# DRAFT

# PRODUCT ENVIRONMENTAL FOOTPRINT CATEGORY RULES

PEFCR draft

Office Chair

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Draft VERSION, rev1

*Il presente documento include indicazioni metodologiche per la conduzione di uno studio LCA secondo quanto previsto dalla metodologia PEF (Product Environmental Footprint) per la valutazione dell'impronta ambientale di prodotto così come definita nella Raccomandazione 2013/179/UE della Commissione e, ove possibile, dalle Product Environmental Footprint Category Rules Guidance, Version 6.3, May 2018.*

*ll documento, sviluppato nell'ambito del progetto LIFE EFFIGE, è riferito al solo mercato italiano ed è stato redatto in collaborazione con il partner FLA.*

*I suoi contenuti sono un contributo agli studi di settore, ma non sono vincolanti rispetto ad altre iniziative in corso o a venire.*

Life Effige
Environmental Footprint For Improving and Growing Eco-efficiency

## 1. Introduction

The present Product Environmental Footprint Category Rules (PEFCR) is developed within the Life EFFIGE Project, aimed to develop new tools for the implementation of PEF in small and medium-sized businesses, helping them to experiment innovative approaches and methods reduce their environmental footprint and making them more competitive on the current market.

The Product Environmental Footprint (PEF) Guide provides detailed and comprehensive technical guidance on how to conduct a PEF study. PEF studies may be used for a variety of purposes, including in-house management and participation in voluntary or mandatory programmes.

For all requirements not specified in this PEFCR the applicant shall refer to the documents this PEFCR is in conformance with (see chapter 2).

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

**Terminology: shall, should and may**

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

- The term “shall” is used to indicate what is required in order for a PEF study to be in conformance with this PEFCR.
- The term “should” is used to indicate a recommendation rather than a requirement. Any deviation from a “should” requirement has to be justified when developing the PEF study and made transparent.
- The term “may” is used to indicate an option that is permissible. Whenever options are available, the PEF study shall include adequate argumentation to justify 2. General information about the PEFCR

This PEFCR is valid for products in scope sold in Italy

The PEFCR is written in English.

This PEFCR has been prepared in conformance with the following documents:

- PEFCR "Guidance version 6.3*" excluding all that parts applicable only for products already covered by existing PEFCR. Deviations from the requirements of Guidance v.6.3 have been made based on older versions of the Guidance and expert judgment.*

- Product Environmental Footprint (PEF) Guide; Annex II to the Recommendation 2013/179/EU, 9 April 2013. Published in the official journal of the European Union Volume 56, 4 May 2013

This PEFCR was developed within the Project EFFIGE –LIFE by the STG Working station guided by partner FLA.

The existing Product Category Rules for the product in scope (Office chair) are the following:

| Source | PCR | Product category | Underlying standards and program instructions |
|---|---|---|---|
| **EPD** | UN CPC 3812 & 3814 OTHER FURNITURE USED IN OFFICES AND OTHER FURNITURE N.E.C. | Other furniture used in offices | ISO14040-14044<br>ISO 14025 |

## 2. PEFCR scope

### *2.1 Product classification*

Office furniture production is the result of activities classified in the *Nomenclature Générale des Activités Économiques dans les Communautés Européennes/*Statistical classification of products by activity NACE/CPA Rev.2 under code **31.01 Manufacture of office furniture** and, more specifically,

**31.01.11 Metal furniture of a kind used in office**.

This product category includes the production of office furniture of several materials (excluded some specific ones), including chairs/seats and tables.

## 2.2 Representative product(s)

The representative product was determined as a virtual product from the weighted average of the office chair sold on the Italian market as indicated by STG and FLA partner..

The product types are the following:

- Operational padded chair type A EN 1335-1
- Operational padded chair with mesh backrest type A EN 1335-1
- 4 leg multiuse chair –plastic
- 4 leg multiuse chair –padded

**Table 1 Representative product**

| Representative Product | Type | % |
|---|---|---|
| **Office chair** | Operational padded chair type A EN 1335-11 | *45%* |
| | Operational padded chair with mesh backrest type A EN 1335-1 | *35%* |
| | 4 leg multiuse chair –plastic | *10%* |
| | 4 leg multiuse chair –padded | *10%* |

The screening study is available upon request to the STG coordinator that has the responsibility of distributing it with an adequate disclaimer about its limitations.

