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Guidance Note for Calculating the Product Environmental Footprint

Environmental Footprint Labelling for

Version history

Version	Date	Comment
V1.0	01/10/2025	Implementation of Decree No. 2025-957

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CONTENTS

01
Introduction

The textile industry is among the world's most polluting sectors and generates significant volumes of waste, a problem that has worsened with the rise of fast fashion since the 2000s. Our clothes go through many stages and processes during their life cycle, each of which can have negative impacts on both the environment and the people who make and wear them in the countries concerned.

I. Background

Environmental labelling for clothing was introduced as part of the Climate and Resilience Act passed on 24 August 2021. Under Article 2, environmental labels must provide consumers with "accurate and easy-to-understand" information about the "environmental impact of the products and services concerned over their full life cycle." The aim of displaying the environmental footprint of clothing is to ensure consumers can clearly see the impacts of each product they buy, helping them to make more informed choices. Governed by a shared set of rules, this public scheme also targets producers by encouraging and recognising their efforts to design more sustainable products.

During the course of 2022, a total of eleven trials were conducted, including over 400 case studies and with several dozen brands and manufacturers taking part. A panel of textile industry specialists was then appointed to provide the government with expert insight and help establish a standardised methodology for environmental labelling. Since 2022, the methodology has been refined through a collaborative process involving industry, civil society, life cycle assessment (LCA) experts, and academics.

It is now based on an assessment of the product's life cycle, specifically the European-defined "product environmental footprint" or PEF. Using this approach, the environmental "cost" of a garment can be calculated using a set of simple, product-specific parameters.

II. Environmental footprint

The concept of a product's environmental footprint was introduced into French law by two pieces of legislation: Decree No. 2025-957 of 6 September 2025, setting out the procedure for calculating and reporting the environmental footprint of textiles[1]; and

[1] https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000052212871

the Order of 6 September 2025, which laid down rules for calculating and labelling the environmental footprint of apparel and other textile products[2]. The footprint is a single value that encompasses a range of different categories of environmental impacts, and is expressed as a positive whole number, in the form of impact points.

Each stock-keeping unit or SKU (or, in some cases, a single sales unit[3]) must have its own calculated footprint).

The footprint is based on a life cycle model that combines indicators for all major environmental impacts linked to a textile product, from the production of raw materials, through manufacturing and distribution, to use and end-of-life.

This model provides an overall environmental cost expressed in "impact points". It covers all of the environmental impact categories listed in Article 5 of the aforementioned Order of 6 September 2025, and also reflects how long each item of apparel is expected to last, as introduced in Article 6 of the Order. The environmental footprint value takes into account things such as:

- greenhouse gas emissions;
- impacts on biodiversity;
- use of water and other natural resources;
- durability;
- effects of pollution on environments and ecosystems.

The environmental footprint quantifies the impact of each product, in the same way as a price (in euros), a nutritional value (in kilocalories), or a carbon score (in kg CO2e). The higher the number, the greater the product's impact on the environment.

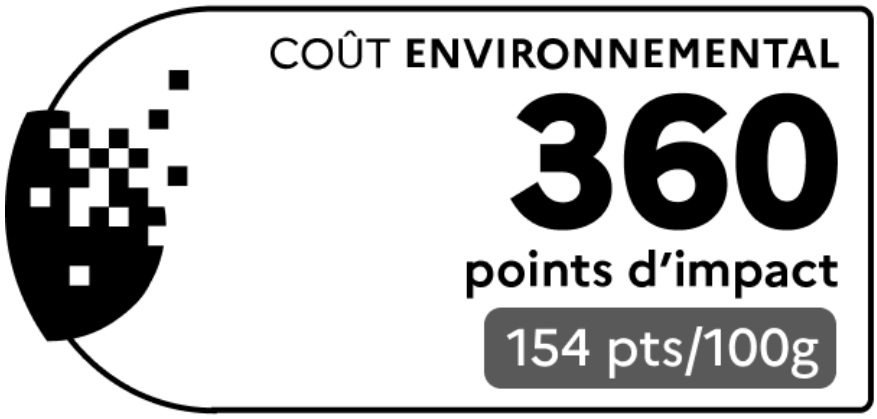
III. Environmental labelling

The way the environmental footprint must be displayed is set out in the Ministerial Order of 6 September 2025, which governs labelling and the methodology used to calculate the environmental footprint of clothing textiles. Whoever provides the label can decide the most suitable place to display the environmental footprint, whether on the product itself, on shelf signage, or online by a visual that helps consumers compare and choose.

For items of apparel, the label takes the following form:

[2] https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000052213047

[3] See Article D. 541-242 of the French Environmental Code ("*Code de l'environnement*").



For more information about how the label should be presented, refer to the graphic charter available on the Ministry for the Ecological Transition's website: https://www.ecologie.gouv.fr/politiques-publiques/affichage-environnemental-vetements

IV. How to read this document

This guidance note explains exactly how the environmental footprint of a garment should be calculated, under the legislation published in France's official gazette on 9 September 2025.

The appendix contains all of the information needed to make the calculations that does not already appear in the main body of the document. That information is presented in the form of four tables:

- Countries
- Products
- Materials
- Components
- Processes

The "processes" table lists the life cycle assessment (LCA) impact categories used in the calculation. All of these processes can be found in ADEME's Footprint Database (https://base-empreinte.ademe.fr/donnees/download-data?select=DAE). The relevant reference file is the spreadsheet published on 18 September 2025.

02
About life cycle assessment

The environmental footprint is calculated using a product's life cycle analysis (LCA). This method ensures that the environmental impacts of a textile product can be modelled for different impact categories, at each stage in the product's life, from the extraction of raw materials through to product disposal (known as the "cradle to grave" model).

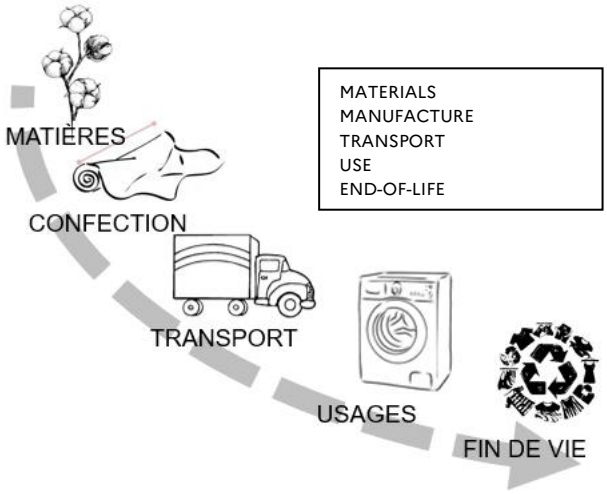


Figure 1: life cycle of a textile

The environmental footprint is calculated as a weighted sum of the impact categories, with each category first normalised, using the following formula:

$$Aggregate\ impact = 1{,}000{,}000 \times \sum Weighting_i \times \frac{Impact_i}{Normalisation_i}$$

The 16 impact categories are those defined under the Product Environmental Footprint (PEF) framework, as detailed in Annex 1 of Commission Recommendation (EU) 2021/2279 of 15 December 2021 on the use of environmental footprint methods to measure and communicate the environmental performance of products and organisations across their entire life cycle[4].

The normalisation factors and weighting coefficients applied are as follows. They may differ from those set out in the PEF framework.

As indicated in Article 5 of the Ministerial Order, for the "freshwater ecotoxicity" impact category, an adjustment is applied: the modelled impact of organic molecules is doubled compared with the PEF framework. The normalisation factor is increased accordingly so that this does not cause the weighting coefficient to rise artificially.

Impact category	**Normalisation**	**Weighting**
Acidification	55.57 mol H+ eq	4.91%
Ozone depletion	0.05 kg CFC-11 eq	5.00%
Climate change	7,553 kg CO_2 eq	21.06%
Eutrophication, freshwater	1.61 kg P eq	2.22%
Eutrophication, marine	19.55 kg N eq	2.35%
Eutrophication, terrestrial	177 mol N eq	2.94%
Photochemical ozone formation	40.86 kg NMVOC eq	3.79%
Particulate matter	5.95e-4 disease incidences	7.10%
Ionising radiation	4,220 kBq U-235 eq	3.97%
Human toxicity, cancer effects	1.73e-5 CTUh	0.00%
Human toxicity, non-cancer effects	1.29e-4 CTUh	0.00%
Water use	11,469 m^3	6.74%
Resource use, fossils	65,004 MJ	6.59%
Resource use, minerals and metals	0.06 kg Sb eq	5.98%
Land use	819,498 Pts	6.29%
Ecotoxicity, freshwater (adjusted)	98,120 CTUe	21.06%

Table 1: Normalisation and weighting of environmental impacts

[4] https://eur-lex.europa.eu/legal-content/FR/TXT/PDF/?uri=CELEX:32021H2279

03
Supplementary impacts (not included in the life cycle assessment)

When calculating a product's environmental footprint, additional analysis criteria are also taken into account that are not included in the LCA. This is done in the following way:

$$Coût\ environnemental = Impact\ agrégé + compléments\ hors\ ACV$$

For the textiles sector, two additional criteria are included to reflect environmental impacts that are currently not sufficiently addressed by the PEF rules or the PEFCR for Apparel & Footwear approved by the technical secretariat in April 2025 following the process described in the PEF rules[5] These two criteria are the export of used textiles to countries outside Europe at the end of their life, and microfibre emissions.

I. Export of used textiles to non-European countries

This adjustment is made to estimate the impact of used items of apparel that are exported outside Europe but ultimately not reused, instead being disposed of in conditions different from those in France or Europe.

The LCA approach recommended by the PEFCR Apparel & Footwear assumes that garments are either disposed of locally (in France or Europe), reused (in France or internationally), or recycled. However, a significant proportion of garments exported outside Europe are quickly disposed of without being reused[6]. Since the destination countries to which these garments are exported (e.g. Ghana, Kenya, Afghanistan, the Caribbean) generally do not have their own organised textile waste management systems, this creates multiple environmental and health issues. At present, there are no life cycle inventory data or characterisation methods available to assess the impacts of this waste on ecosystems and human health. Accordingly, it is suggested that this supplementary impact category should be included, as a simplified solution.

[5] https://pefapparelandfootwear.eu/
[6] Changing Markets Foundation, Trashion: The Stealth Export of Waste Plastic Clothes to Africa (2023), https://changingmarkets.org/portfolio/trashion/.

Calculating the "end-of-life outside Europe" impact

To measure the impact of used textiles exported outside Europe, a benchmark coefficient is applied: 5,000 impact points for 1 kg of used textiles.

$$Coeff\ Waste = 5{,}000\ \frac{Pts}{kg}$$

This coefficient determines the materiality of the supplementary impact and replaces the normalisation factor and weighting coefficient, neither of which is known since this impact cannot be included in the LCA approach due to a lack of available data.

To calculate the supplementary impact, two parameters are then considered:

- The mass of the article of apparel concerned;
- The probability that it will ultimately end up as waste outside Europe when it reaches the end of its life

This probability will depend on the material or fabric, keeping in mind that an item of apparel is considered to be synthetic if synthetic materials make up at least 50% of its composition.

Scenario	**Probab. waste**
Synthetic garments	12.1%
Other garments	4.9%

Table 2: Scenario for "End-of-life outside Europe" impact

The supplementary "end-of-life outside Europe" impact is calculated using the following formula:

$$EOLOE\ impact\ (Pts) = Proba\ Waste \times Mass\ (kg) \times Waste\ Coef\ \left(\frac{Pts}{kg}\right)$$

II. Microfibre emissions

This adjustment is made to estimate the impact of the microfibres released into the environment during a garment's life cycle. When an item of clothing is being made, used, or disposed of, fibre fragments measuring less than 5 mm (synthetic or natural) break off due to friction and are released into the air and water.

Once they enter the environment, these microfibres may last for varying lengths of time (non-biodegradable). Several factors affect the quantity and toxicity of microfibres released over a garment's life cycle, including the types of fibres concerned and they properties, the treatments applied to garments, the way they are washed, and so on.

Calculating the "microfibre emissions" impact

The calculation method uses a semi-quantitative approach to estimate microfibre impacts. A coefficient is defined, expressed in the form of impact points per kilogram of garment. It represents the maximum microfibre impact of a reference garment under the worst-case scenario:

- Made from fibres most persistent in the environment;
- Releasing the largest amount of microfibres throughout its life cycle.

$$Coef = \frac{1{,}000\ Pts}{kg}$$

The impact is then modulated based on the garment's specific characteristics:

- The persistence of microfibres in the environment, which determines the extent to which a fibre is biodegradable. The more biodegradable a substance, the lower its persistence. Different types of fibres used in the textiles industry have different intrinsic properties (for example, polyester is persistent, whereas cotton is biodegradable). Fibre type is the main parameter used to estimate a textile's biodegradability.
- Release potential, i.e. the quantity of microfibres released into the environment (reflecting the ability of a particular fibre or garment to release microfibres into the environment). This occurs across all stages of the garment's life cycle (manufacture, washing, etc.) and impacts all environmental compartments (water, air, soil).

(A) Stage 1: Identifying different fibres

It is suggested that fibres should be classed in one of four categories: synthetic, plant-based, animal-based, artificial. For each fibre type, a level of Persistence (P) and Release (R) is defined, on a scale from 0 (very low) to 10 (very high).

Fibre type (f)	Persistence (P)	Release (R)
Synthetic	10	4
Natural (plant-based)	1	6
Natural (animal-based)	3	6
Artificial	3	4

Table 3 Persistence and release values for the four categories of fibres

(B) Stage 2: Weighting

The ability of a fibre to break down in the environment (persistence) is considered more important than its potential to release large amounts of microfibres (release). Accordingly, the following weighting is proposed:

Persistence (P)	Release (R)
70%	30%

Table 4: Weighting

(C) Stage 3: Calculating benchmark values (%)

Each type of fibre is assigned a benchmark value, by applying the following formula:

$$Ref\ (f\ ) = (0.7 \times P + 0.3 \times R) \times \frac{10}{100}$$

This benchmark value is expressed as a percentage and reflects the portion of the supplementary 'microfibre' impact applicable to each fibre type.

Fibre type	0.7 x P	0.3 x R	Benchmark (f)
Synthetic	7	1.2	82%
Natural (plant-based)	0.7	1.8	25%
Natural (animal-based)	2.1	1.8	39%
Artificial	2.1	1.8	33%

Table 5: benchmark values for each fibre type

The 'microfibre' impact is calculated using the following formula, based on the share of fibres in the garment's composition:

$$Microfibre\ impact = \sum Ref\ (f) \times Composition\ \times Mass\ x\ Coef$$

Where:

$Masse$, The garment's mass in kg

$Composition$, The share of each fibre in the garment's composition

$Coef$, The 'microfibre' impact of a garment with the worst possible characteristics, i.e. 1,000 points

For multi-fibre garments, a weighted sum of the specific benchmark scenarios for each fibre must be calculated.

04
Scope

I. Product type (or category)

The product type is the first parameter introduced in Article 4 of the Order. It is a required parameter and cannot be omitted.

Each product category has different default parameters (weave/knit, default accessories, repair cost), as listed in Appendix 2.

