) and Table A.IV 3 for the footwear product subcategories (representative products 11-13).

Primary data at product level were collected from TS members for each product subcategory. TS members provided raw material inputs for key products, based on either highest volume products or average product data per product sold in Europe, using average sizes. Data collected from TS members were weighted based on their representativeness of an average product sold in the European market using market sales data provided by EURATEX (2018), as well as the average fibre data from the TE Market Report on preferred fibre and materials (2020a). Table A.IV 2 - Bill of materials for the apparel representative products with the share (%) of each material based on the average product weight<sup>54</sup>

List of materials	RP1 T-shirts	RP2 Shirts & blouses	RP3 Sweaters & midlayers	RP4 Jackets & coats	RP5 Pants & shorts	RP6 Dresses, skirts and jumpsuits	RP7 Leggings, stockings , tights and socks	RP8 Underwea r	RP9 Swimwea r	RP10 Apparel accessori es
Average weight [g/product]	170	250	500	950	450	300	130	80	120	110
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Acrylic	-	-	5%	11%	-	-	7%	-	-	16%
Cashmere and camel hair	-	-	4%	0.9%	-	-	-	-	-	-
Cotton <sup>55</sup>	70%	55%	34%	15%	47%	54%	22%	70.5%	-	15%
Duck down	-	-	-	0.9%	-	-	-	-	-	-
Elastane	-	-	-	-	4%	-	9%	7%	9%	-
Mink fur	-	-	-	0.2%	-	-	-	-	-	-
Fox fur	-	-	-	0.05%	-	-	-	-	-	-
Rabbit fur	-	-	-	0.01%	-	-	-	-	-	-
Leather, bovine	-	-	-	0.2%	0.2%	-	-	-	-	1.4%
Leather, calf	-	-	-	0.1%	0.1%	-	-	-	-	1.4%
Leather, ovine	-	-	-	0.4%	0.6%	-	-	-	-	2.1%
Leather, caprine	-	-	-	0.1%	0.1%	-	-	-	-	0.8%
Leather, other (porcine)	-	-	-	0.0%	0.0%	-	-	-	-	1.3%
Linen	-	5%	-	-	4%	-	-	-	-	-
Polyamide	-	-	2%	15%	7%	4%	27%	10%	51%	4%
Polyamide recycled	-	-	-	-	-	-	4%	2%	-	-
Polyester and other synthetics <sup>56</sup>	21.3%	23.2%	21.7%	35.6%	30.9%	24.5%	18.8%	5.1%	37.6%	30.3%
Polyester recycled	2%	3%	4%	4%	3%	2%	2%	-	2%	-

<sup>54</sup> Totals per RP may not reach 100% due to rounding.

<sup>&</sup>lt;sup>55</sup> Although data from the past years indicate an increased share of organic cotton on the European market (Textile Exchange, 2020b), the actual share of organic cotton in 2019 was 0.93% globally. Because of this very low share, organic cotton is included here in the cotton category.

<sup>&</sup>lt;sup>56</sup> Other synthetics include aramid, copolyester, elastodiene, elastolefin, EVA, polyethylene, rubber synthetic.

List of materials	RP1 T-shirts	RP2 Shirts & blouses	RP3 Sweaters & midlayers	RP4 Jackets & coats	RP5 Pants & shorts	RP6 Dresses, skirts and jumpsuits	RP7 Leggings, stockings , tights and socks	RP8 Underwea r	RP9 Swimwea r	RP10 Apparel accessori es
PTFE	-	-	-	1.8%	-	-	-	-	-	-
Silk	-	-	-	-	-	-	-	-	-	1%
Viscose/ Modal/ Lyocell57	6%	13%	5%	4%	2%	13%	8%	5%	-	-
Wool	-	-	24%	9%	-	2%	2%	-	-	26%
Trims <sup>58</sup>	0.7%	0.8%	0.3%	1.6%	1.1%	0.5%	0.2%	0.4%	0.4%	0.7%

<sup>&</sup>lt;sup>57</sup> Because of the very similar production processes of viscose and Modal as well as the overall low share of Lyocell, these materials are grouped in the same category.

<sup>&</sup>lt;sup>58</sup> The assumed material composition of trims is an equal share of care labels (PES), buttons (PET) and zippers (metal for RP4, RP5 and RP10 and nylon for RP1, RP2, RP3, RP6, RP7, RP8, RP9 as a proxy for other plastic trims).

4139 4140

Table A.IV 3 - Bill of materials for the footwear representative products with the share (%) of each material based on the average product weight<sup>59</sup>

List of materials	RP11 Open-toed shoes	RP12 Closed-toed shoes	RP13 Boots
Average weight [g/pair]	350	900	1100
Total	100%	100%	100%
Wood-based nonwoven	-	-	2%
Cork	5%	-	-
Cotton <sup>60</sup>	-	3%	-
EVA	28%	7%	-
Leather, cow	13%	7%	12%
Leather, calf	1.7%	1.4%	4.9%
Leather, sheep	1.1%	0.5%	2.6%
Leather, goat	1.1%	1.3%	1.4%
Leather, other (proxy: swine)	0.3%	0.3%	0.2%
Metal	-	-	2%
Polyamide	-	3%	3%
Polyester and other synthetics <sup>61</sup>	3%	26%	13%
Polyester recycled	-	3%	2%
Polyurethane	8%	6%	10%
PVC	6%	6%	14%
Rubber natural	13%	8%	5%
Rubber synthetic	19%	16%	11%
Thermoplastic polyurethane	-	3%	14%
Viscose/ Modal <sup>62</sup>	-	2%	-
Wool	-	4%	-
Trims <sup>63</sup>	1%	2%	3%

<sup>4141</sup> 

The average final product weights presented in Table A.IV 2 and Table A.IV 3 correspond to the weight of the final product after raw materials acquisition and preprocessing, manufacturing and assembly. The sum of all raw material inputs needed per representative product are higher than the final product weight due to losses along

<sup>4146</sup> the production and value chain. The input amount per functional unit is therefore

<sup>&</sup>lt;sup>59</sup> Totals per RP may not reach 100% due to rounding.