## 2.3 Functional unit and reference flow

The functional unit (unit of analysis) is one unit of product, thus **one office chair,** as agreed in the EFFIGE office furniture STG.

Table 2 defines the key aspects used to define the FU.

**Table 2 Key aspects of the FU**

| | |
|---|---|
| **What?** | Providing of a seating solution in office environment |

| | |
|---|---|
| **How much?** | 1 unit |
| **How long?** | 5 years |
| **How well?** | the office chair satisfies the requirements of UNI EN 1335-1 and UNI EN 1335-2 or UNI EN 16139 |

The reference flow is one office chair

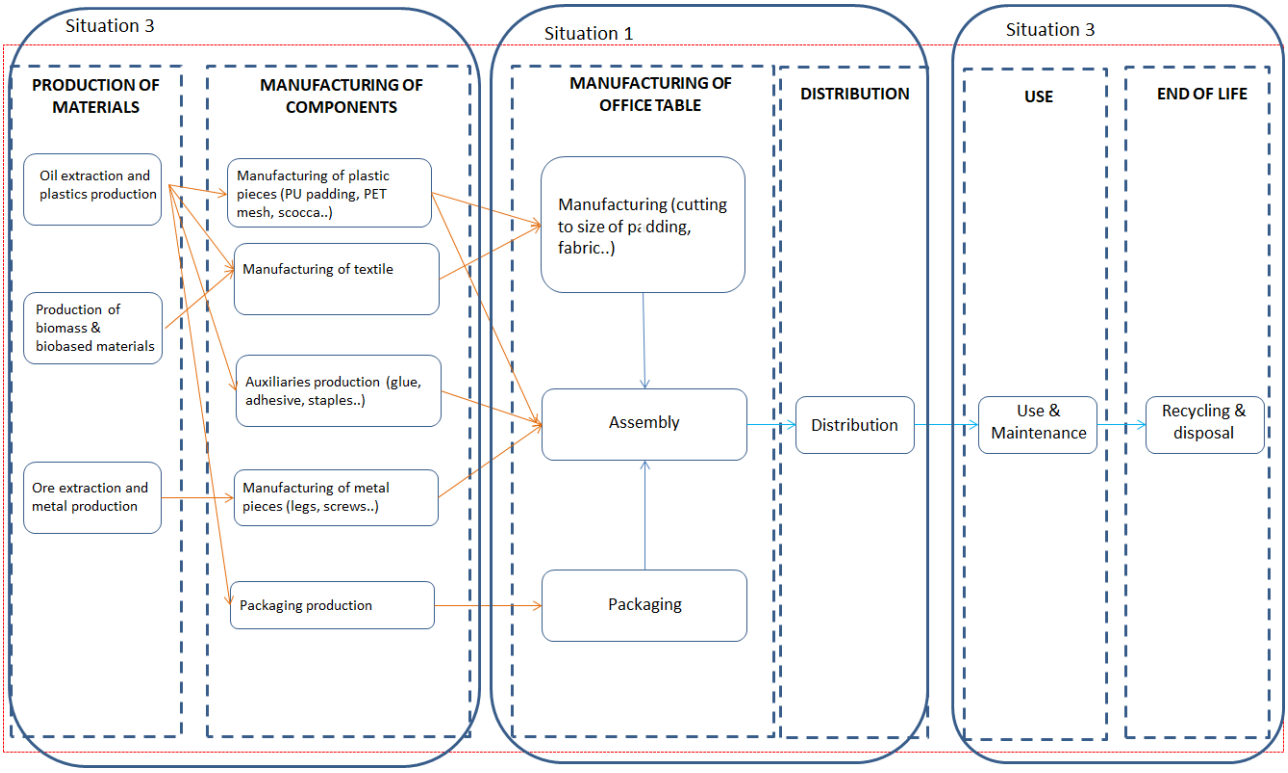
### *2.4 System boundary*

The flow diagram of the entire process includes the following activities (Table 3):