The available categories for the apparel sector are:

Category	Products included
Boxers/Briefs	Boxers, panties, briefs, thong, tanga, shorty, etc.
Trunks	Trunks
Socks	Stockings, socks, tights, gaiters, leg warmers, mid-calf socks, etc.
Shirt	Tunic, blouse, shirt, nightshirt, shirt-blouse, etc.
Denim	All denim garments - trousers, capris, knickers, jodhpurs, cargo pants, chinos, sarouels
Skirt/Dress	Skirt, dress, jumpsuit, culotte skirt, skirt-shorts, nightdress, etc.
Swimwear	One-piece swimsuit, two-piece swimsuit, swim shorts, swim briefs, swim t-shirt, wetsuit, etc.
Coat/Jacket	Jacket, bolero, windbreaker, blazer, waistcoat, parka, raincoat, kimono, coat, suit jacket, sports jacket, overshirt, tailored jacket, all-in-one (baby), etc.
Trousers	Pyjama bottoms, bermuda shorts, cropped trousers, trousers, dungarees, sarouels, shorts, chinos, leggings, etc.
Sweater	Gilet, pullover, cardigan, sweatshirt, etc.
T-shirt/Polo shirt	T-shirt of any style: short-sleeved or long-sleeved top, roll-neck, polo shirt, vest, pyjama top, undershirt, camisole, bodysuit, baby romper, sleepsuit (baby), etc.

Table 6: Categories of textile products

The following products are not included within the scope of the environmental footprint calculation. To include these products, an amendment to secondary regulation (i.e. a change to this guidance note setting out all of the parameters for defining new product categories) must be made. Alternatively, the main Order will need to be amended.

Requires an amendment to the Order	Requires an amendment to this guidance note
Household linen and home textiles	Bra
Disposable (single-use) articles of apparel	Padded jacket
Garment with electronic components	Fancy dress or costume
Products where more than 20% of the mass is made up of materials not listed in this guidance note	100% silk shirt (requires addition of new materials)
Footwear, leather goods	Textile accessories: scarf, hat, cap, etc.
Technical products: PPE, sportswear (covered by the sporting and recreational goods EPR scheme), garments not covered by the apparel, household linen and footwear EPR scheme, etc.	

Table 7: Products not included in the scope

II. Units containing multiple items

Where several items (or "textile product units") are sold together as a single sales unit, the environmental footprint must be calculated for that sales unit (see Article 3 of the Order).

When calculating the environmental footprint for a sales unit or SKU that includes several items (for example, multipacks), there are several different situations possible.

- Situation 1: The products contained in the same pack are identical or made in a similar way (same product type, same composition, processed in the same countries).

The pack can be treated as a single item. This means a single calculation can be carried out based on the total mass of the pack. Because the parameters used in the calculation (e.g. material types and countries of manufacture) are the same, modelling each item separately would produce results almost identical to modelling the total mass of the pack as a whole.

Example: a pack of three bodysuits with different colours and patterns but the same composition and manufactured in the same factories.

- Situation 2: The pack contains at least one item that is outside the scope of the environmental footprint labelling requirements.

In this case, the entire pack is treated as being out of scope.

Example: a pack of two bodysuits with one soft toy

- Situation 3: The pack contains different items but all are within the scope of the environmental footprint labelling requirements.

The calculation must be done for each item individually. The environmental footprint displayed must be the sum of the footprints calculated for each item.

Example: a pack containing one cotton bodysuit and one polyester pyjama set.

III. Products with multiple components

Ideally, the environmental footprint of a textile product made up of several different components (or "textile parts") should be calculated as the sum of the footprint of each component. For each component, the material composition can be specified, along with the countries where each stage of production takes place. To ensure consistency, the same assumptions must be applied to each component when calculating durability, and the price used should be that of the entire garment, not of each individual component. To avoid double counting, accessories must be included only once.

The calculation can be simplified in two ways:

	Calculation	**Mass**	**Composition**	**Traceability**
Calculation by component	Calculation for each component	Mass of each component	Composition of each component	Country of processing for each component
Simplified calculation #1	A single calculation for the whole garment	Mass of the whole garment	Composition of all components used when determining the garment's composition	*Simplification:* Only the country of processing for the primary component is used
Simplified calculation #2	A single calculation for the whole garment	Mass of the whole garment	*Simplification:* Only the composition of the primary component is used.	*Simplification:* Only the country of processing for the primary component is used

Both simplified calculation methods require a primary component to be identified. It must be the heaviest component of the garment.

The second simplified method eliminates the need for data on components that make up less than 5% of the garment's mass, provided the "labelling" regulation does not require their composition to be displayed.[7]

The product mass used in the calculation must match the total mass of the finished product, in order to maintain the mass balance.

Here is an example of the simplified calculations

Polo shirt (200 g):

- Main component (180 g) - 100% cotton - China
- Collar (20 g) - 100% polyester - Pakistan

	Calculation	Mass	Composition	Traceability
Calculation by component	1 calculation for the main component 1 calculation for the collar	180 g 20 g	100% cotton 100% polyester	China Pakistan
Simplified calculation #1	A single calculation	200 g	90% cotton + 10% polyester	China
Simplified calculation #2	A single calculation	200 g	100% cotton	China

NB - To be compatible with this simplification, Article 7 of the Order describes the composition of a product in the following terms:

"8° The type and percentage of materials that make up the product, or the textile part under consideration per the guidance note, provided these materials represent at least 2% of the product's total mass and 5% of the total impact of the product modelled;"

IV. Products sourced from multiple countries

Several parameters concern the countries where the material is produced or where different stages of processing or manufacture take place. Assigning a value to these parameters can be complex when a single SKU is sourced from more than one country ("multi-sourcing").

[7] REGULATION (EU) No. 1007/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 September 2011 on textile fibre names and related labelling and marking of textile products.

To align with existing regulation and to avoid brands having to carry out duplicate calculations, multi-sourcing should be treated according to the same rules as those defined for the implementation of Decree No. 2022-748 of 29 April 2022, which deals with information provided to consumers about the environmental characteristics of products that generate waste. These rules can be found in the FAQ published on 18 April 2023[8], and specifically paragraph 2.9.2.

> 2.9.2 Specify methodology to be used: How should information be reported for models with several parts and/or manufactured in several countries?
> The producer or importer of the products referred to in Article L.541-10-1 (11) of the French Environmental Code must report the geographic provenance of the manufacturing stages where the product model is mainly produced.
> If the geographic provenance of these stages differs between textile sub-components, the producer or importer must indicate the country where the largest portion (by mass) of the model's textile fibres is manufactured.
> If the geographic provenance varies in terms of production units (i.e. the same model is made in several countries), the producer or importer must indicate the

Accordingly, the country of production should be the country "*where the largest proportion by mass of the textile fibres in the product is produced*". Each stakeholder using the environmental footprint label must be able to show the exact method used to identify this country at each stage, particularly in the event of an inspection.

V. Standard sizes

The environmental footprint of a product must be calculated based on the standard sizes shown in the table. A correspondence between the different standard sizes is shown.

Category	FR size	EU size	US size	UK size	International
Baby (0 to 36 months)	74 cm	12 months	74 cm	74 cm	
Child (2 to 14 years)	128 cm	8 years (128 cm)	128 cm	128 cm	
Woman	38	38	8	10	M
Man (jacket)	42	50	20	22	L
Unisex	42	50	32	32	L

[8] www.ecologie.gouv.fr/sites/default/files/documents/FAQ-020123v2.pdf

Bra	90B	75B	34B	34B
Baby socks	21	21	5	4.5
Child socks	32	32	1.5	13
Women's socks	38	38	5	6.5
Men's socks	42	42	8.5	8
Unisex socks	39	39	6/7	6

Table 8: Standard sizes and correspondences

05
The life cycle of textile products

The environmental footprint calculation covers every stage in a textile product's life cycle, from raw material production to end of life. Each stage is assessed according to its contribution to the product's overall environmental impact and the degree of control the producer has over various parameters (for example, the amount of electricity used to spin thread).

I. Stage 1: Materials

The list of materials available can be found on the "Base Empreinte" site. Most of the life cycle inventory (LCI) data is from Ecoinvent, but some comes from other sources (details of which are also available on the Base Empreinte site).

A full list of materials and the attributes used to describe them is provided in Appendix 3.

Materials available	**Material type**	**Additional process details**
Acrylic	Synthetic	Bead format
Hemp	Natural (plant-based)	

Cotton	Natural (plant-based)	Weighted average of three main producing countries (China, India, United States)
Organic cotton	Natural (plant-based)	An additional parameter is included for this process, based on average global irrigation of 0.75 m^3 of water per kilogram of organic cotton fibre.
Recycled cotton (manufacturing waste)	Recycled, natural (plant-based)	Default countries: Spain and France
Recycled cotton (post-consumer waste)	Recycled, natural (plant-based)	
Elastane (Lycra)	Synthetic	
Jute	Natural (plant-based)	
New wool[9]	Natural (animal-based)	
Default wool	Natural (animal-based)	
Flax (linen)	Natural (plant-based)	
Nylon (polyamide)	Synthetic	
Polyester	Synthetic	Pellet format
Recycled polyester	Recycled synthetic	Pellet format
Polypropylene	Synthetic	
Viscose	Artificial	

Garments made from blended fabrics (e.g. polycotton)

Table 9: List of available materials

For clothing items made from a mix of natural and synthetic fibres, the impact of each fibre is calculated using the following formula and then added together:

$$I_i = t_i \times m \times I$$

Where:

t_i, the proportion of fibre i in the garment's composition

m, the total mass of the raw material fibres

I, the impact of the fibre in points per kilogram (per the database)

[9] This wool represents markets where wool recycling is underdeveloped or non-existent (e.g. the French wool sector). The "default wool" process is used, with the only change being the application of an allocation rate of 4% rather than the 37% rate applied to standard wool.

01) USE OF RECYCLED MATERIALS

When recycled materials are used, the environmental footprint calculation applies part of the European Product Environmental Footprint (PEF) method, specifically the Circular Footprint Formula (CFF). This formula is included in the Materials stage of the assessment. The formula used is as follows:

$$(1 - R_1)E_V + R_1(A \times E_{recycled} + (1 - A)E_V \frac{Q_{sin}}{Q_p})$$

Where:

R_1, the proportion of recycled material at the end of the Materials stage

E_V, the impact (emissions and resources) of the virgin, non-recycled material used

A , the coefficient used to allocate impacts and credits between the supplier and user of recycled materials (see Table 11)

$E_{recycled}$, the impact (emissions and resources) of the recycled material used

$\frac{Q_{sin}}{Q_p}$, the quality ratio between the recycled material used and the equivalent virgin material before recycling (see Table 11**Erreur ! Aucun nom n'a été donné au signet.**)

Recycled material	$\boldsymbol{A}$	$\boldsymbol{\frac{Q_{sin}}{Q_p}}$
Polyester from recycled PET	0.5 Impact shared between the supplier and the user	1 No loss of quality
Polyester from PET bottles	0.5 Impact shared between the supplier and the user	0.7 Loss of quality on recycling
Synthetic fibres from recycled textile products	0.8 Impact mainly borne by the user	1 No loss of quality
Natural fibres from recycled textile products	0.8 Impact mainly borne by the user	0.5 Loss of quality on recycling

Table 10: Allocation coefficient and quality ratios for recycled materials

02) MISSING MATERIALS

Some materials are not included in the available dataset. Their use must be addressed according to the two scenarios described below.

- Case 1: the missing material accounts for less than 20% of the total mass: select a substitute material using the correspondence table
- Case 2: The missing material accounts for 20% or more of the total mass:
    - If an acceptable proxy exists (see correspondence table), it should be used.
    - If no acceptable proxy is available, the product cannot be scored.

Missing materials	Proxy	Case 1	Case 2
Other recycled synthetic materials	Recycled polyester		
Other recycled natural materials	Recycled cotton		
Cashmere, mohair, alpaca	Wool		
Yak wool	Local wool (sourced from peasant agriculture)		
Polyamide	Nylon		
Silk	Wool		
Lyocell	Viscose		

Table 11: Proxies for missing materials

II. Stage 2: Spinning

Yarn is produced by combining fibres (for spun yarn) or filaments (for continuous filament yarn) so they can be used to make textile products.

There are two main processes:

- Staple spinning, which makes short fibres
- Filament spinning, which makes longer, continuous synthetic fibres

Yarn count is the metric used to determine the thickness of a yarn, by measuring the length of the yarn in relation to its weight. It is expressed in terms of "numero metric count": the finer the yarn, the higher the number. For example, Nm 20 means that 20 metres of the yarn weighs 1 gram.

Yarn count is a fixed value, and depends on the product category. It is used during two stages:

- During yarn production: the average amount of electricity used to spin a kilogram of yarn will depend directly on the yarn count.

- During weaving: the yarn count is used to calculate the density of the yarns, and hence the amount of electricity used during this stage (in kWh).

Category	Yarn count
Trunks (woven)	45 Nm
Socks	35 Nm
Shirt	40 Nm
Denim	40 Nm
Skirt / Dress	40 Nm
Swimsuit	40 Nm
Coat / Jacket	30 Nm
Trousers / Shorts	40 Nm
Sweater	35 Nm
Boxers / Briefs (knit)	45 Nm
T-shirt / Polo shirt	40 Nm

Table 12: Yarn count applied to each category

01) CALCULATION METHOD

For the yarn manufacturing stage, the calculation only covers electricity use. Other impacts (machinery, auxiliary products, etc.) are considered negligible. The impact is calculated using the following formula:

$$I_{Spinning} = Quantity\ elec_{yarn} \times I_{elec}$$

Where:

$Quantity\ elec_{yarn}$, the quantity of electricity required

I_{elec} , the impact of generating 1 kWh of electricity in the country concerned

For natural and artificial fibres, the process used is conventional staple spinning, while for synthetic fibres, i.e. yarns made from filaments, the filament spinning process applies. The electricity values associated with these two processes are shown in the table below:

	Conventional spinning	Filament spinning
$\boldsymbol{Quantity\ Constant_{elec}}$, in kWh / kg of yarn	4	1.5

Table 13: electricity values for each spinning process

A linear correlation is applied by default between the yarn count (Nm) and electricity consumption (kWh). The benchmark used in the formula is an average yarn with a count of 50 Nm / 200 dtex.

Electricity consumption for yarn production is therefore expressed as follows:

$$Quantity\ elec_{yarn} = \frac{Yarn\ count}{50} \times Quantity\ Constant_{elec} \times Output\ Mass(kg)$$

Garments made from multiple materials:

When a fabric is produced from several different materials, the blend is accounted for at the fabric manufacturing stage (weaving or knitting), through the use of specific yarns.

If a garment contains fibres of different types (e.g. synthetic and natural), yarns of different types are produced accordingly. The amount of electricity used in the yarn manufacturing stage is therefore equal to the sum of the impacts of each process used.

Illustration for a T-shirt made from a 50/50 polyester/cotton blend:

T-shirt / 50% polyester 50% cotton / yarn count Nm 40 / 250 g of yarn to be produced				
Process	**Quantity (kg)**	**Constant (kWh/kg)**	**Yarn count (Nm)**	**kWh**
Spinning (50% polyester)	0.125	1.5	40	0.15
Conv. spinning (50% cotton)	0.125	4	40	0.4
			Total	0.55

02) MATERIAL LOSS RATES

Default loss rates are applied to the calculations. For recycled materials, the loss rate of the equivalent virgin material is used.