<sup>&</sup>lt;sup>60</sup> Although data from the past years indicate an increased share of organic cotton on the European market (Textile Exchange, 2020b), the actual share of organic cotton in 2019 was 0.93% globally. Because of this very low share, organic cotton is included here in the cotton category.

<sup>&</sup>lt;sup>61</sup> Other synthetics include aramid, copolyester, elastodiene, elastolefin, polyethylene.

<sup>&</sup>lt;sup>62</sup> Because of the very similar production processes of viscose and modal these materials are grouped in the same category.

 $<sup>^{63}</sup>$  The assumed material composition of trims is shoe laces for RP11, an equal share of shoe laces, shoe eyelets (nylon) and shoe eyelets (metal) for RP12 and an equal share of zippers (metal(, shoe laces, shoe eyelets (nylon) and shoe eyelets (metal) for RP13.

- 4147 calculated data and the quantities are determined according to residual losses during
- 4148 the production processes (See Section 6.1.2 for details)

# 4149 ANNEX V – Detailed requirements regarding 4150 intrinsic durability

4151 Annex V is provided as a separate document.

Note This entire section has been revised between PEFCR v1.3 and PEFCR v2.0. The intrinsic durability tests are optional, and though highly recommended, not mandatory. A default quality multiplier of 0.67 shall be used should no intrinsic durability tests be conducted (except for exemptions mentioned in Section 3.3.3.2).

# 4153 ANNEX VI – Exploring the extrinsic durability of 4154 apparel and footwear products

4155 Duration of Service (DoS), or product lifetime, is a key metric in the Apparel & 4156 Footwear PEFCRs (A&F PEFCR) – it is an estimate of the number of times a product 4157 is used in its lifetime (DoS), which is used in the functional unit of this PEFCR.

- 4158 The Holistic Durability Working Group (HDWG) has identified that the consumer
- 4159 primarily determines the DoS, so started out by finding out what made consumers
- 4160 decide that End of Life (EoL) had been reached.
- 4161 17 separate peer-reviewed consumer studies presented in Table A.VI 2 have helped
- 4162 to identify three major EoL sources:
  - Worn out: 37%
  - Poor fit: 28%
  - Low perceived value (fashion, cheapness, ...): 35%



- 4163 These EoL sources, coming from strong scientific studies, led the HDWG to identify4164 two primary dimensions of apparel and footwear lifetimes:
- Intrinsic dimension: product-specific attributes that contribute to lifetime:
- Physical durability
- Design for fit
- Design for value
- Extrinsic dimension: external attributes that influence the likelihood of a product
   reaching its potential lifetime (e.g. company/commercial practices)

4171 It is clear that DoS are influenced by many different factors, some of which are 4172 dependent on one another. The HDWG focused only on characterising non-physical 4173 durability factors as other elements were addressed by other working groups: the 4174 Physical durability WG focussed on the physical durability attributes that are part of 4175 the intrinsic durability, and the Repairability WG focussed on refining the repairability 4176 multiplier.

## 4177 Holistic Durability Methodology

## 4178 The HDWG defined secondary attributes for the Fit and Perceived Value EoL reasons.

#### 4179

## Table A.VI 1 - Attributes affecting Duration of Service

EoL Reason	Dimension	Secondary Attribute	Definition (Presence of)		
	Intrinsic	Extensive fit options for the product.	Number of sizes per SKU offered at point of sale		
Fit	Intrinsic	Perfect point of sale (POS) fit for the product	Customisable fit or Made to measure service provided at point of sale.		
	Intrinsic	Inherent adjustability	Design features that contribute to wearing ease, such as pleats and multi-position buttons and fastenings.		
	Intrinsic	Enduring Style	Absence of product style changes from season to season or year on year.		
	Extrinsic	Personalisation	Personalisation service (direct consumer participation in design		
	Intrinsic	Modular Design	Two or more configurations to extend wearing opportunities.		
	Intrinsic	Reversibility	Product can be worn or used inside out.		
	Extrinsic	Renewal Rate (R)	Collection renewal frequency		
	Intrinsic	Price	Retail price prior to discounting.		
	Intrinsic	Repairability included parts	Spare Parts included with product		
Perceived Value	Extrinsic	Ease of reuse/resale	Share of second-hand products in a category sold by a brand as a percentage of total sales for that category		
	Extrinsic	Discounting Rate (D)	Frequency and intensity of discounting		
	Extrinsic	Product Range size (PR)	Total number of articles of (x product type) (y customer segment) / total volume (customer segment) products		
	Extrinsic	Repairability Services	Brand provides access to repair services in-house or through a partner.		
	Extrinsic	Repairability Info	Repair documentation is provided to customer		
	Intrinsic	Repair Cost ratio	Relative Price of repair vs price of product		
	Intrinsic	Fabric Performance	Appearance changes (pilling and abrasion)		
	Intrinsic	Fabric Performance	Colour fastness		
Physical Durability	Intrinsic	Functional Performance	Persistence of applied functionality through wash and wear		
Durability	Intrinsic	Garment Integrity Resistance to multiple cleaning cycles	Appearance change		
	Intrinsic	Garment Integrity Resistance to multiple cleaning cycles	Dimensional stability		

Intrinsic	Garment Integrity Resistance to multiple cleaning cycles	Seam & trim integrity
Note: This table includes a	all secondary attributes conside	red over the tenure of the HDWG.
The HDWG developed	criteria for the attributes (a	part from physical durability and
repairability) and tested t	hem according to the below key	points:
• The science behind	d each criterium and how to we	igh them within their lifetime
multiplier (EoL rea	son);	
• The relevance to t	he various representative subpr	oduct types;
• The scalability: dat	a collection, calculation, and ve	rification.
Conclusion and Reco	nmendations	
The DoS multipliers are d	esigned to predict the increase	or decrease in number of lifetime-
uses associated with the p	presence or absence of intrinsic	attributes and extrinsic influences.
After considerable debate	e, the HDWG concluded that th	e lack of science prevented it from
progressing integration of	of the missing attributes (sev	eral intrinsic attributes relating to
ohysical durability and ex	rinsic attributes relating to repa	airability being included) into PEFCR
v2.0. For DoS multipliers t	o meaningly predict the numbe	r of lifetime-uses they must be:
1. Based on scientific	evidence demonstrating a caus	sal link with DoS;
2. Weighted to reflect	t their relative importance to o	ther attributes and;
3. Scalable, enabling	adoption by the broader textile	industry.
The lack of science suppor	ting Points 1 and 2, together wit	h difficulties for brands in extracting
the required data prev	ented the HDWG from pro	posing the needed methodology
improvements in the PEF	CRs.	
In order to overcome th	e status quo, the HDWG recor	mmends the following solutions to
improve and update the F	EFCR A&F:	
• Add an appendix t	o PEFCR A&F to:	
<ul> <li>gather pub</li> </ul>	lic consultation insight on intrin	sic & extrinsic attributes;
○ inform nex	t TS of rationale & barriers;	
<ul> <li>provide tex</li> </ul>	tile industry insight to improve	scalability;