**Table 3. Life cycle stages**

| *Life cycle stage* | *Short description of the processes included* |
|---|---|
| **Manufacturing chair components** | Production and supply of raw materials, including:<br>• Plastics (PP, ABS, PAM, expanded PU)<br>• Metals (Steel, aluminium)<br>• Fabric (wool, cotton, polyamide)<br>• Wood based particleboard<br>Manufacturing of the components:<br>• Particleboard production<br>• Glass tempering<br>• Steel machining and cutting, bending, powder coating)<br>• Aluminium (extrusion)<br>• Plastics injection moulding<br>• Fabric production (spinning of fibres)<br>Transport to chair assembly facility |

| | |
|---|---|
| **Manufacturing chair packaging** | Production and supply of raw materials, including:<br>• Packaging (PE, Cardboard);<br>Transport to chair assembly facility |
| **Manufacturing -chair** | • Chair assembly (the cutting to size of the padding and fabric, the use of glue and staples to fix the components)<br>• Packaging |
| **Distribution** | Transport by lorry<br>Transport by ship |
| **Use & maintenance** | Cleaning of the surface (use of tap water) |
| **End of life** | End of life of packaging (cardboard, PE)<br>End of life of chair |




Processes in Situation 1 are the processes run by the company applying the PEFCR. Processes in Situation 3 are the ones not run by the company applying the PEFCR and this company does not have access to (company-) specific information.

According to this PEFCR, the following processes may be excluded based on the cut-off rule:

- The production of buildings and equipment. *Relevance of buildings and equipment will be tested during supporting studies.*

## *2.5 EF impact assessment*

Each PEF study carried out in compliance with this PEFCR shall calculate the PEF-profile including all PEF impact categories listed in the table below (ILCD Method 2011 for characterisation, normalisation and weighting factors).

| Impact category | Indicator | Unit | Recommended default LCIA method |
|---|---|---|---|
| **Climate change** | *Radiative forcing as Global Warming Potential (GWP100)* | *kg $CO_{2\ eq}$* | *Baseline model of 100 years of the IPCC (based on IPCC 2013)* |
| **- Climate change-biogenic** | | | |
| **- Climate change – land use and land transformation** | | | |
| **Ozone depletion** | *Ozone Depletion Potential (ODP)* | *kg CFC-11 $_{eq}$* | *Steady-state ODPs 1999 as in WMO assessment* |
| **Human toxicity, cancer*** | *Comparative Toxic Unit for humans ($CTU_h$)* | *CTUh* | *USEtox model (Rosenbaum et al, 2008)* |
| **Human toxicity, non-cancer*** | *Comparative Toxic Unit for humans ($CTU_h$)* | *CTUh* | *USEtox model (Rosenbaum et al, 2008)* |
| **Particulate matter** | *Impact on human health* | *kg PM2,5 equivalent* | *UNEP recommended model (Fantke et al 2016)* |
| **Ionising radiation, human health** | *Human exposure efficiency relative to $U^{235}$* | *kBq $U^{235}$ $_{eq}$* | *Human health effect model as developed by Dreicer et al. 1995 (Frischknecht et al, 2000)* |
| **Photochemical ozone formation, human health** | *Tropospheric ozone concentration increase* | *kg NMVOC $_{eq}$* | *LOTOS-EUROS model (Van Zelm et al, 2008) as implemented in ReCiPe* |
| **Acidification** | *Accumulated Exceedance (AE)* | *mol H+ $_{eq}$* | *Accumulated Exceedance (Seppälä et al. 2006, Posch et al, 2008)* |
| **Eutrophication, terrestrial** | *Accumulated Exceedance (AE)* | *mol N $_{eq}$* | *Accumulated Exceedance (Seppälä et al. 2006, Posch et al, 2008)* |
| **Eutrophication, freshwater** | *Fraction of nutrients reaching freshwater end compartment (P)* | *kg P $_{eq}$* | *EUTREND model (Struijs et al, 2009b) as implemented in ReCiPe* |
| **Eutrophication, marine** | *Fraction of nutrients reaching marine end compartment (N)* | *kg N $_{eq}$* | *EUTREND model (Struijs et al, 2009b) as implemented in ReCiPe* |
| **Ecotoxicity, freshwater**[1] | *Comparative Toxic Unit for ecosystems ($CTU_e$)* | *CTUe* | *USEtox model, (Rosenbaum et al, 2008)* |
| **Land Use** | *Soil Organic Matter (SOM)* | *Kg C deficit* | *Mila i Canals et al. 2007* |
| **Water resource depletion** | *Freshwater scarcity* | *$m^3$ water $_{eq}$* | *Swiss Ecoscarcity 2006* |
| **Mineral, fossil & renewable resource depletion** | ***Scarcity of mineral resource*** | ***kg Sb $_{eq}$*** | *van Oers et al. 2002.* |

[1] Long-term emissions (occurring beyond 100 years) shall be excluded from the toxic impact categories. Toxicity emissions to this sub-compartment have a characterisation factor set to 0 in the EF LCIA (to ensure consistency). If included by the applicant in the LCI modelling, the sub-compartment 'unspecified (long-term)' shall be used

### *2.6 Limitations*

The main limitation are:

- The lack of primary data for the production of buildings and equipment.