Fibres	**Loss rates (%)**
Natural or Artificial	12%
Synthetic	3%

Table 14: loss rates for each fibre type during the spinning process

III. Stage 3: Weaving or Knitting

Fabric production involves interlacing yarns, fibres, or filaments using a variety of techniques. Textiles fall into two categories:

- Woven textiles: weaving is the process of interlacing yarns on a loom to produce a warp and weft fabric. It involves crossing the warp yarns (vertical) with the weft yarns (horizontal).
- Knitted textiles: knitting is a method of fabric production in which loops of yarn (called stitches) are interlaced using needles. The resulting structure is a stretchable fabric, as the loops can move and deform.

01) CALCULATION METHOD

For the Weaving/Knitting stage, the calculation only takes into account the electricity use specific to each process. Other aspects of the weaving or knitting process (such as oils, lubricants, or sizing agents) are considered negligible, as they represent less than 5% of the process's total impact.

A single weaving or knitting operation is applied for each textile category.

Trunks	Woven
Socks	Fully fashioned/seamless knit
Shirt	Woven
Denim	Woven
Skirt/Dress	Woven
Swimsuit	Standard knit
Coat/Jacket	Woven
Trousers/Shorts	Woven
Sweater	Standard knit
Boxers/Briefs	Standard knit
T-shirt	Standard knit

Table 15: Operations by category

Fully fashioned / seamless knitting is a piece-by-piece knitting process that reduces seams and material losses when the garment is assembled.

The environmental impact for this stage is calculated using the following formula:

$$I_{fabric} = I_{elec} \times Quantity\ elec_{fabric}$$

Where:

$Quantity\ elec_{fabric}$, the quantity of electricity required

I_{elec} , the impact of generating 1 kWh of electricity in the country concerned

The electricity values associated with these two knitting processes are shown in the table below:

	Standard knit	Fully-fashioned/seamless knit
$\boldsymbol{Quantity\ elec_{fabric}}$, in kWh / kg of yarn	2.4	1.68

Table 16: electricity values for each process

Calculation for the weaving process:

The crimp percentage is fixed at 8%, and the yarn count for each product type is shown in Table 12. Yarn density is assumed to be the same for both warp and weft. The electricity constant used is 0.0003145 kWh per pick and per metre. The weaving process is calculated using the following formula:

$$Quantity\ electricity_{weaving} = \frac{Yarn\ count \times OutputMassWeaving(g) \times 0.0003145}{1.08 \times 2}$$

The weight of a fabric is expressed in grams per square metre (GSM). A specific fabric weight is applied depending on the garment type (jeans, T-shirts, etc.). Yarn density is used to characterise the fabric structure. It also helps to refine the estimate of the electricity required by the weaving process. Yarn density reflects the number of operations performed by the machinery. The higher the weft count (i.e. the number of weft yarns), the more times the shuttle will be passed back and forth.

Category	Fabric weight	Yarn density	Picks/metre
Trunks (woven)	180 GSM	38 #/cm	4, 902 picks per metre
Socks	250 GSM	41 #/cm	3, 307 picks per metre
Shirt	200 GSM	37 #/cm	4, 444 picks per metre
Denim	250 GSM	46 #/cm	4, 508 picks per metre
Skirt / Dress	200 GSM	37 #/cm	4, 426 picks per metre
Swimsuit	220 GSM	41 #/cm	4, 357 picks per metre
Coat / Jacket	450 GSM	62 #/cm	2, 736 picks per metre
Trousers / Shorts	250 GSM	46 #/cm	4, 389 picks per metre
Sweater	250 GSM	41 #/cm	4, 051 picks per metre

Boxers / Briefs (knit)	180 GSM	38 #/cm	4, 902 picks per metre
T-shirt / Polo shirt	200 GSM	37 #/cm	4,357 picks per metre

Table 17: fabric weight, yarn density, and weft count for each category

02) MATERIAL LOSS RATES

Process	Loss rate
Woven	6.25%
Standard knit	5.45%
Fully-fashioned/seamless knit	0.5%

Table 18: fabric loss rates for each process

For fully-fashioned/seamless knitting, the assembly parameters are changed accordingly and set as fixed values. The loss rate during assembly is assumed to be 2%.

03) DEFAULT COUNTRY

The geographic location where the spinning stage takes place is an optional parameter, rather than a mandatory requirement. Consequently, a default country is suggested: India.

IV. Stage 4: Fabric finishing

Fabric finishing gives textiles their visual appearance and physical and aesthetic properties. This stage is divided into three sub-stages, as explained below:

- Pre-treatment = preparing and cleaning the fibres
- Dyeing and printing = applying dyes or pigments
- Finishing = applying special treatments

Pre-treatment involves cleaning and preparing the fabric for the next stage, which is usually dyeing. Even if the fabric is not intended to be dyed, pre-treatment is necessary to clean it. Several processes may be used depending on the material, including washing, desizing, singeing, mercerisation, scouring, and bleaching. The pre-treatment processes considered in the environmental impact calculation are:

- Scouring: removes impurities from the fibre (e.g., pectins, fats, waxes) to make the fibres permeable for subsequent processes such as bleaching or dyeing.
- Bleaching: removes natural colour from the fibre to make it whiter and more absorbent.

- Washing: removes preparation agents from synthetic yarns.

Dyeing and printing both involve applying colour to the fabric. Printing, however, applies colour only to specific areas to create a desired pattern rather than colouring the entire fabric.

Two printing methods are included: pigment printing and reactive printing. Pigment printing deposits coloured pigments on the fabric's surface, whereas reactive printing fixes dyes directly to the fibre, like dyeing (unlike pigments, which penetrate less deeply into the fibre).

Both methods are based on an average of three techniques: flatbed screen printing, rotary screen printing, and digital inkjet printing.

The final sub-stage includes all of the treatments applied to textiles to give them their desired properties (referred to as "preparations"). These treatments can affect visual appearance, hand feel, and may also give the fabric special characteristics, such as making it water repellent or flame retardant.

01) CALCULATION METHOD

The overall impact of the fabric finishing stage (including all three sub-stages) is calculated as the sum of the impacts of all processes applied to each model/garment. For each impact category, the impact of the finishing processes is calculated as the sum of the impacts of each individual process:

$$I_{finishing} = m \times (\sum (e_i \times t_i) \times I_{elec} + \sum (c_i \times t_i) \times I_{heat})$$

Where:

$I_{finishing}$: the environmental impact of the overall fabric finishing stage, expressed in the relevant unit for the impact category being analysed

m: the fabric mass, expressed in kg (for pre-treatment processes, the mass is proportionate to the fibre type)

e_i: the electricity required for process i per kg of fabric, in kWh/kg

I_{elec}: the environmental impact of the electricity required for the country in which the fabric finishing stage is carried out, expressed in the relevant unit for the impact category concerned

t_i: the rate at which the process is applied to this garment (dimensionless)

1 if the process is applied to this garment

0 is the process is not applied

Between 0 and 0.8 for printing (refer to the section dealing specifically with this process)

c_i: heat required for process i per kg of fabric, in MJ/kg

I_{heat}: the environmental impact of the electricity required for the country in which the fabric finishing stage is carried out, expressed in the relevant unit for the impact category concerned.

Where there are enriched inventories available for certain processes included in a garment production model (e.g. bleaching), the impacts from these enriched inventories are added to the calculation.

02) LOSS RATE

No losses are applied during the fabric finishing stage.

03) APPLICATION OF FINISHING PROCESSES

Pre-treatment processes are applied according to the type of fibre concerned (synthetic, natural, etc.):

- Bleaching: applied by default to all non-synthetic fibres.
- Scouring: applied by default to natural fibres.
- Washing: applied by default to synthetic fibres.

Dyeing / printing processes:

- Standard dyeing: applied by default.
- Pigment printing: optional.
- Reactive printing: optional.

Two types of printing are possible (reactive and pigment). The percentage of the fabric surface printed must be taken into account. Five scenarios are suggested: 1%, 5%, 20%, 50%, and 80%. The upper-bound value should be selected. For example, if a T-shirt has 40% of its surface printed, the value used in the calculation is 50%.

For fibre blends (e.g. polycotton), pre-treatment and dyeing parameters are calculated proportionally based on the type of fibre. Processes should not be combined across different fibre types.

Sub-stage	**Process *i***	t_i
Pre-treatment	Scouring	1 for natural material, 0 for all others
Pre-treatment	Bleaching	0 for synthetic material, 1 for all others
Pre-treatment	Washing (synth. fibres)	1 for synthetic material, 0 for all others
Dyeing	Standard	1
Printing	Pigment	0 by default, between 0.01 and 0.8 if process selected for dyeing, based on rate applied
Printing	Reactive	0 by default, between 0.01 and 0.8 if process selected for dyeing, based on rate applied

Finishing	Chemical treatments (continuous)	1

Table 19: Rates of application of finishing processes

04) ENERGY CONSUMPTION (ELECTRICITY AND HEAT)

Energy consumption (electricity and heat) values should be entered in **Erreur ! Source du renvoi introuvable.**0.

Process	Electricity (kWh/kg)	Heat (MJ/kg)
Scouring	0.30	13.50
Bleaching	0.20	5.40
Washing (synth. fibres)	0.20	10.80
Standard dyeing	1	24.30
Pigment printing	1.27	7.25
Reactive printing	1.45	8.72
Chemical treatments (continuous)	0.60	13.50

Table 20: Electricity and heat consumption for various finishing processes

05) ENRICHED INVENTORIES

Some finishing processes (bleaching, dyeing, printing) have been enriched to reflect the impact generated by the release of chemicals into the environment. These impacts are only considered in terms of ecotoxicity, as other environmental aspects are dealt with elsewhere.

Calculation method

The impact of each enriched inventory, considered separately, is calculated as the product of the "output" mass after the fabric finishing stage and the relevant impact coefficients.

$$EnrichedInventoryImpact = OutputMass(kg) \times InventoryImpact\ Coef$$

Finishing process	CTUe
Dyeing on synthetic fibres	289 CTU / kg
Dyeing on cellulosic fibres	758 CTU / kg
Bleaching	353 CTU / kg
Printing (pigment)	944 CTU / m^2

Printing (dyes)	367 CTU / m^2

Table 21: Coefficients applied for enriched inventories

NB: For printing, the calculation is carried out on the basis of area (in m^2) rather than mass.

- Bleaching: applied by default to all non-synthetic fibres.
- Dyeing on cellulosic fibres: applied by default to all non-synthetic fibres.
- Dyeing on synthetic fibres: applied by default to synthetic fibres.
- Pigment printing: optional.
- Reactive printing: optional.

A "water pollution rate" is used to estimate the quantity of chemicals released in wastewater during a finishing process that is not removed and ends up in aquatic ecosystems. Two parameters, expressed as percentages, are used to define the water pollution rate:

- The connection rate (R) of the industrial site to a wastewater treatment plant,
- The efficiency (E) of the wastewater treatment plant.

The water pollution rate (P) for an industrial site is calculated as:

$$P = 1 - (R \times E)$$

Finishing country	**R**	**E**	**P**
Best case (Europe + North America, Australia, New Zealand)	100%	95%	5%
Average case (Maghreb + Western Asia + East Asia + South-East Asia)	90%	90%	19%
Worst case (Other countries)	90%	70%	37%

Table 22: Water pollution rates by country

V. Stage 5: assembly

The assembly stage is intended to cut out the various parts of a garment and put them together to make the finished product. This stage generally includes cutting the fabric, assembling the individual pieces, and final touches such as ironing and folding.

01) PARAMETERS USED:

- A fabric loss rate is applied for each type of garment. The higher this value, the more fabric needs to be produced.
- A quantity of electricity required for the assembly process is assigned. This value is defined according to the degree of complexity in assembling the garment. There are five possible levels of complexity:
    - Very simple (less than 5 minutes)
    - Simple (5 to 15 minutes)
    - Medium (15 to 30 minutes)
    - Complex (30 to 60 minutes)
    - Very complex (more than 60 minutes)

Each garment is assigned a complexity rating. Each complexity rating equates to a number of minutes required to assemble the product.

Product category	Assembly (complexity)
Trunks (woven)	Low
Socks	Very low
Shirt	Low
Jeans	Medium
Skirt / Dress	Low
Swimsuit	Low
Coat / Jacket	High
Trousers / Shorts	Medium
Sweater	Low
Boxers / Briefs (knit)	Low
T-shirt / Polo shirt	Low

Table 23: complexity of assembly by product category

02) CALCULATION METHODOLOGY

The environmental impact of the assembly stage is limited to the electricity required to carry out the process. A default value of 0.029 kWh[10] of electricity is applied for each minute of assembly. The total electricity consumption therefore depends directly on how complex the garment is to assemble.

Complexity	Assembly time	Minutes	Electricity used (MJ/kWh)
Very low	Less than 5 minutes	5	0.36 / 0.1
Low	Between 5 and 15 minutes	15	1.44 / 0.4
Medium	Between 15 and 30 minutes	30	3.24 / 0.9
High	Between 30 and 60 minutes	60	6.12 / 1.7
Very high	More than 60 minutes	120	12.6 / 3.5

Table 24: Electricity consumption based on complexity

Distressing:

The database includes a distressing process. This is an optional parameter, to be used if it forms part of the garment's manufacturing process.

03) LOSS RATE

Default loss rates are applied for each product type:

Product category	Loss rates (assembly)
Trunks (woven)	15%
Socks	2%
Shirt	20%
Jeans	22%
Skirt / Dress	20%
Swimsuit	15%
Coat / Jacket	20%
Trousers / Shorts	20%
Sweater	20%

[10] Based on the findings of the Mistra Future Fashion programme (Sweden).

Boxers / Briefs (knit)	15%
T-shirt / Polo shirt	15%

Table 25: Loss rate during assembly for each category

04) DEADSTOCK

In addition to losses occurring during the assembly stage itself (e.g. fabric cuttings), a further percentage of losses is also applied to account for the fact that some production is never actually used or sold. This is referred to as deadstock, and includes unsold products, defective fabrics, and similar items.

The Ecodesign for Sustainable Products Regulation (ESPR), published on 28 June 2024, introduced the concept of unsold products into EU law for the first time. The Regulation describes unsold consumer products as those that have never been sold or used. They are further defined in Article 2 as: "'Unsold consumer product': means any consumer product that has not been sold including surplus stock, excess inventory and deadstock and products returned by a consumer on the basis of their right of withdrawal in accordance with Article 9 of Directive 2011/83/EU or, where applicable, during any longer withdrawal period provided by the trader."

Modelling deadstock

Under the environmental impact calculation method, an average deadstock rate of 15% is applied. This figure includes deadstock of finished garments as well as semi-finished products (e.g. fabrics, yarns). Deadstock is modelled using a multiplier. In practice, the quantity of materials processed during the various stages of manufacture is multiplied by 1.15.

Accounting for deadstock effectively entails applying a second material loss rate, meaning 15% more fabric is required before the assembly stage. As a result, the quantities of fabric, yarn, and raw materials needed upstream of assembly are increased accordingly. To determine the amount of fabric required at the start of the assembly phase, both deadstock and losses specific to the assembly stage must be taken into account.