- Engage the fashion ecosystem and the European Commission into conducting deeper
   scientific research into the causal links and relative importance of intrinsic and
   extrinsic attributes on the DoS. Especially on below criteria:
  - Intrinsic Attributes influencing physical durability, fit, and perceived value;
- 4211

- Extrinsic Renewal rate, discount rate; size/width of product range (relative size), ease of reuse/resale.
- 4213

4212

#### Table A.VI 2 - Consumer studies into reasons for disposal

Study	Survey Design	Wear & Tear	Fit	Per- ceived value	Other / un- known
AC Nielsen (Laitala & Klepp 2020) (Laitala & Klepp, What affects garment lifespans? International clothing practices based on wardrobe survey in China, Germany, Japan, the UK and the USA., 2020)	Five countries, 1111 adults 40,456 garments	44%	13%	35%	9%
WRAP <b>(WRAP, 2017)</b>	UK 2058 adults, 16,895 garments	18%	42%	33%	7%
Laitala et al 2015 (Laitala, Boks, & Klepp, Making Clothing Last: A Design Approach for Reducing the environmental impacts, 2015)	Norway Adults (9 men and 16 women) 396 garments	50%	16%	24%	10%
Klepp 2001 (Klepp, 2001)	Norway 24 women Ages 34- 46 329 garments	31%	15%	33%	21%
Collett et al 2013 (Collett, Cluver, & Chen, 2013)	13 female students Ages 18 – 28	41%	38%	21%	
Chun 1987 <b>(Chun, 1987)</b>	USA, 89 female students Ages 18 - 30	6%	29%	56%	9%
Lang et al 2013 (Lang, Armstrong, & Brannon, 2013)	USA 555 Adults	30%	31%	39%	
Koch & Domina 1997 (Koch & Domina, The effects of environmental attitude and fashion opinion leadership on textile recycling in the US. J, 21(1), 1-17., 1997) (Koch & Domina, Consumer Textile Recycling as a Means of Solid Waste Reduction., 1999)	USA 277 students	29%	38%	33%	
Koch & Domina 1999 [13]	USA 396 Adults	21%	37%	42%	
Zhang et al, 2020 (Zhang, Wu, Liu, Wu, & Yang, 2020)	China 507 Adults	43%	19%	22%	16%
Ungeth & Carlsson, 2011 (Ungerth & Carlsson, 2011)	Sweden 1014 Adults	60%	8%	21%	9%

Study	Survey Design	Wear & Tear	Fit	Per- ceived value	Other / un- known
YouGov, 2019 <b>(Yougov, 2019)</b>	Italy 992 Adults	31%	24%	20%	25%
YouGov, 2017 <b>(Yougov, n.d.) (Yougov, n.d.) (Yougov, n.d.)</b> (Yougov, n.d.) (Yougov, n.d.)	Australia, Philippine, Malasia, Hong Kong & Singapore (12434 Adults)	39%	25%	29%	7%
Mean	Approx. 20,000 adults	34.1%	25.8%	31.4%	12.6%

# 4215 ANNEX VII – Inventory modelling and default 4216 datasets

4217 This annex is provided as a separate document and contains a list of: 4218 Mandatory company-specific data to be collected; and how they're used in • 4219 modelling ("Data requirements" tab); 4220 Mandatory default datasets to be used for use phase processes ("Default • 4221 datasets & DQR" tab); 4222 • Optional default datasets to be used for packaging production, transport and 4223 distribution, and end of life processes (e.g. datasets for modelling Ev, E\*v, Erec, Ed); ("Default datasets & DQR" tab); 4224 4225 • Optional trims and manufacturing datasets used in the RP-study v2.0 should 4226 the user of the PEFCR not have access to product specific data ("Default 4227 datasets & DQR" tab); 4228 Proxies for processes for which no datasets are available or no exact match 4229 was found during the supporting studies and PEF-RP study (e.g., exact fibre 4230 but not produced in the exact region) ("Data gaps proxies" tab). 4231 4232 4233

## 4234 ANNEX VIII – Data collection scenarios and 4235 examples of the application of the DNM in the 4236 context of this PEFCR

In this annex, 4 fictitious companies A, B, C and D conducting different steps to produce <u>the same t-shirt</u> and deciding to commission the PEF study of the final t-shirt are illustrated. Depending on the relevance of the processes and whether the company conducting the PEF study has access to the primary data or not, the rules of how to apply the DNM (see section 5.4) are described.