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

The most relevant impact categories for the product RP – Office Chair, in scope of this PEFCR, are the following:

- **Mineral, fossil & ren resource depletion**
- **Particulate matter**
- **Acidification**
- **Climate change, fossil**
- **Photochemical ozone formation.**
- **Terrestrial eutrophication**
- **Marine eutrophication**

The most relevant life cycle stages for the product group in scope of this PEFCR are the following:

- **Manufacturing of chair components**
- **End of life**

The most relevant processes for the product group in scope of this PEFCR are the following (table 4):

**Table 1. List of the most relevant processes**

| Impact category | Processes |
|---|---|
| **Mineral, fossil & ren resource depletion** | Material-mechanism (from life cycle stage Manufacturing of chair components) |
| | Material –gas cylinder (from life cycle stage Manufacturing of chair components) |
| | Material-4 legs (from life cycle stage Manufacturing of chair components) |
| | Material- castors (from life cycle stage Manufacturing of chair components) |
| | Material-connection (from life cycle stage Manufacturing of chair components) |

| Impact category | Processes |
|---|---|
| | Material- base (from life cycle stage Manufacturing of chair components) |
| | Material- cover (from life cycle stage Manufacturing of chair components) |
| | Production –hardware (from life cycle stage Manufacturing of chair components) |
| | Packaging (from life cycle stage Manufacturing of chair packaging) |
| | Assembly (from life cycle assembly stage) |
| | End of life packaging (from end of life stage) |
| **Particulate matter** | Material-mechanism (from life cycle stage Manufacturing of chair components) |
| | Material-mesh (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered backrest (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered seat (from life cycle stage Manufacturing of chair components) |
| | Material –gas cylinder (from life cycle stage Manufacturing of chair components) |
| | Material-4 legs (from life cycle stage Manufacturing of chair components) |
| | Material- castors (from life cycle stage Manufacturing of chair components) |
| | Material- base (from life cycle stage Manufacturing of chair components) |
| | Material- cover (from life cycle stage Manufacturing of chair components) |
| | Production –gas cylinder (from life cycle stage Manufacturing of chair components) |
| | Production –4 legs (from life cycle stage Manufacturing of chair components) |
| | Packaging (from life cycle stage Manufacturing of chair packaging) |
| | Assembly (from life cycle assembly stage) |
| | End of life packaging (from end of life stage) |

| Impact category | Processes |
|---|---|
| **Acidification** | Material-mechanism (from life cycle stage Manufacturing of chair components) |
| | Material-mesh (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered backrest (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered seat (from life cycle stage Manufacturing of chair components) |
| | Material –castors (from life cycle stage Manufacturing of chair components) |
| | Material-base (from life cycle stage Manufacturing of chair components) |
| | Material- cover (from life cycle stage Manufacturing of chair components) |
| | Production –gas cylinder (from life cycle stage Manufacturing of chair components) |
| | Production –4 legs (from life cycle stage Manufacturing of chair components) |
| | Packaging (from life cycle stage Manufacturing of chair packaging) |
| | Assembly (from life cycle Manufacturing of chair stage) |
| | Distribution (from life cycle stage distribution) |
| **Climate change, fossil** | Material-mechanism (from life cycle stage Manufacturing of chair components) |
| | Material-mesh (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered backrest (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered seat (from life cycle stage Manufacturing of chair components) |

| Impact category | Processes |
|---|---|
| | Material –gas cylinder (from life cycle stage Manufacturing of chair components) |
| | Material –armrest (from life cycle stage Manufacturing of chair components) |
| | Material –4 legs (from life cycle stage Manufacturing of chair components) |
| | Material –castors (from life cycle stage Manufacturing of chair components) |
| | Material –base (from life cycle stage Manufacturing of chair components) |
| | Material –cover (from life cycle stage Manufacturing of chair components) |
| | Assembly (from life cycle stage Manufacturing of office chair) |
| | Packaging (from life cycle stage Manufacturing of chair packaging) |
| | Production-mechanism (from life cycle stage Manufacturing of chair components) |
| | Production-gas cylinder (from life cycle stage Manufacturing of chair components) |
| | Production-4 legs (from life cycle stage Manufacturing of chair components) |
| **Photochemical ozone formation** | Material-mechanism (from life cycle stage Manufacturing of chair components) |
| | Material-mesh (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered backrest (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered seat (from life cycle stage Manufacturing of chair components) |
| | Material –gas cylinder (from life cycle stage Manufacturing of chair components) |
| | Material –armrest (from life cycle stage Manufacturing of chair components) |
| | Material –4 legs (from life cycle stage Manufacturing of chair components) |