VI. Stage 6: Accessories

A textile product is primarily made of textile materials obtained from a complete agricultural and industrial process, as described in the following sections: raw material, yarn production, fabric manufacturing, finishing, and garment assembly. However, some articles also include accessories, such as buttons, zips, etc. Since these accessories generally represent only a minor (or even negligible) share of the finished product's overall mass and environmental impact, they are modelled in a simplified way. Accordingly, the environmental footprint calculation method takes into account only the number of accessories present on a garment, without allowing for more

detailed parameters (such as mass, provenance, or material composition). Each product category is associated with a default number of accessories. This number can be adjusted for the specific garment for which the environmental footprint is being calculated.

Each type of accessory is assumed to have a given composition, which can be found in Appendix 4. The corresponding life cycle inventories used for these materials are provided in Appendix 5.

Product category	Default accessories
Trunks	2 plastic buttons
Socks	
Shirt	11 plastic buttons
Jeans	1 metallic button, 1 short zip
Skirt / Dress	1 short zip, 1 plastic button
Swimsuit	1 plastic button
Coat / Jacket	5 plastic buttons, 1 long zip
Trousers / Shorts	1 metallic button, 1 short zip
Sweater/Gilet	5 plastic buttons
Boxers / Briefs	
T-shirt / Polo shirt	3 plastic buttons

Table 26: Default accessories for each product category

VII. Stage 7: Distribution

The distribution stage refers to the transport of the finished product from the storage warehouse (following assembly and upstream transport) to a retail store or distribution centre. The warehouse is assumed to be located in France.

The only mode of transport considered is road freight.

For simplification purposes, the calculation does not take into account shipping between the retail store or distribution centre and the end consumer.

CALCULATION METHOD

The environmental impacts generated by the distribution stage are calculated using the following formula:

$$I_{distribution} = \frac{m}{1{,}000} \times D_{truck} \times I_{truck}$$

Where:

$I_{distribution}$, the environmental impact of the distribution stage, expressed in the relevant unit for the impact category being analysed (or the environmental footprint)

m , the mass of the finished product, expressed in kg.

D_{truck}, the distance over which the product is transported by road between the storage warehouse in France (or the manufacturing site in France, if applicable) and the point of sale or local delivery point, in km

I_{truck}, the environmental impact of the road transport, expressed in the relevant unit for the impact category being analysed, per tonne and per kilometre

Parameter used: D_{truck} = 500 km

VIII. Stage 8: Use

The use stage concerns the care and maintenance of the garment. It involves modelling both the number of wears and the associated impacts. An average duration of use[11] has been defined for each product category.

01) CALCULATION METHOD:

The environmental impacts of the use phase are associated with the care processes used to maintain the garment[12]:

- Washing - Electricity
- Washing - Detergent
- Washing - Wastewater treatment
- Drying - Electricity
- Ironing - Electricity

Specific "use phase" processes are defined for each category to group together all these care processes.

Certain parameters depend on the product category (e.g. skirt, trousers, T-shirt) and on the durability of the garment. To illustrate this, the parameter specific to each garment is used. The number of care cycles varies between categories with, for example, 45 cycles for a T-shirt compared with 5 for a coat, reflecting the fact that a T-shirt is washed more frequently than a coat over the same lifetime.

Impact of use

The calculation is divided into two parts: a non-electricity component and an electricity component, the latter itself being split into ironing and non-ironing electricity use.

$$I_{use} = n_{cycles} \times m \times I_{nonironing} + E_{use} \times I_{elec}$$

Where:

I_{use} , the environmental impact of using the garment over its lifetime, expressed in the relevant unit for the impact category being analysed.

n_{cycles} , number of care cycles for the garment over its lifetime (dimensionless)

m , the garment's mass in kg

$I_{nonironing}$, the environmental impact of maintaining 1 kg of a category *i* garment, expressed in the relevant unit for the impact category being analysed, per kg.

I_{elec} , the environmental impact of generating 1 kWh of electricity, expressed in the relevant unit for the impact category being analysed

[11] Based on data from the PEFCR for Apparel & Footwear.

[12] As described in the "Base Impacts" documentation

E_{use} , the quantity of electricity used to maintain the garment, over its entire lifetime, in kWh. This value is calculated as follows:

$$E_{use} = n_{cycles} \times m \times E_{nonironing,i} + n_{cycles} \times E_{ironing,i}$$

$E_{nonironing,i}$, the quantity of electricity used - excluding ironing - for one care cycle for 1 kg of a category i garment, in kWh/kg. This quantity is defined in the process Use: Impact excluding ironing (i) as an external flow.

$E_{ironing,i}$, the quantity of electricity used for ironing, for the care cycle of a category i garment, in kWh/garment.

Number of care cycles

A specific number of care cycles is calculated for each garment, based on the default number of cycles and its durability coefficient:

$$n_{cycles} = n_{cycles,i\,,default} \times C_{durability}$$

Where:

n_{cycles} , the number of care cycles for product *i*;

$n_{cycles,i\,,default}$, the default number of care cycles for the product category *i*;

$C_{durability}$, the product's durability coefficient (dimensionless);

For example, for a T-shirt with high durability (coefficient x 1.35), the number of care cycles used in the calculation would be 61 days (45 x 1.35).

02) NUMBER OF CYCLES BY DEFAULT

The default number of cycles $n_{cycles,i\,,default}$ for each category of product is shown in the table below:

Product category	Average duration	Care cycle (n)
Trunks	60 days	60
Socks	50 days	25
Shirt	40 days	20
Jeans	70 days	23
Skirt/Dress	70 days	23
Swimsuit	30 days	30
Coat/Jacket	100 days	5
Trousers/Shorts	70 days	23
Sweater	85 days	17
Boxers/Briefs	60 days	60
T-shirt/Polo shirt	45j	45

Table 27: Average duration and care cycle for each product category

03) ENERGY USED FOR IRONING

The parameter $E_{ironing,i}$ is shown for each product category in Table 28. For the purposes of the use stage, the electricity mix is assumed to be equivalent to the French low voltage electricity supply.

Product category	Electricity for ironing (kWh)
Trunks	0
Socks	0
Shirt	0.05
Jeans	0.07
Skirt/Dress	0.02
Swimsuit	0
Coat/Jacket	5.00e-3
Trousers/Shorts	0.07
Sweater	0
Boxers/Briefs	0
T-shirt/Polo shirt	0.03

Table 28: Electricity used for ironing for each product category

IX. Stage 9: End-of-life

The end-of-life stage impact in the environmental footprint calculation is divided into two components:

- The scenario suggested in version 1.3 of the PEFCR for Apparel & Footwear
- The supplementary "end-of-life outside Europe" impact (see **Erreur ! Source du renvoi introuvable.**)

Possible end-of-life scenarios for items of apparel:

- Recycling (neglected)
- Incineration and landfill

To assess the impact of incineration and landfill, the following are treated as a single process for the purposes of the calculation:

- Transport
- Incineration
- Landfill

Calculation method:

$$I_{total\ EOL} = I_{EOL\ excluding\ vehicle} + EOLOE\ impac$$

Where:

$I_{EOL\ excluding\ vehicle}$, the impact of the End-of-Life process (excluding vehicle), multiplied by the garment's mass

$EOLOE\ impact$, the supplementary "end-of-life outside Europe" impact

06
Methodological Notes

I. Transport

Transport includes all movements throughout the garment's value chain. The mass transported between each stage is adjusted to account for losses and is expressed in tonnes. A conversion must be applied to relate this to the mass in kilograms used elsewhere in the calculations.

Stage	From	To	Mass of product concerned
1.	Geographic provenance of raw materials	Geographic provenance of spinning	Raw material
2.	Geographic provenance of spinning	Geographic provenance of weaving/knitting	Yarn
3.	Geographic provenance of weaving/knitting	Geographic provenance of finishing	Fabric
4.	Geographic provenance of finishing	Geographic provenance of assembly	Fabric
5.	Geographic provenance of assembly	Warehouse location: France	Garment
6.	Warehouse location: France	Store or pickup point Country: France	Garment

Table 29: Mass considered for each transport process

01) CALCULATION METHOD

Impact of transport on life cycle

$$TransportImpact = TransportImpact1 + \ldots + TransportImpact6$$

Impact for a specific mode of transport

Products are assumed to be transported by one of three routes. Each route is assumed to use one mode of transport:

- road (truck)
- sea (boat)
- air (plane)

For each stage, the environmental impact of transport for a given mode *i* is calculated as follows:

$$Transport\ Impact_i = Mass_i \times Distance_i \times Transport\ Process\ Impact$$

Where:

- $TransportImpact_i$: the environmental footprint of transport for mode *i*, expressed in impact points (Pts);
- $Mass_i$: the mass of the product transported, in tonnes. The mass value used is adjusted for Losses and waste.
- $Distance_i$: the distance travelled for transport mode *i*, expressed in kilometres (see section 2, distances between countries);
- $Transport\ Process\ Impact$: the environmental footprint of transport by mode *i*, expressed in impact points per tonne kilometre.

Breakdown between modes of transport

The breakdown between the three transport modes is adjusted based on the countries of origin and destination for each transport leg. The transport impact for each stage is calculated as a weighted average of the three modes considered:

$$TransportImpact_i = a \times I_{Air} + (1 - a) \times (t \times I_{Road} + (1 - t) \times I_{Sea})$$

Where

- t, proportion of road transport relative to total "road + sea" transport
- a, proportion of air transport relative to total "air + road + sea" transport

02) DISTANCES BETWEEN COUNTRIES

The distance for each mode of transport is calculated according to the countries of origin and destination for each transport leg. All of the distances between various countries are shown in Appendix 6.

If the country is not listed in Appendix 1:

In this case, the relevant region should be selected instead. Example for country *Germany* ⇒ select the region *Western Europe*.

To define the distances and modes of transport used for each region, a representative country is assigned as follows:

Western Europe = Spain

Eastern Europe = Czechia

Asia = China

Africa = Ethiopia

North America = United States

Latin America = Brazil

Oceania = Australia

Middle East = Türkiye

The transport impact is then calculated in the same way as if the representative country had been selected.

If the country is unknown

Select "Unknown" or "Unknown (default)"

In this case, India will be automatically used as the reference country for the purpose of determining distances and modes of transport.

[NB: "unknown country" can be selected for the raw materials and spinning stages, but must not be used for the weaving/knitting, finishing, or assembly stages, as the corresponding parameter must be specified in accordance with Article 7 of the Decree of 6 September 2025 setting out the procedure for calculating and reporting the environmental footprint of clothing textiles.]

If two consecutive stages take place in the same country

Where two consecutive stages take place in the same country, it is assumed that the transport process is entirely by road, with a distance of 500 km.

03) BREAKDOWN BETWEEN ROAD AND SEA ROUTES

The distance for each mode of transport is calculated according to the countries of origin and destination for each transport leg. The proportion of transport by road (t) as a percentage of total "road + sea" transport is established as follows:

Distance by road	***t***
<=500 km	100%
500 km <= 1000 km	90%
1000 km <= 2000 km	50%
2000 km <= 3000 km	25%
> 3000 km	0%

Table 30: Percentage road transport based on distance travelled

Examples:

t	**Türkiye**	**France**	**Spain**	**Portugal**
Türkiye	100%			
France	25%	100%		
Spain	0%	90%	100%	
Portugal	0%	50%	90%	100%

Table 31: Percentage road transport - examples

"For a "Türkiye-France" journey, 25% of the (non-air) transport will be by road (truck) and 75% by sea (boat)"

04) PROPORTION OF TRANSPORT BY AIR

A proportion of air transport is included as an optional parameter:

- Only for transport between the assembly stage and the warehouse
- This proportion is only taken into account if assembly does not take place in Europe or Türkiye. (The warehouse is assumed to be located in France.)

The proportion of transport by air (a) (as a percentage of total "air + road + sea transport") is treated as follows for the default value:

- If the durability coefficient is > or = 1
  - 0% for European countries or Türkiye,
  - 33% for other countries.
- If the durability coefficient is < 1
  - 0% for European countries or Türkiye,
  - 100% for other countries.

05) DISTRIBUTION

For distribution, products are assumed to be transported a default distance of 500 km, by truck, from a warehouse located somewhere in France to a store or pickup point closer to the consumer.

II. Electricity

Electricity consumption is expressed in kilowatt-hours (kWh). Some processes require energy to be measured in megajoules (MJ), in which case, a conversion is applied (1 kWh = 3.6 MJ).

Two scenarios are used to model electricity consumption for the processes involved in textile production:

- Scenario 1: electricity is already included in the process as an "Internal Flow"
- Scenario 2: electricity is not included in the process and must be added as an "External Flow" (this is the case for many processes in the Finishing stage).

In this second scenario, the electricity required to carry out the process is calculated as the product of the "output" mass at the end of the process (e.g. 0.5 kg of fabric at the end of the Finishing stage) and the coefficient applicable to the external "electricity consumed" flow (e.g. 0.1 kWh/kg for the desizing pre-treatment process).

The external "electricity consumed" flow reflects the electricity mix of the relevant geographic area where the process takes place. A total of twenty scenarios are suggested, to reflect different levels of traceability:

- Scenario 1 => unknown origin (default scenario): when the country of provenance is unknown, the geographical area "Unknown" should be selected.

This option may only be used for the spinning stage; all other processing stages require a defined country of provenance.

- Scenario 2 => a Country (eight options) or Region (eleven options) must be selected. If the country is known, select the following:
  - the country, if available in the list of options
  - the region, if the country is not available in the list

Regions	Countries
Western Europe	France
Eastern Europe	India
Asia	China
Middle East	Pakistan
Africa	Türkiye
Latin America	Vietnam
North America	Cambodia
Oceania	Morocco
	Tunisia
	Bangladesh
	Myanmar

Table 32: List of available countries and regions

In France, the electricity process uses low-voltage power during the use phase, while the other life-cycle stages use medium-voltage power.

III. Heat

The heat process is selected on the basis of the country. Heat consumption is expressed in megajoules (MJ). Two scenarios are used to model heat consumption for the processes involved in textile production:

- Scenario 1: heat is already included in the process as an "Internal Flow"
- Scenario 2: heat is not included in the process and must be added as an "External Flow" (this is the case for many processes in the Finishing stage).

In this second scenario, the heat required to carry out the process is calculated as the product of the "output" mass at the end of the process and the coefficient applicable to the external "heat consumed" flow. There are two possible regions:

Zone	Heat process	Heat sources

Europe	Heat mix (Europe)	44% natural gas / 56% others
Rest of the world	Heat mix (World)	23% natural gas / 77% others

Table 33: Heat processes available

By compiling data on heat sources (natural gas vs. others) and their share in each regional energy mix (e.g. 44% from natural gas and 56% from other sources for Europe), we can assess the impact of industrial heat use in each region.

IV. Rates of loss and waste

Both losses and waste are taken into account at each stage of textile manufacture. The calculation formulas are explained in the sections dedicated to each process.

MASS CALCULATIONS

Mass is calculated by tracing the production chain backwards, starting with the finished garment, then the fabric, the yarn, and finally the raw material. To work back through the chain, the input mass is calculated from the output mass and the loss rate (T) for each stage, using the following formula:

$$mass_{input} = \frac{mass_{output}}{1 - T}$$

V. Upcycling / Remanufacturing

Upcycling (also referred to as remanufacturing in some contexts) refers to upgrading a textile product of lower value, such as a used garment or fabric offcut, into something of higher quality or usefulness. In other words, it gives a second life to textile materials through "upward recycling". Remanufacturing involves designing new garments from existing material stocks. It is not suited to large-scale production.