4242





### 4245 **Overview of the 4 scenarios:**



Scenario 1:

company A, a retailer, buys the t-shirt and has no insights about the supply chain



### Scenario 2:

Scenario 4:

company B outsources the production of the t-shirt using cotton from company D (Scenario 4) and has access to the data from company D



#### Scenario 3:

company C manufactures the t-shirt with no visibility on the supply chain

company D produces cotton in the US

4246

Figure A.VIII 2 - overview of 4 scenarios for the illustration of the application of the DNM

4247

## 4248 Common data collection rules for all companies in all 4 scenarios



Figure A.VIII 3 - DNM decision tree for "mandatory" data points

### 4258 For all companies A, B, C & D in all 4 scenarios, the same data collection requirements

- 4259 for «mandatory» data points apply:
- collection of company-specific data
- 4261 DQR ≤ 1.5
- 4262

#### 4263 The «mandatory» data points (see section 5.1) are summarized in Table A.VIII 3.

4264

Table A.VIII 1 - overview on "mandatory" company-specific data

Life Cycle Stage	Mandatory company-specific data
<ol> <li>1 – raw material acquisition</li> <li>&amp; pre-processing</li> </ol>	<ul> <li>At least 95% of the product's Bill Of Materials (BOM) by weight, covering 100% of the main fabrics, lining, padding, and electronic parts and metals</li> <li>If the BOM isn't available, product weight and reference size</li> <li>Raw material mass transported</li> </ul>
2 - manufacturing	If the BOM isn't available, assembly loss rate for the product studied
3 - distribution	<ul> <li>Air cargo distances at company level</li> <li>Air cargo share of product mass transported for each origin at company level</li> <li>Product weight (if not collected in LCS1)</li> </ul>
4 - use	Apparel: Product type, if delicate product or sportswear
General	Share (% product) of unsold consumer products at product sub-category or product category (apparel and footwear) level

Furthermore, for all companies A, B, C & D in all 4 scenarios, the same data collection
requirements for «mandatory, if available» data points apply. The «mandatory, if
available» data points (see section 5.1) are:

4268

Table A.VIII 2 - overview on "mandatory, if available" company-specific data

Life Cycle Stage	Mandatory, if available company-specific data
<ol> <li>1 – raw material acquisition</li> <li>&amp; pre-processing</li> </ol>	• raw materials transport distances, modes, share of raw material mass transported for each transport leg, and utilisation rates for trucks
2 - manufacturing	<ul> <li>manufacturing technologies</li> <li>other processing loss rates</li> <li>energy mix of the manufacturing steps for the product studied – exempted for SMEs</li> <li>intermediate product transport distances, modes, share of semi-finished product mass transported for each origin and utilisation rates for trucks</li> </ul>
3 - distribution	• product transport distances, modes, share of product mass transported for each origin and utilisation rates for trucks

- 4270 According to section 5.4, further processes (beside the mandatory ones) shall be
- 4271 evaluated according to the DNM to determine which data are needed and shall be
- 4272 used within the modelling of the PEF, depending on the level of influence the user of
- 4273 the PEFCR (company) has on the specific process.
- 4274
- 4275 Scenario 1: company A, a retailer, commissions the PEF study of the t-shirt,
- 4276 without running any processes and access to data
- 4277 Company A is in situation 3, Options 1 & 2 for all processes related to the life cycle of
- 4278 the t-shirt. It therefore needs to (see DNM):
- 4279 most relevant processes:
- Use default secondary data set in aggregated form (DQR<3.0)
- Re-evaluate the DQR criteria within the product specific context
- 4282 other processes:
- Use default secondary data set in aggregated form (DQR≤4.0)
- Use the default DQR values



4286 Figure A.VIII 4 - DNM decision tree for Scenario 1 / company A

4287

4288	Scenario 2: company B commissions the PEF study of the t-shirt, outsourcing
4289	the production using cotton from company D (Scenario 4) and having access to
4290	the data from company D

4292 Company B is in situation 2, and can choose between Option 1 and Option 2 for the 4293 production of cotton used for the production of the final t-shirt. It therefore needs to 4294 (see DNM):

- Use company-specific activity data for transport (distance), and substitute the
   sub-processes used for electricity mix and transport with supply-chain specific
   EF compliant datasets (DQR≤3.0)\*
- Re-evaluate the DQR criteria within the product specific context
- 4299 or
- Provide company-specific data (as requested in the PEFCR) and create a
   company-specific dataset, in aggregated form (DQR≤1.5)
- Calculate the DQR values (for each criterion + total)
- 4303



# 4308 Scenario 3: company C commissions the PEF study of the t-shirt, with own 4309 assembly process of the final product

- 4310
- 4311 Company C is in situation 1 and can choose between Option 1 and 2 for the assembly 4312 process of the t-shirt, and therefore needs to (see DNM):
- Use default secondary dataset in PEFCR, in aggregated form (DQR<3.0)
- 4314 Use the default DQR values
- 4315 or
- 4316 Provide company-specific data (as requested in the PEFCR) and create a
   4317 company-specific dataset, in aggregated form (DQR≤1.5)
- Calculate the DQR values (for each criterion + total)
- 4319



- 4320
- 4321 Figure A.VIII 6 DNM decision tree for Scenario 3 / company C
- 4322
- 4323
- 4324
- 4325

4326 Scenario 4: company D commissions the PEF study of the t-shirt, with own4327 production of cotton

- 4328
- 4329 Company D is in situation 1, Option 1 to produce cotton used for the production of the
- 4330 final t-shirt, and therefore needs to (see DNM):
- 4331 Provide company-specific data (as requested in the PEFCR) and create a
   4332 company-specific dataset, in aggregated form (DQR≤1.5)
- Calculate the DQR values (for each criterion + total)
- 4334



- 4335
- 4336 Figure A.VIII 7 DNM decision tree for Scenario 4 / company D
- 4337
# ANNEX IX – List of organisations and individuals participating in the public consultations

- 4340 Due to the large number of respondents to the public consultations on the Apparel &
- 4341 Footwear PEFCR, the names of the participating organisations and individuals is
- 4342 included in this Annex.
- 4343

#### 4344 First public consultation

- 4345 The first public consultation took place from 7 July 2021 to 24 September 2021, on the
- 4346 PEFCR for apparel and footwear stakeholder workspace.
- 4347 A total of 996 comments were received from the following organisations:
- 4348