| Impact category | Processes |
|---|---|
| | Material –castors (from life cycle stage Manufacturing of chair components) |
| | Material –base (from life cycle stage Manufacturing of chair components) |
| | Material –cover (from life cycle stage Manufacturing of chair components) |
| | Packaging (from life cycle stage Manufacturing of chair packaging) |
| | Production-mechanism (from life cycle stage Manufacturing of chair components) |
| | Assembly (from life cycle stage Manufacturing of office chair) |
| | Distribution (from life cycle stage distribution) |
| | End of life packaging (from end of life stage) |
| **Marine eutrophication** | Material-mechanism (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered backrest (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered seat (from life cycle stage Manufacturing of chair components) |
| | Material –castors (from life cycle stage Manufacturing of chair components) |
| | Material –base (from life cycle stage Manufacturing of chair components) |
| | Material –cover (from life cycle stage Manufacturing of chair components) |
| | Packaging (from life cycle stage Manufacturing of chair packaging) |
| | Assembly (from life cycle stage Manufacturing of office chair) |

| Impact category | Processes |
|---|---|
| | Distribution (from life cycle stage distribution) |
| | End of life chair (end of life stage) |
| **Terrestrial eutrophication** | Material-mechanism (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered backrest (from life cycle stage Manufacturing of chair components) |
| | Material-upholstered seat (from life cycle stage Manufacturing of chair components) |
| | Material –base (from life cycle stage Manufacturing of chair components) |
| | Material –cover (from life cycle stage Manufacturing of chair components) |
| | Packaging (from life cycle stage Manufacturing of chair packaging) |
| | Assembly (from life cycle stage Manufacturing of office chair) |
| | Distribution (from life cycle stage distribution) |

## 4. Life cycle inventory

### *4.1 List of mandatory company-specific data*

The following processes shall be modelled using company specific data:

- **Assembly –chair**
- **Distribution**

*Activity data to be collected will be verified and validated during the PEF supporting studies.*

*Default datasets will be validated during the PEF supporting studies.*

### *4.1.1 Assembly –chair*

In this process all the components of the office chair provided by the suppliers are assembled to form the final product. The process includes energy consumption even though it is mainly carried out manually, with the cutting to size of the padding and fabric, the use of glue and staples to fix the components.

**Data collection requirements for mandatory process Assembly-chair**

| **Requirements for data collection purposes** | | | **Requirements for modelling purposes** | | | | | | | | **Remarks** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Activity data to be collected* | *Specific requirements (e.g. frequency, measurement standard, etc)* | *Unit of measure* | *Default dataset to be used* | *Dataset source (i.e. node)* | *UUID* | *TiR* | *TeR* | *GR* | *P* | *DQR* | |
| Inputs: | | | | | | | | | | | |
| Yearly electricity consumption for Assembly | 1 year average | kWh/year | Electricity, medium voltage {COUNTRY}\| market for \| APOS, U | Ecoinvent | *n/a* | *n/a* | *n/a* | *n/a* | *n/a* | *n/a* | |
| *Other material inputs..* | | | | | | | | | | | |
| Outputs: | | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| … | … | … | … | … | … | … | | | | | |
| | | | | | | | | | | | |

### *4.1.2 Distribution*

The distribution of the product occurs on road by lorry or by seaship .

| ***Process name**** | ***Unit of measurement (output)*** | ***Default dataset*** | ***Dataset source*** | ***~~UUID~~*** | ***Default DQR*** | | | | ***Remarks*** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | *P* | *TiR* | *GR* | *TeR* | |
| *DISTRIBUTION LORRY* | *Kg*km* | *Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U* | Ecoinvent | *n/a* | *n/a* | *n/a* | *n/a* | *n/a* | |
| *DISTRIBUTION SHIP* | *KG*KM* | *Transport, freight, sea, transoceanic ship {GLO}\| market for \| APOS, U* | Ecoinvent | *n/a* | *n/a* | *n/a* | *n/a* | *n/a* | |

### *4.2 List of processes expected to run by the company*

The following processes are expected to be run by the company applying the PEFCR:

- **Assembly-chair**
- **Distribution -chair**

The processes description is in chapter 5.1.