For environmental impact calculations, a product is classed as remanufactured if at least 90% of it comes from previously used finished goods.

The environmental footprint methodology allows some or all of the life-cycle processes to be excluded where appropriate. This means an upcycled garment can be modelled. In such cases, the manufacture of the original fabric is considered to have already been accounted for, so its impact is treated as zero. Only the processes directly linked to remanufacturing (e.g. transport, distribution) are included in the calculation.

Since upcycling can take a variety of different forms, the environmental footprint calculation must reflect all the main stages involved.

When the "remanufacturing" parameter is activated:

- The spinning, weaving/knitting, and finishing stages are excluded.

- The provenance of the material must be entered as the country where the remanufactured fabric was collected.
- The complexity level of the assembly stage is set to “high” by default, to reflect the often complex operations involved.

07
Durability of apparel items

The durability of garments must be taken into account in their environmental footprint, by estimating how many times they are worn during their lifetime. The more a garment is worn, the lower its overall environmental impact.

I. Background

Two main factors are generally used to assess a garment's durability:

- Physical durability: the garment's ability to withstand wear and tear from use and care.
- Non-physical durability: the likelihood that the garment will continue to be worn for longer, based on other criteria such as repairability or emotional attachment.

Both factors are highlighted in various studies, including in the European PEFCR for Apparel & Footwear.

At this stage, only non-physical durability is taken into account.

II. Calculation method

01) CALCULATING THE ENVIRONMENTAL FOOTPRINT

Each garment is assigned a durability coefficient. This value ranges from 0.67 for the least durable products to 1.45 for the most durable. The environmental cost is calculated as follows:

$$Environmental\ footprint = \frac{Sum\ of\ Impacts}{C_{durability}}$$

Where:

$Sum\ of\ Impacts$, the sum of the garment's impacts over its entire life cycle. For the use stage, the number of wears and care cycles is adjusted according to the durability coefficient. A more durable garment is worn and cleaned more frequently, generating a larger impact (spread over a longer lifetime).

$Environnemental\ footprint$, the environmental footprint is therefore based on a functional unit referred to as "X days of wear", where X is the average duration of service defined for the relevant product category (see Table 27)

Example:

- If $C_{durability} = Coef_{min}$ = 0.67, the environmental footprint is greater.
- If $C_{durability} = Coef_{max}$ = 1.45, the environmental footprint is smaller.

02) CALCULATING THE DURABILITY COEFFICIENT

The durability coefficient is based on two criteria, each of which is assigned a weighting.

Criterion	Weighting
Incentive to repair	50%
Product range breadth	50%

Table 34: Breakdown of criteria used to determine the extrinsic durability coefficient

Each criterion is expressed in the form of an index value (I) between 0 and 1, meaning it can also be expressed as a percentage. Applying the weightings indicated above, and the minimum ($Coef_{min}$) and maximum ($Coef_{max}$) values of the durability coefficient $C_{durabilité}$, the formula used to determine it is:

$$C_{Durability} = Coef_{min} + (Coef_{max} - Coef_{min}) \times \sum_{criterion} Weight_{criterion} \times I_{criterion}$$

Or alternatively:

$$C_{Durability} = 0.67 + (1.45 - 0.67) * \left(0.5 \times I_{incentive\ repair} + 0.5 \times I_{range\ breadth}\right)$$

(A) Product range breadth

Definition

Product range breadth refers to the maximum number of new product SKUs, including remanufactured items, offered by a brand within the market segment of the product in question.

Additional information

The sales channel is assumed to be the brand's own website. If the brand does not sell online through its own site, another sales channel must be selected.

Exceptionally, for brands primarily sold through an online platform, the product range breadth is set to a default of 100,000 SKUs per segment.

A brand is assumed to be distributed mainly via an online platform if that platform accounts for the majority of its sales.

If a brand sells its products through a multi-brand site but manages its own Extended Producer Responsibility (EPR) obligations and has a unique identifier (UID), and if its

main sales are not through the multi-brand site, the SKU count is taken from the brand's own website, not the multi-brand site.

If the brand does not have a UID, its product range breadth is set to the default value of 100,000 SKUs.

This approach covers products in five market segments: ladieswear, menswear, childrenswear, babywear, and underwear. These segments are introduced to avoid bias that would disadvantage a brand covering all segments, as compared with one focused on only one or a few segments, for example, a brand offering only women's ready-to-wear items. Within these segments, SKUs targeted at a specific subset of potential customers are excluded. Examples include items for plus sizes, maternity wear, or adaptive clothing for people with disabilities. The aim is to approximate the choice available to each consumer: man, woman, child, or baby.

The "underwear" segment includes all intimate apparel: lingerie, undergarments (boxers, briefs, shorts, panties, etc.), pyjamas and other homewear, and swimwear.

Included	Excluded
○ Silk shirts (not covered by the regulatory framework due to the lack of available data for silk) ○ Bras	○ Accessories that are not primarily textile: caps, hats, headbands, straps ○ Pet clothing ○ SKUs targeted only at a specific subset of consumers (maternity wear, adaptive clothing, plus sizes, etc.) ○ Sportswear, covered by the covered by the sporting and recreational goods EPR scheme ○ Leather goods, tote bags, and leather garments ○ Footwear (shoes and slippers)

Table 35: Products included when calculating range breadth

Example: website C sells brand A (2,000 SKUs), brand B (3,000 SKUs), and brand C (4,000 SKUs). Brand A and Brand B also operate their own websites. Brand A offers 2,500 SKUs on A.fr, while Brand B offers 3,500 SKUs on B.fr. The range breadths are therefore:

- Brand A: 2,500
- Brand B: 3,500
- Brand C: 4,000

	Brand A	Brand B	Brand C	Total for site
Site A.fr	2,500 SKUs			2,500 SKUs
Site B.fr		3,500 SKUs		3,500 SKUs
Site C.fr	2,000 SKUs	3,000 SKUs	4,000 SKUs	9,000 SKUs
Range breadth	2,500 SKUs	3,500 SKUs	4,000 SKUs	

Table 36: Product range breadth example

The term "SKU" or "stock keeping unit", is generally understood to mean a sequence of letters or numbers displayed on the product page, corresponding to a particular product in a particular colour.

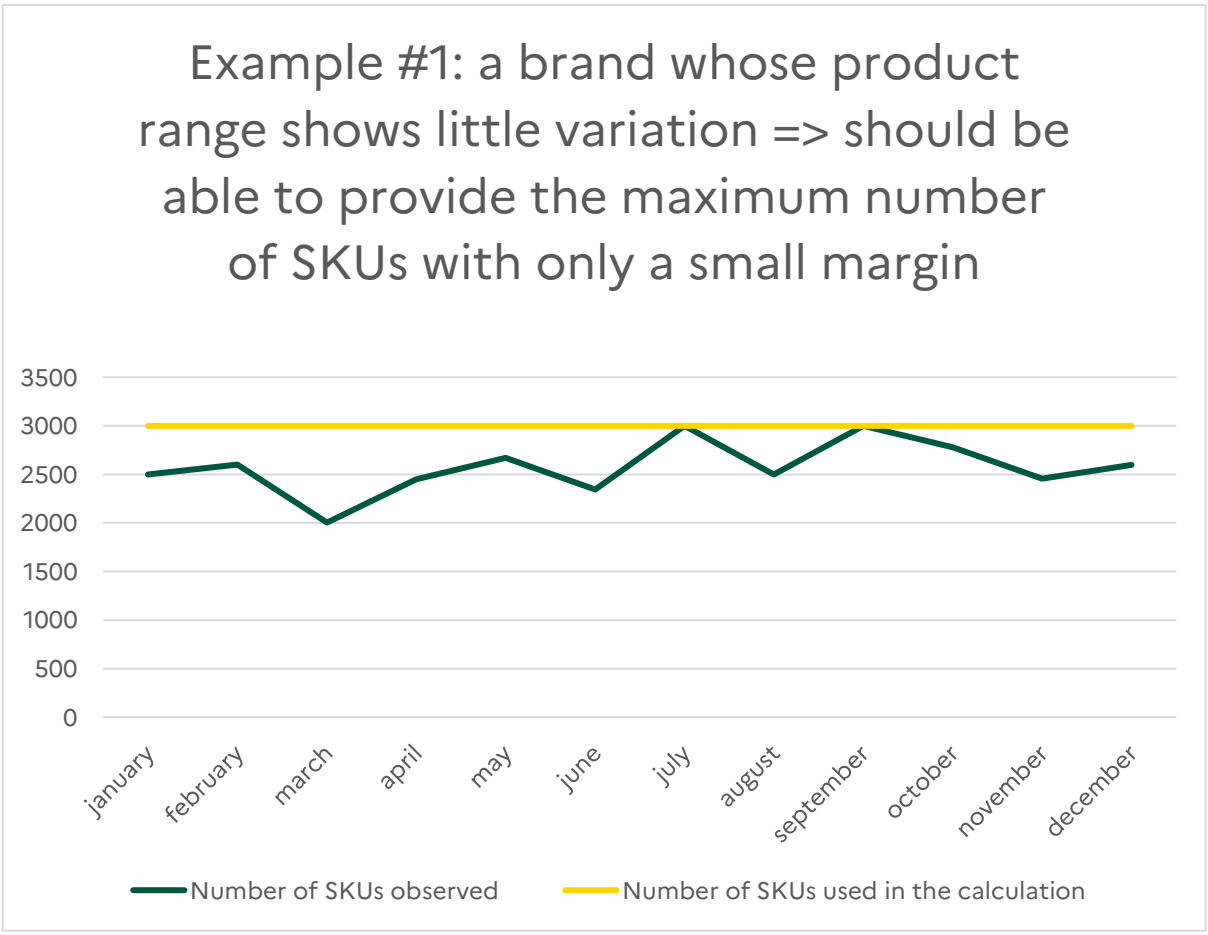
One SKU may be offered in several sizes. In this case, only one SKU is counted for all of the sizes available. Some SKUs may be assigned to specific sizes. This is true of plus-size garments, for example. On the illustration below, each line represents one SKU, regardless of the range of sizes covered.

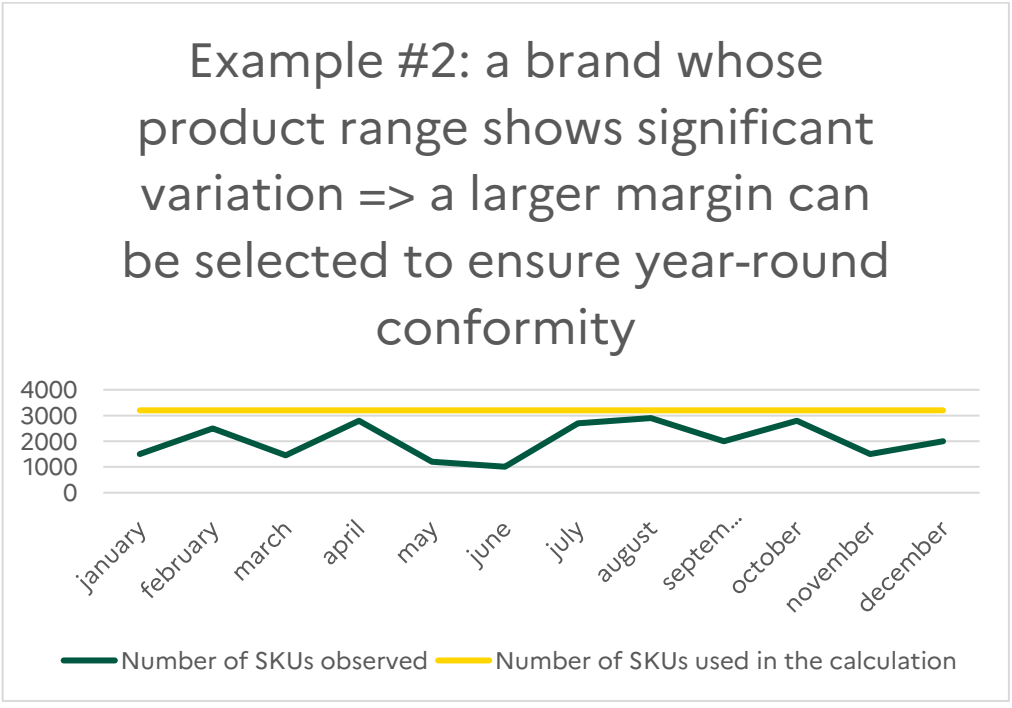
	XS to XL	**XXL to XXXXL**	**Included in range breadth?**
SKU #1	Yes	Yes	1 SKU
SKU #2	Yes	No	1 SKU
SKU #3	No	Yes	No (unless the brand's target market is essentially plus-size consumers)

Table 37: Inclusion of size SKUs in product range breadth

Only SKUs corresponding to apparel textiles should be counted. Items such as shoes or bags are excluded. SKUs for apparel that may not be fully covered by the regulatory framework (e.g. a cashmere sweater) should still be included (see Table 35 above).

The number of SKUs to report should be the maximum number offered on any single day over the whole calendar year. This ensures that, in the event of an audit on any given day, the number of SKUs actually sold will not exceed the reported value used to calculate the "product range breadth" index. Brands are not expected to declare the exact number of SKUs, which is only known at year-end. Instead, they should provide an estimated maximum and commit not to exceed that number at any one time. If a brand is unable to predict the number of SKUs it will offer during the year, it should apply a margin of error, chosen at its discretion. Two illustrative examples are provided below.

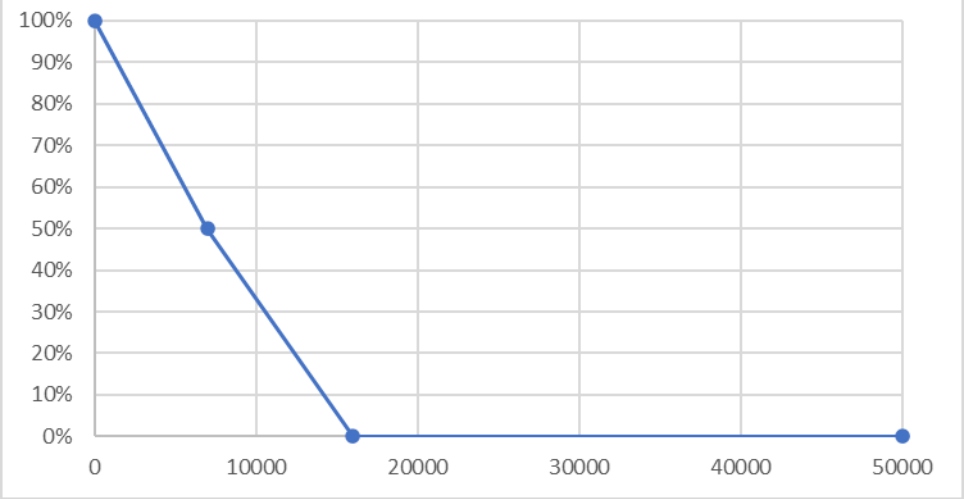

Example #1: a brand whose product range shows little variation => should be able to provide the maximum number of SKUs with only a small margin
3500
3000
2500
2000
1500
1000
500
0
january
february
march
april
may
june
july
august
september
october
november
december
Number of SKUs observed
Number of SKUs used in the calculation


Example #2: a brand whose product range shows significant variation => a larger margin can be selected to ensure year-round conformity
4000
3000
2000
1000
0
january
february
march
april
may
june
july
august
septem...
october
november
december
Number of SKUs observed
Number of SKUs used in the calculation

Calculation formula

The "product range breadth" index takes the following values:

- 100% where the number of SKUs per segment is less than 1,000
- 50% where the number of SKUs per segment is 7,000
- 0% where the number of SKUs per segment exceeds 16,000
- Between these points, the index changes linearly (see diagram below).