#### 4349

Table A.IX 1 - Participants to the first public consultation

Company	Name
A W Hainsworth & Sons Ltd.	Diane Simpson
AASMB	Sally Hicks
ADEME	Autret
Australian Superfine Woolgrowers Association	Catherine Hayne
Bahariye Mensucat A.S.	SANSAL CETIN
Benetton Group	Roberto Taiariol
BKB Ltd	Lindsay Humphreys
Blaikie Science Solutions	Frances Blaikie
Botto Giuseppe e Figli Spa	Silvio Botto Poala
British Wool	Haldi Kranich-Wood
Campaign for Wool	Marshall Allender
Cape Wools SA	Deon Saayman
Cashmere and Camel Hair Manufacturers Institute	Fabio Garzena
Chambre Syndicale des Laines de France	Anne-Laure Milhe
Clear Fashion	n/a
CLEON	CLEON J
Collectif Tricolor, France	Pascal Gautrand
Consumption Research Norway, Oslo Metropolitan University	I.G. Klepp and K. Laitala
COTANCE	Gustavo G-Quijano
Cotton Council International	n/a
CTCP-APICCAPS	n/a
Ecoinnovazione	Alessandra
ECOS	Valeria Botta
EEB	n/a
Ellen MacArthur Foundation	Carsten Wachholz

Company	Name
En Mode Climat : a movement of 200 French brands demanding more regulation to fight climate change	Guillaume Declair
ERAM	Gauthier Bedek
Ermenegildo Zegna Group	Fulvio Benetti
EurEau	Rafael Heredero
FAIRLY MADE	Clément AUMAND
FAIRLY MADE	Leïla GIMENO
FAIRLY MADE	Pierre DIENOT
Fédération de la maille, de la lingerie et du balnéaire (FMLB) - France	Mathilde LESPETS
Fédération Nationale Ovine	Audrey Desormeaux
Federation of Norwegian Industry Textile & Clothing Sector. + Norwegian Fashion & Textile Agenda	Kjersti Kviseth
FFC	Guilloux Bonnet
FFILC / CLUB LAINE	Joëlle DA FONSECA RUELLAN
Fibershed	Heather Podoll
FICE	Miriam
Fratelli Piacenza S.P.A.	Ettore Piacenza
French Ministry for Environment Ministère de la transition écologique (CGDD)	Pascal Dagras
Friends fo the Earth Norway	Janne Gilgren
G Modiano Ltd.	Michael Modiano
G.Schneider	Giovanni Schneider
GEMO	Isabelle R.
Global Organics Textile Standards	Christopher Stopes
Hess Natur	Oppenländer
HUGO BOSS	Heinz Zeller
Humeau-Beaupreau	AC HUMEAU
INESCOP	n/a
International Sericultural Commission, Bengalore, India (www.inserco.org)	Dileep Kumar R, Programme Coordinator
IVGT	Schmidt
Lanecardate spa	Chiara Bianchi Maiocchi
Leather UK	Kerry Senior
Marzotto Wool Manufacturing	Vincenzo Tumino
MOHAIR SOUTH AFRICA	Jackie Gant
National Council of Wool Selling Brokers of Australia (NCWSBA)	Paul Deane, Executive Director
NEF coordinator	Charlotte Thy
Nejdecka cesarna vlny a.s.	Ladislav Mikes
New South Wales Farmers Association Wool Committee	Hellen Carrigan
Norwegian Network for Sustainable Textiles	Janne Gilgren (Friends of the earth Norway), Siv Elin Ånestad (Future in our hands Norway), Tone Skårdal Tobiasson (Nice Fashion)
Pantex spa	Piercarlo Zedda

Company	Name
Ratti spa	Massimo Lolli
Segard Masurel	Olivier Segard
Servizi e Seta	Giovanni Schneider
Sphera - EF Helpdesk	Daniel Thylmann, Lana Reid- McConnell, John Jewell
Successori Reda S.p.A.	Luca Bruschi
Suedwolle Group Italia SPA	Davide Marcante
Suedwollegroup	Lindner
Swedish EPA/Swedish Life Cycle Center	Björn Spak
t+m	Eckert
The Woolmark Company	Ella Edwards
UICSO	JEGOU
UIT	Eric BOEL
Union des Industries Textiles Sud (UIT Sud)	Richard RICO
Vitale Barberis Canonico	Lucia Bianchi Maiocchi
WAFarmers	Jessica Wallace
Worldproducers Australia	Jo Hall
Yukan (Glimpact)	Frédéric Bettens, Klara Cielen & Edgar Towa
Zegna Baruffa Lane Borgosesia S.p.A.	Alfredo Botto Poala

4350

#### 4351 Second public consultation

4352 The second public consultation took place from 18 March 2024 to 28 April 2024, on

4353 the PEFCR for apparel and footwear stakeholder <u>workspace</u>.

4354 A total of 5119 comments were received from the following organisations and4355 individuals:

- 4356
- 4357

#### Table A.IX 2 - Participants to the second public consultation

Organization	Name(s)
Aust Dohne Breeders Association	Greg Hall
"Banda Grazing" Bungarby Road Bungarby NSW 2630	Greg Alcock
"Briidlesdale", 820 Slacks Creek Road, COOMA NSW 2630	W & J Crowe
"Nelenia"	Robin Guthrie
"Oakvale" 1038 Corrowong Road Delegate 2633 NSW	Stuart Reed
"Redhill" Tombong Rd, Delegate, NSW, Aust	Milton Ingram
"Rowensville Merino Stud", St Helens Vic., 3285	DF & SJ Rowbottom
"TBM FARMS" Bungarby Road Bungarby NSW 2630	Thomas Alcock
A & W Anderson	Lynley Anderson