### *4.3 Data gaps*

Unless primary data on raw materials and consumables production of appropriate quality (as defined in the PEF Recommendation) are made available from producers, to assure an appropriate overall quality of the PEF study and the comparability of the results, default proxies reported in cap. 5.1. have to be used.

### *4.4 Data quality requirements*

This PEFCR does not specify more stringent data quality requirements and additional criteria for the assessment of data quality compared to the ones reported in PEFCR Guidance 6.3.

For data quality requirements, assessment and reporting, see PEFCR Guidance 6.3, Section B.5.4.

### *4.5 Data needs matrix (DNM)*

For the evaluation of all processes required to model the product and outside the list of mandatory company-specific (listed in section 5.1) using the Data Needs Matrix, see PEFCR Guidance 6.3. Section B.5.5.

### *4.6 Allocation rules*

If applicable, allocation in finished particleboard production shall be applied as physical allocation among particleboard finished, dust and waste to dust, since the two coproducts are being reused in the particleboard production.

Table 5. Allocation rules

| *Process* | *Allocation rule* | *Modelling instructions* |
|---|---|---|
| Finished particleboard production | Physical allocation | The mass of the different outputs shall be used. |

## *4.7 Which datasets to use?*

The secondary datasets to be used by the applicant are those listed in this PEFCR. Whenever a dataset needed to calculate the PEF-profile is not among those listed in this PEFCR, then the applicant shall choose between the following options (in hierarchical order)[2]:

- Use an EF-compliant dataset available on one of the following nodes:
  - http://eplca.jrc.ec.europa.eu/EF-node
  - http://lcdn.blonkconsultants.nl
  - http://ecoinvent.lca-data.com
  - http://lcdn-cepe.org
  - https://lcdn.quantis-software.com/PEF/
  - http://lcdn.thinkstep.com/Node
- Use an EF-compliant dataset available in a free or commercial source;
- Use another EF-compliant dataset considered to be a good proxy. In such case this information shall be included in the "limitation" section of the PEF report.
- Use an ILCD-entry level-compliant dataset. In such case this information shall be included in the "data gap" section of the PEF report.

## *4.8 Modelling of wastes and recycled content*

For modelling of waste and recycled content the Circular Footprint Formula, as described in PEFCR Guidance 6.3, Section B.5.11, shall be applied.

[2] These recommendations shall be taken into account under one of the following conditions: 1) the datasets are included in the Database integrated into the software of LCA; or 2) checked and validated procedures exist for the import of EF-compliant datasets into the structure required by the software; or 3) the EF compliant impact assessment method is available in the LCA software and a PEFCR exists with benchmark; or 4) the EF compliant impact assessment method is available in the LCA software and the PEF of a suppliers exists with the EF compliant environmental profile (characterized results)

### 4.8.1 Aluminium recycling

| **Aluminium recycling** | | | |
|---|---|---|---|
| | Ev* | Aluminium, primary, ingot {UN-EUROPE}\| production \| Alloc Rec, U | (A-1)*R2*Qs/Qp |
| | Erec_eol | Aluminium scrap, post-consumer (waste treatment) {RER}\| treatment of aluminium scrap, post-consumer, by collecting, sorting, cleaning, pressing \| Alloc Def, U | (1-A)*R2 |
| | Ese_elect | Electricity, medium voltage {IT}\| market for \| Alloc Rec, U; | R3*LHV*Xerelec*(-1) |
| | Ese_heat | Heat, central or small-scale, natural gas {RER}\| market group for \| Alloc Rec, U; | R3*LHV*Xer heat*(-1) |
| | E er | Scrap aluminium (waste treatment) {CH}\| treatment of scrap aluminium, municipal incineration \| Alloc Def, U | R3 |
| | Ed | Waste aluminium {CH}\| treatment of, sanitary landfill \| Alloc Rec, U | (1-R2-R3) |

| *Parameter* | *Value* | *Source* |
|---|---|---|
| *A* | *0.8* | *Annex C* |
| *R2* | *0.39* | |
| *R3* | *0.214* | |
| *Qs/Qp* | *0.85* | |