1 - Product range breadth index

(B) Incentive to repair

Incentive to repair (1/ 2)

Definition

The first component of the "incentive to repair" index is based on the ratio between the average repair cost and a reference sale price. This parameter is specific to each product.

Additional information

The sale price used is the one listed on the brand's primary sales channel, as defined in the section on the "product range breadth" index. The sale price includes VAT but excludes promotions and discounts.

The average repair cost for each product category is shown in **Erreur ! Source du renvoi introuvable.**38. These values are based on the ADEME study "Fonds réemploi-réutilisation et réparation de la filière TLC".

Product category	Average repair cost
Shirts	€10
T-shirts	€10
Sweaters	€15
Jackets	€31
Trousers	€14

Skirts	€19
Socks	€9
Underwear	€9
Accessories	€9

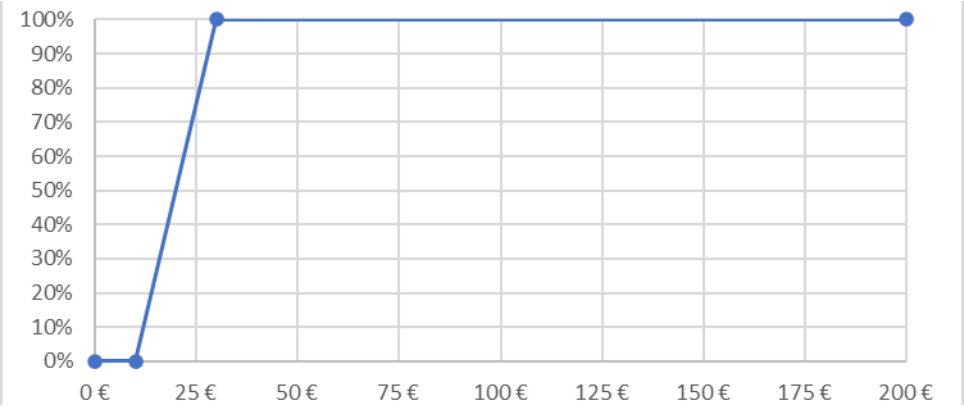
Table 38: Average repair cost for each product category

Calculation formula

The first component of the "incentive to repair" index is defined as follows:

- 100% if the repair cost is less than 33% of the reference new price
- 0% if the repair cost exceeds 100% of the reference new price
- Between these points, the index varies on a linear basis.

Example for a T-shirt, with an average repair cost of €10:



2 - Incentive to repair index

Incentive to repair (2/2)

Definition

This criterion is not applied to SKUs of new or remanufactured products from brands classified as SMEs or microenterprises.

A brand is considered to meet the "repair service" criterion if it offers a repair service (at least for its own products) that is certified by an eco-organisation under the extended producer responsibility (EPR) scheme for apparel, household linen and footwear.

Additional information

In addition to the ratio of repair cost to new price, the existence of a repair service increases the likelihood that a garment will actually be repaired.

Calculation formula

An SME is defined as a company with fewer than 250 employees and either an annual turnover not exceeding €50 million, or a total balance sheet not exceeding €43 million (this is the legal definition under Decree No. 2008-1353 of 18 December 2008).

For garments sold by brands that are not SMEs or microenterprises, the overall "incentive to repair" index is established as follows:

- 66% from part 1/2 above, i.e. the index based on the ratio of repair cost to new price;
- 33% from part 2/2, i.e. the availability of a repair or warranty service.

For garments sold by brands that are SMEs or microenterprises, the overall "incentive to repair" index is established as follows:

- 100% from part 1/2 above, i.e. the index based on the ratio of repair cost to new price;

Part 2/2 takes the following values:

- 0% if the brand does not offer a repair or warranty service that meets the minimum requirements
- 100% if the brand provides at least one in-house repair service certified by the producer responsibility organisation overseeing the EPR scheme for apparel, household linen and footwear.

The resulting formula, for a garment sold by a large company, looks like this:

$$Incentiverepair = 0.66 \times I_{\frac{1}{2}} + 0.33 \times I_{\frac{2}{2}}$$

08 Application to environmental labelling

I. Parameters

The environmental footprint methodology can be applied using a wide range of parameters, including garment mass, product category, materials, provenance, fabric weight, reference price, washing, and air transport, among others.

From a regulatory perspective, two types of parameters are distinguished:

- Required parameters: needed to calculate the environmental footprint
- Optional parameters: can be specified in the calculation but for which a default value is suggested

Parameter	Status	Comment
Product category	Required	
Mass of finished product	Required	
Remanufactured status of finished product	Optional	Default value: not remanufactured
Number of SKUs in segment - Durability	Optional	Default value: 100,000 SKUs
Reference price - Durability	Optional	Default value indicated for each product category (see Appendix 2, field: "Default price").
Company and repair service - Durability	Optional	Default value: "Large company without repair service".
Nature and percentage of raw materials	Required	Materials that account for at least 2% of the total product mass and 5% of the total impact must be reported.
Geographic provenance of raw materials	Optional	Default value depending on each material (see Appendix 3).
Geographic provenance of spinning	Optional	Default value for "Unknown Country".
Geographic provenance of weaving/knitting	Required	
Geographic provenance of finishing	Required	
Type of printing and percentage of surface printed - Finishing	Optional	Select for printed garments
Geographic provenance of assembly	Required	
Application of a distressing process	Optional	Select this for distressed products.
Proportion of transport by air	Optional	The default is based on the provenance of assembly and the durability

		coefficient.
List of accessories	Optional	A default value is assigned to the product category chosen.

Table 39: Status of parameters used in the calculation

II. Margin of error

When calculating the environmental footprint, a tool that applies this methodology and draws data from the "Base Empreinte" database may be used (e.g. Ecobalyse). Using a calculation tool may produce a small variation in the resulting value, typically around one percent. This is mainly due to differences in rounding practices. When recalculating the environmental footprint displayed on a product as part of a compliance check or audit, these variations are generally acceptable, provided they do not reflect systematic or intentional bias. If such bias is present, the person responsible for the calculation could potentially be held accountable. In all cases, these variations are not accepted as a permissible margin under applicable regulations.

III. Updates

This guidance note will be updated as modelling work progresses, while keeping the framework referenced in the Order of 6 September 2025 setting out the procedure for calculating and reporting the environmental footprint of clothing textiles.

Version	Date	Remarks
V1.0	1 October 2025	

MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE,
DE LA BIODIVERSITÉ,
DE LA FORÊT, DE LA MER
ET DE LA PÊCHE

Liberté
Égalité
Fraternité

09 Appendices

Appendix 1: Country- and region-specific values

Name	Electricity mix	Heat	Water pollution rate
Unknown Country (default)	Medium voltage electricity, India	Heat mix (World)	37
Region - Western Europe	Medium voltage electricity, Europe	Heat mix (Europe)	5
Region - Western Europe	Medium voltage electricity, Czechia	Heat mix (Europe)	5
Region - Asia	Medium voltage electricity, Asia	Heat mix (World)	37
Region - Africa	Medium voltage electricity, Africa	Heat mix (World)	37
Region - Middle East	Medium voltage electricity, Middle East	Heat mix (World)	19
Region - Latin America	Medium voltage electricity, Latin America	Heat mix (World)	19
Region - North America	Medium voltage electricity, North America	Heat mix (World)	37
Region - Oceania	Medium voltage electricity, Australia	Heat mix (World)	37
Myanmar	Medium voltage electricity, Myanmar	Heat mix (World)	37
Bangladesh	Medium voltage electricity, Bangladesh	Heat mix (World)	37
China	Medium voltage electricity, China	Heat mix (World)	19
France	Medium voltage electricity, France	Heat mix (Europe)	5
India	Medium voltage electricity, India	Heat mix (World)	37
Cambodia	Medium voltage electricity, Cambodia	Heat mix (World)	19
Morocco	Medium voltage electricity, Morocco	Heat mix (World)	19
Pakistan	Medium voltage electricity, Pakistan	Heat mix (World)	37
Tunisia	Medium voltage electricity, Tunisia	Heat mix (World)	19
Türkiye	Medium voltage electricity, Türkiye	Heat mix (World)	19
Vietnam	Medium voltage electricity, Vietnam	Heat mix (World)	19

Appendix 2: Parameters for each product category

Product(s) concerned	Default accessories	Yarn count	Fabric weight	Yarn density	Volume	Fabric	Picks/metre	Deadstock	Assembly (complexity)	Assembly (# minutes)	Assembly (loss rate)	Number of wear days	Wears before washing	Care cycles	Ironing	Use process (excl. ironing)	Electric drying	Ironing (proportion)	Ironing (time)	Default price	Repair cost
Trunks (woven)	2 plastic buttons	45	180	37.5	0.002	Woven	4860	15	Low	15	15	60	1	60	0	Use: Impact excl. ironing (Sweater)	30	0	0	4	9
Socks		35	250	40.5	0.002	Fully-fashioned / seamless knit	3307	15	Very low	5	2	50	2	25	0	Use: Impact excl. ironing (Sweater)	30	0	0	4	9
Shirt	11 plastic buttons	40	200	37.0	0.006	Woven	4426	15	Low	15	20	40	2	20	0.05	Use: Impact excl. ironing (Shirt-blouse)	12	70	0.043	15	10
Jeans	1 metallic button, 1 short zip	40	250	46.3	0.004	Woven	4508	15	Medium	30	22	70	3	23	0.07	Use: Impact excl. ironing (Jeans)	30	63	0.072	20	14
Skirt / Dress	1 short zip, 1 plastic button	40	200	37.0	0.007	Woven	4426	15	Low	15	20	70	3	23	0.02	Use: Impact excl. ironing (Skirt)	12	18	0.075	15	19
Swimsuit	1 plastic button	40	220	40.7	0.004	Standard knit	4339	15	Low	15	15	30	1	30	0	Use: Impact excl. ironing (Sweater)	30	0	0	15	9
Coat / Jacket	5 plastic buttons, 1 long zip	30	450	62.5	0.015	Woven	2708	15	High	60	20	100	20	5	0.01	Use: Impact excl. ironing (Coat)	25	5	0.067	40	31
Trousers / Shorts	1 metallic button, 1 short zip	40	250	46.3	0.004	Woven	4389	15	Medium	30	20	70	3	23	0.07	Use: Impact excl. ironing (Trousers)	30	63	0.072	20	14
Sweater	5 plastic buttons	35	250	40.5	0.0102	Standard knit	3970	15	Low	15	20	85	5	17	0	Use: Impact excl. ironing (Sweater)	30	0	0	20	15
Boxers / Briefs (knit)		45	180	37.5	0.002	Standard knit	4902	15	Low	15	15	60	1	60	0	Use: Impact excl. ironing (Sweater)	30	0	0	4	9
T-shirt / Polo shirt	3 plastic buttons	40	200	37.0	0.0018	Standard knit	4302	15	Low	15	15	45	1	45	0.03	Use: Impact excl. ironing (T-shirt)	30	40	0.043	10	10

Appendix 3: Parameters for each material type

Name	Process	Source	Provenance	Recycled?	Microfibre impact	Yarn manufacturing process	Recycling process	Geographic provenance	CFF: Allocation coefficient	CFF: Quality ratio
Elastane (Lycra)	Elastane (Lycra)	Custom	Synthetic material	no	-820	Filament spinning	N/A	Asia-Pacific	0	0
Acrylic	Production of plexiglass (Polymethyl methacrylate)	Ecoinvent 3.9. 1	Synthetic material	no	-820	Filament spinning	N/A	Asia-Pacific	0	0
Jute	Production of jute, retting	Ecoinvent 3.9. 1	Natural (plant-based) material	no	-250	Spinning	N/A	Asia-Pacific	0	0
Polypropylene	Production of polypropylene, pellets	Ecoinvent 3.9. 1	Synthetic material	no	-820	Filament spinning	N/A	Europe	0	0
Polyester	Production of PET, pellets, amorphous	Ecoinvent 3.9. 1	Synthetic material	no	-820	Filament spinning	Production of recycled PET, pellets, amorphous	Asia-Pacific	0	0
Recycled polyester	Production of recycled PET, pellets, amorphous	Ecoinvent 3.9. 1	Synthetic material	yes	-820	Filament spinning	N/A	Asia-Pacific	0.5	1
Nylon	Production of nylon 66	Ecoinvent 3.9. 1	Synthetic material	no	-820	Filament spinning	N/A	Europe	0	0
Flax (linen)	Production of flax fibres, retting	Ecoinvent 3.9. 1	Natural (plant-based) material	no	-250	Spinning	N/A	Europe	0	0
Default wool	Default wool	Woolmark	Natural (animal-based) material	no	-390	Spinning	N/A	Asia-Pacific	0	0
New wool	New wool	Custom	Natural (animal-based) material	no	-390	Spinning	N/A	Asia-Pacific	0	0
Cotton	Production of cotton fibres	Ecoinvent 3.9. 1	Natural (plant-based) material	no	-250	Spinning	Production of recycled cotton (manufacturing waste)	Asia-Pacific	0	0
Organic cotton	Production of organic cotton fibres	Ecoinvent 3.9. 1	Natural (plant-based) material	no	-250	Spinning	N/A	Asia-Pacific	0	0
Hemp	Production of hemp	Ecoinvent 3.9. 1	Natural (plant-based) material	no	-250	Spinning	N/A	Asia-Pacific	0	0
Viscose	Viscose fibre	Ecoinvent 3.9. 1	Artificial material of organic origin	no	-330	Spinning	N/A	Asia-Pacific	0	0
Recycled cotton (post-consumer waste)	Production of recycled cotton (post-consumer waste)	Custom	Natural (plant-based) material	yes	-250	Spinning	N/A	France	0.8	0.5
Recycled cotton (manufacturing waste)	Production of recycled cotton (manufacturing waste)	Custom	Natural (plant-based) material	yes	-250	Spinning	N/A	Spain & France	0.8	0.5

Appendix 4: Parameters for accessories

Name	Items
Metallic button	0.003 kg of brass
Plastic button	0.001 kg of PET production, pellets, amorphous
Short zip	0.01 kg of brass
Long zip	0.05 kg of brass