Organization	Name(s)
Achill Station Pty Ltd	Charles Coventry
ADAPTA	Virginie Ducatillon
AgForce Queensland, Sheep Wool and Goats Board	Jaime Colley
AJ & PA McBride Ltd	
Alliance du Commerce	Pierre-Alexandre Naud
Aloeburn Pastoral Co.	Andrew and Jodie Green
Alpakaleben GmbH	Stefanie Hagner
AOS	Davide Colletto
AR&HJ McInness	
Asociación Civil Alpaca del Peru	
Assocalzaturifici, Italian Footwear Manufacturers' Association	Matteo Scarparo
Australian Associaiton of Stud Merino Breeders	Sally Hicks
Australian Association of Stud Merino Breeders	Geoff Davidson
Australian Council of Wool Exporters and Processors	Scott Williams
Australian Superfine Woolgrowers Association Inc	Mark Waters, Catherine Hayne
Australian Wool & Pastoral Agency Limited Trading As Schute Bell Badgery Lumby	
Australian Wool Exchange (AWEX)	Katyana Armen
Australian Wool Innovation	Angus Ireland, Edward Fernie, Geoff Lindon
Australian Wool Innovation / The Woolmark Company	Sue Pownall
Barrington Pastoral Pty Ltd	Sarah Barrington
Beaufort	Lyn Heenan Arkuna
Bella Lana Merino Stud NSW	Scott Brien
Ben Swain	Waterside Grazing
BESTSELLER A/S	Anneke Keuning, Henrik Sand, Anneke Keuning
Bigpont	Anne Charles
Billigaboo Corriedales	RI & JL Carter
Bin Bin Station	Philip Clarke
BKB Ltd	Geoff Kingwill
Bowman Classing & Consultants	Chris Bowman
BRENNAN AGRICULTURE	Kristy Brennan
Brett Staniland	
Bundemar	Tom Kirk
Bunka Fashion Graduate University	Shigeru Yasue
BUNSHA SAS (brand KIABI)	Océane Dussart
Burnt Hut Partnership	Charles Hood
Bylands Creek Kolonga Pastoral	Sarah Thomson
Calcookara Stud	Brenton and Jane Smith
Calga Pty Ltd	Margie Pye C
Canadian Wool Council - Campaign for Wool in Canada	Lidiya Beida

Organization	Name(s)
Cannon Partners Family Trust	Adam Cannon
Carbon Trail	Ashish Rohil, Shantanu Singh
Carmichael & Co Woolbrokers	
Cascale (formerly Sustainable Apparel Coalition)	Joël Mertens
CCMI	
Changing Markets Foundation	
Chargeurs Luxury Fibers	Carolina Borlandelli, Federico Paullier, Maria Estrada, Maria Martirena, Martin Donagaray, Nicolas Sapelli
Classic Pastoral Company Pty Ltd	Sandra Heal
Clear Creek Holdings	Belinda Steers
Clear Fashion	Louise Bertotto, Marguerite Dorangeon
Commercial Merino Breeders Association, Australia	Chris Croker
Coota Kelso Stabilised Genetics Cootamundra NSW Australia	David Alexander
Coromandel Poll Merino Stud	Michael Campbell
COTANCE	Gustavo G Quijano
Cotton Incorporated	Michele Wallace
COUGHLAN INVESTENTS	John Coughlan
Cousins Merino Services	Joshua Cousins
CT Merriman & Son	Jonathan Merriman
D.D. Kaylock & Co	Laura Martin
Decathlon	Antoine Cosne
DEFI	Elise Desrues
Delatite Grazing Pty Ltd, Mansfield, Victoria 3722, Australia	Mark Ritchie
Depratment of Agriculture, Falkland Islands Government	Lucy Ellis
Devold of Norway	
DP & DJ Lawrence & Sons	
EAMON	
Ebert Sheep Farm	Jeff Ebert
Eco-Age	
ECOEFF LAB	Philippe Schiesser
ECOS	Luca Boniolo
EEB	Emily Macintosh
Engraw S.A	
ETAM GROUP	Laura Lelouard, Kachen Hong
EURATEX	
EUROCOTON	
European Footwear Confederation (CEC)	Carmen Arias
Fairly Made	
FEAT COOP	Tristan Vuillet

Organization	Name(s)
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Fox & Lillie Rural	Jeff Angel, Joshua Beer, Shane Ridley, Justin Beer, Toby Haylock
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G.SCHNEIDER S.P.A.	Guillermo Gallia
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Glenelg Estate	Charles Downie
Glimpact (YuKan)	Adrien Lopes, Christophe Girardier, Klara Cielen
GOOD FABRIC - FOOTBRIDGE	Louis Marie Vautier
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Greendale Merinos	Mark McGufficke, Miranda McGufficke
GreenroomVoice	Cira Riedel, Anna Rodewald
Grootplaas	Jason Butterworth
Gum Hill Pty Ltd	Justin Lines
Gundarimbah Merinos	Grant Orr
H&M	Canan Tutuncu, Goker Kahraman, Laura Cars, Ravinder Tuteja, Viktoria Söderberg
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Hart Lagoona Pty Ltd	Richard Hart
Hillsea station Trust	Michelle Nuske
HJ & SM BULL	
HRL Farming Pty Ltd	Josh Nuske, Stephen Nuske
Ian Campbell & Son	MA Campbell & GT McMullan
ICAC	Eric Trachtenberg

Organization	Name(s)
Members of Durhabi:	
AGNES B - ATLAS FOR MEN - AUBADE - AUCHAN - BALZACE PARIS - BASH - BONNE GUEULE - BONNETERIE D'ARMOR - BONOBO - BREAL - BS PRODUCTION - BZB - CACHE CAHCE - CAROLL - CARREFOUR - ELIO - CHANTELLE - CLAUDIE PIERLOT - COMPTOI DES COTTONNIERS - CREATION & IMAGE PARIS - DAMART - DARJEELING -DCMJ (JENNYFER) - DECATHLON - DEVERD1902 - EMINENCE - ERIC BOMPARD - ETAM - FST HANDWEAR - FURSAC - GALERIES LAFAYETTES - GEMO - GO SPORT - GRAIN DE MALICE - IKKS - INTERSPORT - JACADI - JULES - KIABI - LA HALLE - LA REDOUTE - LACOSTE - LAFUMA - LE BOURGET BODYWEAR - LE SLIP FRANÇAIS - LEMAHIEU - MADE IN SENS - MAISON 123 - MAJE - MILLET MOUNTAIN - MONOPRIX - MORGAN - NEW WAVE FRANCE - OBAIBI - OKAIDI - OLLY PIMKIE - PRINCESSE TAM TAM - PROMOD - ROUGE GORGE - SAINT JAMES - SANDRO - SEZANNE - SIMONE PERELE - SMOOM LINGERIE - TAPE A L'OEIL - TERRES DE MARINS - TRENDETHICS - UNDIZ - UNIQLO - VILEBREQUIN - WELL LINGERIE - WOLF LINGERIE - ZYGA	
IFTH	Carole Garbowski
INCA BRANDS INC.	Kim Brooks
Independent Commodity Services P/L	Andrew Woods
IndiDye Natural Color Technology Company	
Innisvale Pastoral Co	Michael Lowe
International Alpaca Association	
International Fur Federation	Marianne Coulavin
Intertek HK	Simon Tse
IWTO	Klaus Steger
IWTO	
Jemalong Wool Pty Ltd	Rowan Woods
Jogilma EH	Greg Williams
Joyce Ventures PL	Tom Joyce
Jumbuck Plains	Michelle Fowler
KALGARA MERINOS	DH& SH CALVERT
Kangaroo Island Wool Pty Ltd	Greg Johnsson
KELLER PARTNERS	Craig & Jed Keller
Kenton Ag	
Kettlewell Consulting	
Kia Ora Merino	Susan Finnigan
Kirby McPhee and Bathurst Merino Association Inc.	
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L Mortimer & Sons	Robert Mortimer