### 4.8.2 Steel recycling

| **Steel recycling** | | | |
|---|---|---|---|
| | Ev* | Steel, low-alloyed {RoW}\| steel production, electric, low-alloyed \| Alloc Rec, U | (A-1)*R2*Qs/Qp |
| | Erec_eol | Iron scrap, sorted, pressed {RER}\| sorting and pressing of iron scrap \| Alloc Rec, U | (1-A)*R2 |
| | Ese_elect | | R3*LHV*Xerelec*(-1) |
| | Ese_heat | | R3*LHV*Xer heat*(-1) |
| | E er | Scrap steel {CH}\| treatment of,incinerationl \| Alloc Rec, U | R3 |
| | Ed | Scrap steel {CH}\| treatment of, inert material landfill \| Alloc Rec, U | (1-R2-R3) |

| *Parameter* | *Value* | *Source* |
|---|---|---|
| *A* | *0.2* | *Annex C* |
| *R2* | *0.73* | |
| *R3* | *0.0945* | |
| *Qs/Qp* | *1* | |

### 4.8.3 Glass recycling

| Glass recycling | | | |
|---|---|---|---|
| | Ev* | | (A-1)*R2*Qs/Qp |
| | Erec_eol | | (1-A)*R2 |
| | Ese_elect | | R3*LHV*Xerelec*(-1) |
| | Ese_heat | | R3*LHV*Xer heat*(-1) |
| | E er | | R3 |
| | Ed | Waste glass {CH}\| treatment of, inert material landfill \| Alloc Def, U | (1-R2-R3) |

| *Parameter* | *Value* | *Source* |
|---|---|---|
| *A* | *0.2* | *Annex C* |
| *R2* | *0.76* | |
| *R3* | *0* | |
| *Qs/Qp* | *1* | |

### 4.8.4 Paper and cardboard packaging recycling

| Paper and cardboard packaging | | | |
|---|---|---|---|
| | Ev* | Paper, woodfree, uncoated {RER}\| market for \| Alloc Rec, U | (A-1)*R2*Qs/Qp |
| | Erec_eol | Graphic paper, 100% recycled {GLO}\| market for \| Alloc Rec, U; | (1-A)*R2 |
| | Ese_elect | Electricity, medium voltage {IT}\| market for \| Alloc Rec, U; | R3*LHV*Xerelec*(-1) |
| | Ese_heat | Heat, central or small-scale, natural gas {Europe without Switzerland}\| market for heat, central or small-scale, natural gas \| Alloc Rec, U; | R3*LHV*Xer heat*(-1) |
| | E er | Waste graphical paper {Europe without Switzerland}\| treatment of waste graphical paper, municipal incineration \| Alloc Rec, U; | R3 |
| | Ed | Waste graphical paper {Europe without Switzerland}\| treatment of waste graphical paper, sanitary landfill \| Alloc Rec, U | (1-R2-R3) |

| *Parameter* | *Value* | *Source* |
|---|---|---|
| *A* | *0.2* | *Annex C* |
| *R2* | *0.73* | |

| | | |
|---|---|---|
| *R3* | *0.0945* | |
| *Qs/Qp* | *0.85* | |

### *4.8.5 Plastic packaging recycling*

| **Plastic packaging** | | | |
|---|---|---|---|
| | Ev* | Polyethylene terephthalate, granulate, amorphous {RER}\| production \| Alloc Rec, U | (A-1)*R2*Qs/Qp |
| | Erec_eol | PET (waste treatment) {GLO}\| recycling of PET \| Alloc Def, U_mod; | (1-A)*R2 |
| | Ese_elect | Electricity, medium voltage {IT}\| market for \| Alloc Rec, U; | R3*LHV*Xerelec*(-1) |
| | Ese_heat | Heat, central or small-scale, natural gas {Europe without Switzerland}\| market for heat, central or small-scale, natural gas \| Alloc Rec, U; | R3*LHV*Xer heat*(-1) |
| | E er | Waste polyethylene {CH}\| treatment of, municipal incineration \| Alloc Rec, U; | R3 |
| | Ed | Waste polyethylene terephtalate {CH}\| treatment of, sanitary landfill \| Alloc Rec, U | (1-R2-R3) |

| *Parameter* | *Value* | *Source* |
|---|---|---|
| *A* | *0.5* | *Annex C* |
| *R2* | *0.31* | |
| *R3* | *0.24* | |
| *Qs/Qp* | *1* | |

## 5. Life cycle stages

*For each process, default datasets will be verified during the PEF supporting studies process. During the PEF supporting studies the availability of data for the amount per FU will be verified. If not available, the default amount per FU will be applied.*