Appendix 5: Processes

Name	Source	Category	Unit	Electricity	Heat	Losses	Density
Steel (low alloy)	Ecoinvent 3.9.1	Material, Type of material: metal	kg	0	0	0	0
Chemical treatments	Custom	Transformation	kg	0.6	13.5	0	0
Bleaching	Custom	Transformation, Type of material: organic_fibers	kg	0.2	5.4	0	0
Scouring	Custom	Transformation, Type of material: organic_fibers	kg	0.3	13.5	0	0
Chemical distressing, impact-weighted process, ineffective treatment of wastewater	Base Impacts 2.01	Transformation	kg	1.8138888888888889	37.81	0	0
Desizing	Custom	Transformation	kg	0.1	3.2	0	0
Elastane (Lycra)	Custom	Material, textile	kg	0	0	0	0
Low voltage electricity, France	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, France	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Viscose fibre	Ecoinvent 3.9.1	Material, textile	kg	0	0	0	0
Filament spinning (40 Nm)	Custom	Transformation, Material type: synthetic_fibers	kg	1.36	0	3	0
Conventional spinning (40 Nm)	Custom	Transformation, Type of material: organic_fibers	kg	3.64	0	12	0
Non-conventional spinning (40 Nm)	Custom	Transformation, Type of material: organic_fibers	kg	1.82	0	12	0
End-of-life excl. vehicle (truck transport,	Custom	End-of-life	kg	0	0	0	0

incineration, landfill)							
Printing (pigment)	Custom	Transformation	m2	0	0	0	0
Printing (reactive)	Custom	Transformation	m2	0	0	0	0
Reactive printing, representative process, medium treatment of wastewater	Base Impacts 2.01	Transformation	m2	1.45	8.72	0	0
Pigment printing, representative process, medium treatment of wastewater	Base Impacts 2.01	Transformation	m2	1.2666666666666666	7.25	0	0
New wool	Custom	Material, textile	kg	0	0	0	0
Default wool	Woolmark	Material, textile	kg	0	0	0	0
Brass	Ecoinvent 3.9.1	Material, Type of material: metal	kg	0	0	0	0
Washing (synthetic fibres)	Custom	Transformation, Material type: synthetic_fibers	kg	0.2	10.8	0	0
Mercerisation	Custom	Transformation	kg	0.1	2.7	0	0
Heat mix (Europe)	Custom	Energy	MJ	0	0	0	0
Heat mix (World)	Custom	Energy	MJ	0	0	0	0
Production of recycled PET, pellets, amorphous	Ecoinvent 3.9.1	Material, textile	kg	0	0	0	0
Production of PET, pellets, amorphous	Ecoinvent 3.9.1	Material, Textile, Material type: synthetic_fibers	kg	0	0	0	0
Production of hemp	Ecoinvent 3.9.1	Material, textile	kg	0	0	0	0
Production of recycled cotton (manufacturing waste)	Custom	Material, Textile, Material type: organic_fibers	kg	0	0	0	0
Production of recycled cotton (post-consumer waste)	Custom	Material, Textile, Material type: organic_fibers	kg	0	0	0	0
Production of cotton fibres	Ecoinvent 3.9.1	Material, Textile, Material type: organic_fibers	kg	0	0	0	0
Production of organic cotton fibres	Ecoinvent 3.9.1	Material, Textile, Material type: organic_fibers	kg	0	0	0	0
Production of flax fibres, retting	Ecoinvent 3.9.1	Material, textile	kg	0	0	0	0
Production of jute, retting	Ecoinvent 3.9.1	Material, textile	kg	0	0	0	0
Production of nylon 66	Ecoinvent 3.9.1	Material, textile	kg	0	0	0	0
Production of plexiglass (Polymethyl methacrylate)	Ecoinvent 3.9.1	Material, textile	kg	0	0	0	0
Production of polypropylene, pellets	Ecoinvent 3.9.1	Material, textile	kg	0	0	0	0
Continuous dyeing	Ecobalyse	Transformation	kg	0.8	16.2	0	0

Batch dyeing	Ecobalyse	Transformation	kg	1.2	32.4	0	0
Dyeing, cellulosic fibres	Custom	Transformation	kg	0	0	0	0
Dyeing, synthetic fibres	Custom	Transformation	kg	0	0	0	0
Standard dyeing	Ecobalyse	Transformation	kg	1	24.3	0	0
Weaving (40Nm and 250 GSM)	Custom	Transformation, Material type: synthetic_fibers, Material type: organic_fibers	kg	5.82	0	6.25	0
Weaving (apparel)	Custom	Transformation	kg	0	0	6.253	0
Unspecified truck transport France	Base Impacts 2.01	Transport	t·km	0	0	0	0
Transport by vehicle to pickup point precalculated for end-of-life	Base Impacts 2.01	Transport	Item(s)	0	0	0	0
Circular knitting	Custom	Transformation	kg	1.1808361111111112	0	3.4000000000000004	0
Fully-fashioned knitting	Custom	Transformation	kg	1.684563888888889	0	0.5	0
Standard knitting (mix of circular and flat)	Custom	Transformation	kg	2.4	0	5.446	0
Flat knitting	Custom	Transformation	kg	1.165	0	4.003	0
Seamless knitting	Custom	Transformation	kg	3.6697777777777776	0	0.5	0
Use: Impact excl. ironing (Shirt-blouse)	Custom	Use	kg	0.22486666666666666	0	0	0
Use: Impact excl. ironing (Jeans)	Custom	Use	kg	0.2851666666666667	0	0	0
Use: Impact excl. ironing (Skirt)	Custom	Use	kg	0.22486666666666666	0	0	0
Use: Impact excl. ironing (Coat)	Custom	Use	kg	0.2684166666666667	0	0	0
Use: Impact excl. ironing (Trousers)	Custom	Use	kg	0.2851666666666667	0	0	0
Use: Impact excl. ironing (Sweater)	Custom	Use	kg	0.2851666666666667	0	0	0
Use: Impact excl. ironing (Dress)	Custom	Use	kg	0.22486666666666666	0	0	0
Use: Impact excl. ironing (T-shirt)	Custom	Use	kg	0.2851666666666667	0	0	0
Long-haul air transport	Ecoinvent 3.9.1	Transport	t·km	0	0	0	0
rail transport	Ecoinvent 3.9.1	Transport	t·km	0	0	0	0
sea transport	Ecoinvent 3.9.1	Transport	t·km	0	0	0	0
road transport	Ecoinvent 3.9.1	Transport	t·km	0	0	0	0
Medium voltage electricity, Africa	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0

Medium voltage electricity, Albania	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, North America	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Latin America	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Asia	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Australia	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Bangladesh	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Brazil	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Cambodia	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, China	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Spain	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Europe	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, India	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, India	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Kenya	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Morocco	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Middle East	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Myanmar	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, New Zealand	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Pakistan	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Peru	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Czechia	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Sri Lanka	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Tunisia	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Türkiye	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, USA	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0
Medium voltage electricity, Vietnam	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0

Medium voltage electricity, Ethiopia	Ecoinvent 3.9.1	Energy	kWh	0	0	0	0

Appendix 6: Distances between countries

Countries are identified by their ISO 3166-1 alpha-2 code.
Figures are expressed in kilometres for each transport route:

- "road" (truck)
- "sea" '(boat)
- "air" (plane)

Example:

The distance between Germany and Spain is:

- 1,759 km by road (truck)
- 2,363 km by sea (boat)
- 1,585 km by air (plane)

Appendix 6.1: Distances between countries by air

	AL	AU	BD	BE	BR	CH	CN	CZ	DE	EG	ES	ET	FR	GB	GR	HU	IN	IT	KE	KH	LK	MA	MM	NL	NZ	PE	PK	PL	PT	RO	TN	TR	TW	US	VN
AL		13795	6663	1647	9502	1169	7191	1034	1397	1804	2031	4067	1554	2183	280	667	5830	628	4787	8658	7084	2441	7459	1673	17843	11236	4631	1223	2378	687	1243	1298	9196	9174	8531
AU	13795		7294	14998	15822	14773	7469	14200	14648	12522	15822	10908	15244	15287	13592	13861	7969	14404	10562	5361	6747	15943	6603	14840	4049	14861	9206	13879	16170	13468	14660	12498	5735	15230	5581
BD	6663	7294		7704	16009	7508	1894	6914	7356	5984	8658	5804	7982	8011	6520	6604	1413	7221	6149	1995	2113	9077	849	7547	11246	17872	2090	6586	8996	6224	7771	5397	3154	13103	1892
BE	1647	14998	7704		8804	517	7776	827	352	3440	1355	5686	557	539	1927	1245	7123	1114	6383	9655	8495	2219	8414	221	18671	10170	5838	1118	1569	1638	1913	2750	9731	7527	9462
BR	9502	15822	16009	8804		8857	16580	9489	9122	10025	7627	10497	8401	8658	9602	9702	14772	9012	10366	17829	15184	7061	16857	9002	12462	2302	13927	9871	7318	10041	8321	10704	18453	6877	17869
CH	1169	14773	7508	517	8857		7738	634	451	2939	1241	5177	474	1051	1443	912	6828	600	5868	9485	8155	2000	8253	633	18714	10364	5569	1030	1539	1307	1446	2359	9724	8012	9315
CN	7191	7469	1894	7776	16580	7738		7105	7460	7052	8976	7413	8189	7930	7132	6920	3210	7630	7866	2437	3956	9604	1594	7578	10977	17233	3318	6718	9276	6603	8417	6090	2006	11611	2107
CZ	1034	14200	6914	827	9489	634	7105		483	2814	1875	5080	1091	1290	1301	452	6298	796	5811	8881	7668	2604	7645	747	18081	10958	5017	404	2171	823	1829	1950	9090	8254	8703
DE	1397	14648	7356	352	9122	451	7460	483		3201	1585	5463	759	817	1677	918	6772	953	6177	9310	8149	2403	8070	280	18410	10518	5486	771	1839	1303	1888	2426	9427	7806	9121
EG	1804	12522	5984	3440	10025	2939	7052	2814	3201		3445	2266	3246	3978	1525	2387	4836	2346	3002	7896	5816	3424	6832	3477	16385	12094	3911	2900	3769	2154	2155	1410	8955	10943	7860
ES	2031	15822	8658	1355	7627	1241	8976	1875	1585	3445		5469	826	1564	2231	2081	7860	1439	6054	10649	9090	892	9430	1577	19814	9226	6654	2271	347	2442	1333	3329	10965	7651	10499
ET	4067	10908	5804	5686	10497	5177	7413	5080	5463	2266	5469		5437	6225	3789	4649	4404	4577	774	7337	4745	5174	6596	5736	14348	12787	4130	5148	5751	4392	4138	3447	8954	13111	7430
FR	1554	15244	7982	557	8401	474	8189	1091	759	3246	826	5437		935	1812	1383	7291	931	6097	9959	8604	1667	8725	772	19162	9891	6038	1471	1090	1775	1459	2799	10166	7700	9787
GB	2183	15287	8011	539	8658	1051	7930	1290	817	3978	1564	6225	935		2462	1734	7519	1651	6919	9926	8924	2456	8684	543	18529	9876	6219	1487	1674	2113	2384	3240	9841	6997	9712
GR	280	13592	6520	1927	9602	1443	7132	1301	1677	1525	2231	3789	1812	2462		903	5638	881	4512	8513	6863	2559	7328	1953	17632	11394	4467	1453	2578	816	1288	1125	9133	9452	8399
HU	667	13861	6604	1245	9702	912	6920	452	918	2387	2081	4649	1383	1734	903		5920	731	5388	8587	7264	2699	7359	1192	17842	11270	4657	556	2406	400	1715	1508	8920	8706	8425
IN	5830	7969	1413	7123	14772	6828	3210	6298	6772	4836	7860	4404	7291	7519	5638	5920		6436	4736	3083	1502	8132	2193	7004	12016	16929	1313	6034	8207	5522	6806	4531	4551	13554	3099
IT	628	14404	7221	1114	9012	600	7630	796	953	2346	1439	4577	931	1651	881	731	6436		5269	9214	7708	1977	7999	1198	18450	10665	5217	1152	1782	1030	1036	1909	9633	8599	9070
KE	4787	10562	6149	6383	10366	5868	7866	5811	6177	3002	6054	774	6097	6919	4512	5388	4736	5269		7500	4818	5666	6894	6446	13760	12668	4664	5898	6313	5145	4740	4219	9257	13701	7635
KH	8658	5361	1995	9655	17829	9485	2437	8881	9310	7896	10649	7337	9959	9926	8513	8587	3083	9214	7500		2712	11068	1242	9487	9258	19657	4062	8539	10986	8211	9757	7389	2050	13914	349
LK	7084	6747	2113	8495	15184	8155	3956	7668	8149	5816	9090	4745	8604	8924	6863	7264	1502	7708	4818	2712		9229	2467	8396	10769	17483	2794	7437	9436	6865	7922	5805	4646	15018	2900
MA	2441	15943	9077	2219	7061	2000	9604	2604	2403	3424	892	5174	1667	2456	2559	2699	8132	1977	5666	11068	9229		9886	2438	19001	8852	7012	3007	875	3001	1326	3681	11609	8064	10957
MM	7459	6603	849	8414	16857	8253	1594	7645	8070	6832	9430	6596	8725	8684	7328	7359	2193	7999	6894	1242	2467	9886		8245	10483	18535	2931	7299	9763	6988	8590	6208	2366	13181	1072
NL	1673	14840	7547	221	9002	633	7578	747	280	3477	1577	5736	772	543	1953	1192	7004	1198	6446	9487	8396	2438	8245		18451	10330	5711	973	1789	1570	2072	2697	9526	7526	9288
NZ	17843	4049	11246	18671	12462	18714	10977	18081	18410	16385	19814	14348	19162	18529	17632	17842	12016	18450	13760	9258	10769	19001	10483	18451		10917	13234	17693	19775	17469	18485	16547	8996	12569	9416
PE	11236	14861	17872	10170	2302	10364	17233	10958	10518	12094	9226	12787	9891	9876	11394	11270	16929	10665	12668	19657	17483	8852	18535	10330	10917		15861	11288	8885	11653	10173	12519	17677	5746	19308
PK	4631	9206	2090	5838	13927	5569	3318	5017	5486	3911	6654	4130	6038	6219	4467	4657	1313	5217	4664	4062	2794	7012	2931	5711	13234	15861		4738	6999	4263	5696	3342	5083	12357	3981
PL	1223	13879	6586	1118	9871	1030	6718	404	771	2900	2271	5148	1471	1487	1453	556	6034	1152	5898	8539	7437	3007	7299	973	17693	11288	4738		2559	761	2186	1853	8698	8321	8351
PT	2378	16170	8996	1569	7318	1539	9276	2171	1839	3769	347	5751	1090	1674	2578	2406	8207	1782	6313	10986	9436	875	9763	1789	19775	8885	6999	2559		2775	1633	3676	11256	7388	10830
RO	687	13468	6224	1638	10041	1307	6603	823	1303	2154	2442	4392	1775	2113	816	400	5522	1030	5145	8211	6865	3001	6988	1570	17469	11653	4263	761	2775		1902	1130	8608	9053	8057
TN	1243	14660	7771	1913	8321	1446	8417	1829	1888	2155	1333	4138	1459	2384	1288	1715	6806	1036	4740	9757	7922	1326	8590	2072	18485	10173	5696	2186	1633	1902		2386	10420	8976	9658
TR	1298	12498	5397	2750	10704	2359	6090	1950	2426	1410	3329	3447	2799	3240	1125	1508	4531	1909	4219	7389	5805	3681	6208	2697	16547	12519	3342	1853	3676	1130	2386		8076	10173	7278
TW	9196	5735	3154	9731	18453	9724	2006	9090	9427	8955	10965	8954	10166	9841	9133	8920	4551	9633	9257	2050	4646	11609	2366	9526	8996	17677	5083	8698	11256	8608	10420	8076		12130	1776
US	9174	15230	13103	7527	6877	8012	11611	8254	7806	10943	7651	13111	7700	6997	9452	8706	13554	8599	13701	13914	15018	8064	13181	7526	12569	5746	12357	8321	7388	9053	8976	10173	12130		13565
VN	8531	5581	1892	9462	17869	9315	2107	8703	9121	7860	10499	7430	9787	9712	8399	8425	3099	9070	7635	349	2900	10957	1072	9288	9416	19308	3981	8351	10830	8057	9658	7278	1776	13565	