Organization	Name(s)
La Belle Empreinte	Delphine Droz
Lake Hamilton Pastoral	Ryan & Lisa Boot
Lawson Grains	Sam Pateman
Leahcim Farming	Andrew Michael
Lenzing AG	
Lincoln Rural Supplies Pty Ltd	
Livestock Breeding Services Pty Ltd Australia	Michelle Humphries
Livestock GeneTEx	Michael Blake
Livestock SA Incorporated	Travis Tobin
Lone Pine Merinos	Ron Mackay
Lynford Farms Pty Ltd	
M & P Cuming	
Macaulayglovers	
Macdonald & Co Woolbrokers	Don Macdonald
Maharatta Partnership	Charles Hood
maki Consulting gmbh	Kirana Wolf
Målbar	Anders Koefoed
Mascot International A/S	Mette Schulin-Zeuthen
McGuiness Farms	Tom McGuiness
Merambego Bungarby	John & Jenny Alcock
Merino SA	Lin Cowling
MH Enterprizes	Michael Hollow
Mid Sweden University	Judith Waller
Millabong Pastoral Co.	Colin & Amanda McCrabb
Mirridong Food and Fibre	Todd Burger
Modiano Australia Pty Ltd	Stuart Clayton
Monaro Farming Systems	Mandy Horton
Morley Poll Merino Stud	Leonie Mills
Moses & Son	Abby Byrnes, Adele Smith
Mt Buckalnd farm	Robert Kingam
Mt William Ag Pty Ltd	
Mullengudgery Pty Ltd	Thomas Moxham
Murdoch Bibbenluke	
Myrtlewood Pastoral	Madeleine Scott
Nargong Partnership	Stephen Rutledge
Nejdecká česárna vlny a.s.	Ing. Ladislav Mikeš
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OKAIDI	Nina Carmellino
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Oster Farming	Elden Oster
P Sprigg & Co, Ebenezer Poll Merinos	Stephen Sprigg
PA & LM Kammermann	Phillip Kammermann
Paling Yards Trading Co	Richard Bell
Penrose Pastoral	Bruce Pengilly
Portuguese Footwear and Allied Trade National Industrial Association: APICCAPS & Research and Technological Centre: CTCP	Maria José Ferreira
Quinburra Partnership	Ron Horton
Reda	
Resortecs	Rawaa Ammar
RIDGWAY ADVANCE	David Ridgway
Robin Schwartz	
Rolfe Agriculture	Andrew Rolfe
Rosedale Pastoral Co	Alan Rissmann
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Rosewood Wool Services	Andrew Dennis
RPM Livestock Pty Ltd	Matthew Coddington
Rural Data Management Services Pty Ltd	Mike Kirke
S & J Green	
SA & JM Gregory	Shaun Gregory
Salomon	Alix Poitou
Saralco Partnership	Simon Cameron
Segard Masurel S.A.S.	Olivier Segard
Sézane	Alexandra De Toni
SheepMetriX	Sally Martin
Shinshu University	Yasuyuki Cho
SJ & JL Makeham	Simon & Justine Makeham
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Spring Hills KI	Jonathan & Rosalie Bell
STOCK PTY LTD	Devon Ridgway Ridge
Stucken Group	Anthony Kirsten
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SUL	Ignacio Abella
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Organization	Name(s)
Sykes Grazing	Adrian Sykes
T.A Field Estates Pty Limited	Michael Field
Talaheni/Yass ultrafine wool grower	John Ive
Talmo Pastoral company	Chris Shannon
Talooby Trust	Bruce Allworth
Tarrangower Merinos	
TH Brown & Sons / member of Seymour Wool Marketing Group	Robert & Michelle Brown
The New Zealand Merino Company	Natalie Norman
The Woolmark Company	Alexis Zhang, Angela Jabara, Catherine Veltman, Cherry He, Flora Zheng, Xiaoxu Zhou
The Yanko Grazing PTY LTD	Hugh Cameron
ThreeLakes Elliston SA 5670	Nigel & Debbie May
Tintagel Pastoral Co Pty Ltd	Charles Hood
Tod's Group	
Toulon Pastoral Company	
Tralee Grazing	Brett Smith
Tumbleton Partnership	Gemma Wilkinson
U.S. Cotton Trust Protocol	
Ullingala Pastoral Company - Gunnegalderie Merinos	
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Ward Family Pastoral Co	
Warooka Pastoral Company	Kym Lyons
Warrembool Pty Ltd	Charles Cay
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Wheare Holdings	Craig Wheare
Whitehill Poll Merinos	Chris Ruediger
Willowvale	John Eliott
Women in Wool	Victoria Fish
Woodside Moutajup	
Woodstock Pastoral	Darcy Larritt
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Wool in School	Lorna McCormack
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-	David & Andrea Mitchell
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-	Erksville Bombala
-	Garry Preston
-	GRADY & NONI OBST R & O RURAL
-	GS & TD Parker
-	Helen R Clark
-	Jens Kraus
-	Martin Moses
-	Michael Campbell
-	Michael McMeniman
-	ML Rowe
-	Monica Ebert
-	Peter Maher
-	Peter Thornton
-	Peter Wakefield
-	R & M Whitby
-	Samantha Wan

## 4359 ANNEX X – List of future revision points

4360	This section includes recommendations for a future revision of this PEFCR, i.e.
4361	elements that a future Technical Secretariat should revisit.
4362	
4363	Topics to to touch upon:
4364 4365 4366 4367 4368 4369 4370 4371 4372 4372	<ol> <li>Division of Subcategories         <ul> <li>Revising and introducing more granularity in the PEFCR categories</li> <li>Apparel Accessories could be further specified</li> <li>Underwear division may be needed to reflect differences in care practices</li> <li>Tights should be separated to account for difference in the Duration of Service</li> <li>Shoes (further fragmentation to reflect different use and care cases)</li> <li>Potential addition: workwear; challenge in accounting for considerably different use and taxing protocols</li> </ul> </li> </ol>
4373 4374 4375 4376 4377 4378 4378	<ul> <li>a. Should the EU Commission have updated the general PEF method on this matter</li> <li>b. Revisit whether organic certifications are the most appropriate proxy indicator while the Commission update is still pending.</li> </ul>
4380 4381 4382 4383	<ol> <li>Extrinsic Durability</li> <li>a. Integrate a generalised assessment approach based on the latest available research and evidence</li> <li>b. Consider its weighting vis-a-vis other durability factors</li> </ol>
4384 4385 4386 4387 4388 4389 4390 4391 4392 4393 4394 4395 4396	<ul> <li>4. Intrinsic Durability <ul> <li>a. Revise benchmarking based on Data Available from the Implementation of the Framework (basic, aspirational, etc.)</li> <li>b. Revise Fragmentation of the Durability Testing Protocol based on evidence gathered from the implementation of the current testing protocol, including regarding material composition</li> <li>c. Revise the test list of the Durability Testing Protocol as needed</li> <li>d. Further expansion of the durability multiplier</li> <li>e. Revise the definition of the 'sport segment' in Annex V in case of more rigid definition in the ESPR delegated acts</li> <li>f. Define separate durability testing protocols for fur and leather</li> </ul> </li> <li>5. Repairability <ul> <li>a. The calculation of the Multiplier and criteria should be revised based on</li> </ul> </li> </ul>
4397 4398 4399	further emerging evidence b. Multiplier weight should be expanded c. Country-specific Costs of Repair Services should be revisited

4400		d. Criterion to be integrated: Designed to be Repaired if sufficient evidence
4401		is available
4402	6.	Fiber Fragment Approach
4403		<ul> <li>Extend Life Cycle Stages Covered with needed evidence</li> </ul>
4404		<ul> <li>Extending Impact Areas Covered with Needed Evidence</li> </ul>
4405		c. Integration of wastewater treatment measures in the developed
4406		approach
4407		d. Integration into Overall Impact Calculation Pending Revision of PEF
4408		Method by the European Commission
4409	7.	Representative Products
4410		a. Revise fibre composition to mirror more recent data on market
4411		compositions
4412		<ul> <li>Revise material composition for footwear, in particular PVC</li> </ul>
4413	8.	End-of-Life
4414		a. Extending Pathways Modeled (in particular: biodegradability, fibre-to-
4415		fibre recycling)
4416		b. revise methane emission factors from apparel and footwear landfilling
4417		based on further evidence
4418	9.	Default Duration of Service
4419		a. Revision of the default durations of service based on novel evidence
4420		available
4421		<ul> <li>Revision of duration of service: separation into adult and children</li> </ul>
4422		products
4423		c. Revision of duration of service according to material composition
4424	10	Duration of Service Multipliers
4425		a. <u>Tights</u>
4426		<ul> <li>Material-based revision of DoS (in particular: leather and fur items)</li> </ul>
4427		<ul> <li>Revision of Subcategories based on further research</li> </ul>
4428	11	Washing Frequencies
4429		a. Global revision pending the publication of new best-available evidence
4430		(particular highlights: T-shirt, Socks, Legging, Tights, Socks)
4431		<ul> <li>Ski jackets and down jackets washing frequency and scenario should</li> </ul>
4432		be specified
4433		c. Revise based on new literature and evidence (global statement)
4434		<ul> <li>Underwear washing frequencies should be revisited</li> </ul>
4435	12	Manufacturing Leftover Rates
4436		<ol> <li>the default rates provided in the PEFCR should be revised based on</li> </ol>
4437		further market evidence to reflect common practice better
4438	13	Distribution
4439		<ul> <li>Revision of the subject of volume-limited transportation</li> </ul>
4440	14	Sizing
4441		a. The standard sizes can be further harmonised, for example by
4442		following standards such as ISO 8559, and aligned with other
4443		regulations such as the Textile Labelling Regulation.

4444	15. Communication of PEF study results
4445	a. Should the European Commission impose the communication of PEF
4446	results, it should be accompanied by a consumer survey or a
4447	consultation on the consumers' needs regarding to the information they
4448	wish to have included before it is implemented.
4449	16. Measures to make the Method more Approachable and Relevant (separate
4450	into a document to the Commission)
4451	<ul> <li>Extend the duration of the public consultation to improve its</li> </ul>
4452	accessibility
4453	b. pursue further measures to increase the visibility of public consultations
4454	(i.e. press releases)
4455	c. Integrate the impacts from microplastic releases into the 16 impact
4456	calculation of the overarching PEF method (for all life cycle stages)
4457	<ul> <li>pursue and support the implementation of research aimed at</li> </ul>
4458	determining the appropriate weighting of DoS multipliers vis-a-vis one
4459	another
4460	e. develop approachable educational materials to transparently educate
4461	on the micro point calculation method of the EF method
4462	f. Refine the method to develop a separate biodiversity impact calculation
4463	and indicator
4464	17. Measures to ensure a smooth implementation of the PEFCR method
4465	a. Perform a pilot assessment of the effectiveness of the PEFCR method
4466	before implementing it in legislative contexts
4467	

### 4468 ANNEX XI – Calibration sheet for the pre-4469 verification of the IDM calculation module in tools

- 4470 This annex is provided as a separate .xls document and contains calculation examples
- for the rules of calculating the IDM for fictitious apparel & footwear products, based on
- 4472 conducted tests and respective test results.
- 4473