Appendix 6.2: Distances between countries by road

	AL	AU	BD	BE	BR	CH	CN	CZ	DE	EG	ES	ET	FR	GB	GR	HU	IN	IT	KE	KH	LK	MA	MM	NL	NZ	PE	PK	PL	PT	RO	TN	TR	TW	US	VN
AL			7722	1834		1462	23104	1208	1542	1806	2656		1867	2516	454	806	19036	727		28956	7083		8956	1833			5206	1449	2976	827		1440	9180		28284
AU																																			
BD	7722			24871		24084	2936	22476	23859	5974	27584		25449	25647	7611	21384	1503	22265		2706	2120		1197	24550			2596	21191	28617	7612		6187	3149		2595
BE	1834		24871			574	8582	892	407	3440	1425		634	631	2252	1287	23253	1220		31204	8493		27581	285			6727	1157	1653	1743		2970	9713		11504
BR																										3429									
CH	1462		24084	574			8598	772	478	2939	1440		538	1245	1893	1010	22263	672		30890	8153		27285	717			6338	1171	1657	1464		2581	9706		30136
CN	23104		2936	8582		8598		7931	8243	7039	9977		9005	9159	22976	7860	4758	8870		3100	3963		1983	8424			4492	7418	10173	7629		7258	2006		2644
CZ	1208		22476	892		772	7931		551	2816	2133		1206	1522	1488	511	20861	1024		29303	7668		25678	826			5936	445	2363	962		2176	9074		10866
DE	1542		23859	407		478	8243	551		3202	1759		858	1030	1967	991	22231	1127		30150	8148		26529	304			6322	833	1987	1448		2645	9410		11179
EG	1806		5974	3440		2939	7039	2816	3202		3441	2275	3245	3977	1527	2390	4828	2346	3015	7886	5813	3418	6821	3477			3903	2903	3763	2158	2152	1413	8940		7849
ES	2656		27584	1425		1440	9977	2133	1759	3441			912	1923	3085	2317	25614	1672		34608	9083		31035	1657			7520	2540	417	2756		3773	10945		33893
ET										2275									1025			17569									5406				
FR	1867		25449	634		538	9005	1206	858	3245	912			1152	2283	1534	23612	1030		32255	8599		28649	861			6728	1619	1150	1991		2971	10148		31498
GB	2516		25647	631		1245	9159	1522	1030	3977	1923		1152		2901	1923	15450	1837		20261	8921		17771	824			7299	1744	2146	2370		3601	9823		12050
GR	454		7611	2252		1893	22976	1488	1967	1527	3085		2283	2901		1013	18596	2008		28604	6862		8896	2237			5142	1670	3380	1061		1377	9116		27961
HU	806		21384	1287		1010	7860	511	991	2390	2317		1534	1923	1013		19629	1051		28482	7265		24876	1321			5482	690	2649	469		1725	8904		27749
IN	19036		1503	23253		22263	4758	20861	22231	4828	25614		23612	15450	18596	19629		20303		11851	1509		3109	23104			2263	19639	26702	18494		15041	4544		11470
IT	727		22265	1220		672	8870	1024	1127	2346	1672		1030	1837	2008	1051	20303			30814	7705		27229	1353			6283	1370	2012	1521		2527	9616		30110
KE										3015		1025										13755									6470				
KH	28956		2706	31204		30890	3100	29303	30150	7886	34608		32255	20261	28604	28482	11851	30814			2710		1909	12146			15555	11145	35536	27502		25323	2051		530
LK	7083		2120	8493		8153	3963	7668	8148	5813	9083		8599	8921	6862	7265	1509	7705		2710			2471	8394			2804	7439	9428	6867		5807	4644		2898
MA										3418		17569							13755												1910				
MM	8956		1197	27581		27285	1983	25678	26529	6821	31035		28649	17771	8896	24876	3109	27229		1909	2471			27032			3795	24130	31937	8880		7455	2362		1468
NL	1833		24550	285		717	8424	826	304	3477	1657		861	824	2237	1321	23104	1353		12146	8394		27032				6556	997	1880	1770		2936	9509		11359
NZ																																			
PE					3429																														
PK	5206		2596	6727		6338	4492	5936	6322	3903	7520		6728	7299	5142	5482	2263	6283		15555	2804		3795	6556				5579	7837	5131		3741	5075		14986
PL	1449		21191	1157		1171	7418	445	833	2903	2540		1619	1744	1670	690	19639	1370		11145	7439		24130	997			5579		2771	1068		2364	8682		10339
PT	2976		28617	1653		1657	10173	2363	1987	3763	417		1150	2146	3380	2649	26702	2012		35536	9428		31937	1880			7837	2771		3085		4079	11236		34821
RO	827		7612	1743		1464	7629	962	1448	2158	2756		1991	2370	1061	469	18494	1521		27502	6867		8880	1770			5131	1068	3085			1392	8593		26785
TN										2152		5406							6470			1910													
TR	1440		6187	2970		2581	7258	2176	2645	1413	3773		2971	3601	1377	1725	15041	2527		25323	5807		7455	2936			3741	2364	4079	1392			8062		24341
TW	9180		3149	9713		9706	2006	9074	9410	8940	10945		10148	9823	9116	8904	4544	9616		2051	4644		2362	9509			5075	8682	11236	8593		8062			1776
US																																			
VN	28284		2595	11504		30136	2644	10866	11179	7849	33893		31498	12050	27961	27749	11470	30110		530	2898		1468	11359			14986	10339	34821	26785		24341	1776		

Appendix 6.3: Distances between countries by sea

	AL	AU	BD	BE	BR	CH	CN	CZ	DE	EG	ES	ET	FR	GB	GR	HU	IN	IT	KE	KH	LK	MA	MM	NL	NZ	PE	PK	PL	PT	RO	TN	TR	TW	US	VN
AL		15203	10086	4931	9115	1753	17249	1058	5604	1954	4263	4175	4913	4777	1067	806	7642	550	7427	11995	8079	2746	10636	5089	20022	12940	7953	6662	3088	1668	1188	1617	14141	11289	12715
AU	15203		8753	19609	19187	16482	11574	16168	20194	13291	18853	11158	19503	19367	14711	15977	9770	15670	10608	6964	7678	17336	8885	19919	3897	15097	11173	21252	17678	15267	15591	14143	8363	25624	7676
BD	10086	8753		14433	19020	11509	9244	11088	15141	8208	13824	6105	14450	14313	9658	10924	4187	10617	7099	3990	2322	12282	1170	14626	12094	22667	5582	15855	12625	10214	10538	9114	6137	26331	4815
BE	4931	19609	14433		8236	4476	21532	5953	893	6237	1655	8503	674	1254	5396	5617	11944	5302	11951	16277	12410	2524	14919	378	24282	11475	12337	1967	2170	5997	4327	6091	18424	10088	17102
BR	9115	19187	19020	8236		8596	25166	10074	9006	10472	7695	12738	8315	8049	9642	9854	16189	9548	14094	20106	16831	6422	19506	8429	21910	6907	16457	10001	6759	10235	8573	10337	22010	7499	20931
CH	1753	16482	11509	4476	8596		18473	2634	5202	3229	3724	5515	4362	4325	2269	2590	7827	2237	8691	13190	9342	2203	11966	4785	20024	12410	9210	2101	2873	2886	1621	2445	15338	10768	14198
CN	17249	11574	9244	21532	25166	18473		18166	22240	15307	20899	13204	21549	21412	16808	18023	11274	17716	14016	5771	9168	19381	9348	21725	11949	19362	12627	23298	19724	17313	17637	16189	3214	27066	4704
CZ	1058	16168	11088	5953	10074	2634	18166		6680	2925	5124	5210	5769	5802	1517	1440	8601	694	8383	13074	9125	3729	11661	6262	19719	13816	8905	7377	4350	2484	2154	2690	15030	12246	13893
DE	5604	20194	15141	893	9006	5202	22240	6680		6944	2363	9211	1391	1954	6104	6325	12651	6009	12677	16985	13118	3232	15627	666	24989	12183	13063	1926	2878	6705	5034	6799	19132	10775	17810
EG	1954	13291	8208	6237	10472	3229	15307	2925	6944		5604	2277	6254	6117	1462	2727	5718	2421	5633	10052	6185	4086	8694	6429	18060	14235	6019	8002	4429	2017	2342	894	12199	13398	10877
ES	4263	18853	13824	1655	7695	3724	20899	5124	2363	5604		7870	1672	1597	4764	4984	11311	4669	11276	15644	11773	1891	14286	1848	23649	11052	11764	3421	1428	5364	3694	5458	17791	10045	16469
ET	4175	11158	6105	8503	12738	5515	13204	5210	9211	2277	7870		8520	8384	3728	4994	3649	4687	3501	7950	4081	6353	6592	8696	15958	16547	3903	10269	6695	4284	4608	3203	10097	15663	8775
FR	4913	19503	14450	674	8315	4362	21549	5769	1391	6254	1672	8520		1298	5414	5634	11961	5319	11768	16294	12427	2541	14936	876	24299	11541	12403	2456	2187	6014	4344	6108	18391	9031	17119
GB	4777	19367	14313	1254	8049	4325	21412	5802	1954	6117	1597	8384	1298		5277	5497	11824	5182	11800	16158	12291	2404	14800	1439	24162	10755	12186	2590	2051	5878	4207	5972	18305	9622	16983
GR	1067	14711	9658	5396	9642	2269	16808	1517	6104	1462	4764	3728	5414	5277		1841	7169	1534	7034	11502	7635	3246	10144	5589	19510	13440	7460	7162	3589	684	1592	1180	13649	12560	12327
HU	806	15977	10924	5617	9854	2590	18023	1440	6325	2727	4984	4994	5634	5497	1841		8434	787	8264	12768	8901	3467	11410	5810	20775	13661	8653	7383	3809	2441	1909	2534	14915	12780	13593
IN	7642	9770	4187	11944	16189	7827	11274	8601	12651	5718	11311	3649	11961	11824	7169	8434		8128	5186	6020	2146	9793	4625	12136	14067	19978	2181	13409	10287	7724	8049	6670	8167	19102	6845
IT	550	15670	10617	5302	9548	2237	17716	694	6009	2421	4669	4687	5319	5182	1534	787	8128		8012	12462	8595	3152	11104	5494	20469	13346	8398	7067	3632	2135	1594	2228	14609	12465	13286
KE	7427	10608	7099	11951	14094	8691	14016	8383	12677	5633	11276	3501	11768	11800	7034	8264	5186	8012		8841	4966	9726	7556	12260	14149	19703	5622	13374	10348	7637	7964	6539	10975	18244	9523
KH	11995	6964	3990	16277	20106	13190	5771	13074	16985	10052	15644	7950	16294	16158	11502	12768	6020	12462	8841		3913	14127	4093	16470	9625	19933	7489	18043	14470	12058	12382	10934	2698	23101	1333
LK	8079	7678	2322	12410	16831	9342	9168	9125	13118	6185	11773	4081	12427	12291	7635	8901	2146	8595	4966	3913		10260	2780	12603	11960	20454	3516	14176	10602	8191	8515	7107	6060	19570	4738
MA	2746	17336	12282	2524	6422	2203	19381	3729	3232	4086	1891	6353	2541	2404	3246	3467	9793	3152	9726	14127	10260		12769	2717	22131	10243	10112	4290	716	3847	2176	3941	16274	9509	14952
MM	10636	8885	1170	14919	19506	11966	9348	11661	15627	8694	14286	6592	14936	14800	10144	11410	4625	11104	7556	4093	2780	12769		15112	12179	22663	6039	16685	13111	10700	11024	9576	6240	26435	4918
NL	5089	19919	14626	378	8429	4785	21725	6262	666	6429	1848	8696	876	1439	5589	5810	12136	5494	12260	16470	12603	2717	15112		24474	11668	12646	1751	2363	6190	4520	6284	18617	8929	17295
NZ	20022	3897	12094	24282	21910	20024	11949	19719	24989	18060	23649	15958	24299	24162	19510	20775	14067	20469	14149	9625	11960	22131	12179	24474		10704	15659	26047	22474	20065	20389	18942	9133	15880	9484
PE	12940	15097	22667	11475	6907	12410	19362	13816	12183	14235	11052	16547	11541	10755	13440	13661	19978	13346	19703	19933	20454	10243	22663	11668	10704		20542	13290	10365	14041	12370	14093	17843	6145	19411
PK	7953	11173	5582	12337	16457	9210	12627	8905	13063	6019	11764	3903	12403	12186	7460	8653	2181	8398	5622	7489	3516	10112	6039	12646	15659	20542		8175	9374	8220	8350	6925	9491	18630	8308
PL	6662	21252	15855	1967	10001	2101	23298	7377	1926	8002	3421	10269	2456	2590	7162	7383	13409	7067	13374	18043	14176	4290	16685	1751	26047	13290	8175		3936	7763	6093	7857	19839	11832	18868
PT	3088	17678	12625	2170	6759	2873	19724	4350	2878	4429	1428	6695	2187	2051	3589	3809	10287	3632	10348	14470	10602	716	13111	2363	22474	10365	9374	3936		4189	2519	4284	16718	9419	15294
RO	1668	15267	10214	5997	10235	2886	17313	2484	6705	2017	5364	4284	6014	5878	684	2441	7724	2135	7637	12058	8191	3847	10700	6190	20065	14041	8220	7763	4189		2192	1721	14205	13161	12883
TN	1188	15591	10538	4327	8573	1621	17637	2154	5034	2342	3694	4608	4344	4207	1592	1909	8049	1594	7964	12382	8515	2176	11024	4520	20389	12370	8350	6093	2519	2192		2276	14529	11491	13207
TR	1617	14143	9114	6091	10337	2445	16189	2690	6799	894	5458	3203	6108	5972	1180	2534	6670	2228	6539	10934	7107	3941	9576	6284	18942	14093	6925	7857	4284	1721	2276		13081	13255	11743
TW	14141	8363	6137	18424	22010	15338	3214	15030	19132	12199	17791	10097	18391	18305	13649	14915	8167	14609	10975	2698	6060	16274	6240	18617	9133	17843	9491	19839	16718	14205	14529	13081		19856	1732
US	11289	25624	26331	10088	7499	10768	27066	12246	10775	13398	10045	15663	9031	9622	12560	12780	19102	12465	18244	23101	19570	9509	26435	8929	15880	6145	18630	11832	9419	13161	11491	13255	19856		22368
VN	12715	7676	4815	17102	20931	14198	4704	13893	17810	10877	16469	8775	17119	16983	12327	13593	6845	13286	9523	1333	4738	14952	4918	17295	9484	19411	8308	18868	15294	12883	13207	11743	1732	22368	