### *5.1 Manufacturing chair components*

**Table 6. Raw material acquisition and processing**

| ***Process name*** | ***Unit of measurement (output)*** | ***Default*** | | | | ***UUID*** | ***Default DQR*** | | | | ***Most relevant process [Y/N]*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***$R_1$*** | ***Amount per FU*** | ***Dataset*** | ***Database*** | | *P* | *TiR* | *GR* | *TeR* | |
| *Polypropylene - armrest* | *kg* | | *1.56* | *Polypropylene, granulate {GLO}\| market for \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Injection moulding- armrest* | *kg* | | *1.56* | *Injection moulding {RER}\| processing \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Nylon -PAM - castors 5* | *kg* | | *0.32* | *Nylon 6 {GLO}\| market for \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Injection moulding - castors* | *kg* | | *0.32* | Injection moulding {RER}\| processing \| | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | APOS, U | | | | | | | |
| *Steel - castors* | *kg* | | *0.08* | Steel, low-alloyed {RER}\| steel production, converter, low-alloyed \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Aluminium-chair base* | *kg* | | *1.36* | Aluminium, primary, ingot {IAI Area, EU27 & EFTA}\| aluminium, ingot, primary, import from Rest of Europe \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Extrusion Al-chair base* | *kg* | | *1.36* | Impact extrusion of aluminium, 1 stroke {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Nylon -PAM – chair cover* | *kg* | | *0.15* | Nylon 6 {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Wool- chair cover* | kg | | 0.15 | Sheep fleece in the grease {RoW}\| sheep production, for wool \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Cotton- chair cover* | *kg* | | *0.15* | Cotton fibre {GLO}\| market | Ecoinvent | n/a | n/ | n/a | n/a | n/a | n/a | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | for \| APOS, U | | | a | | | | |
| *Spinning_textile* | *kg* | | *0.45* | Spinning, bast fibre {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Steel - connection chair* | kg | | 0.48 | Steel, low-alloyed {RER}\| steel production, converter, low-alloyed \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Metal working-steel - connection chair* | kg | | 0.48 | Metal working, average for steel product manufacturing {RER}\| processing \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Steel – gas cylinder | kg | | 0.8 | Steel, low-alloyed {RER}\| steel production, converter, low-alloyed \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Metal working-steel gas cylinder | kg | | 0.8 | Metal working, average for steel product manufacturing {RER}\| processing \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Cutting-bending- | MJ | | 1.6 | Electricity, medium | Ecoinvent | n/a | n/ | n/a | n/a | n/a | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| steel - gas cylinder | | | | voltage {COUNTRY}\| market for \| APOS, U | | | a | | | | |
| Powder coating - gas cylinder | m2 | | 0.12 | Powder coat, steel {RER}\| powder coating, steel \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| POM - gas cylinder | kg | | 0.08 | Polyoxymethylene (POM)/EU-27 | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Aluminium-chair mechanism | kg | | 0.64 | Aluminium, primary, ingot {IAI Area, EU27 & EFTA}\| aluminium, ingot, primary, import from Rest of Europe \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Extrusion Al-chair mechanism | kg | | 0.64 | Impact extrusion of aluminium, 1 stroke {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Nylon -PAM - mechanism | kg | | 1.6 | Nylon 6 {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Injection moulding – mechanism PA | kg | | 1.6 | Injection moulding {RER}\| processing \| | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | APOS, U | | | | | | | |
| *Polyester PET -mesh* | kg | | 0.35 | Polyethylene terephthalate, granulate, amorphous {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Extrusion plastic - mesh* | kg | | 0.35 | Extrusion, plastic pipes {RER}\| production \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Polyurethane expanded - mesh* | kg | | 0.175 | Polyurethane, flexible foam {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Steel – hardware chair | kg | | 0.2 | Steel, low-alloyed {RER}\| steel production, converter, low-alloyed \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Polypropylene - hardware chair | kg | | 0.2 | Polypropylene, granulate {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Metal working-steel - chair hardware* | kg | | 0.2 | Metal working, average for steel product manufacturing {RER}\| processing \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Zinc coating_mod IT - chair hardware* | kg | | 0.2 | Zinc coat, coils {RER}\| zinc coating, coils \| Alloc Def, U_MOD IT | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Steel - 4 legs chair* | kg | | 0.8 | Steel, low-alloyed {RER}\| steel production, converter, low-alloyed \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Metal working-steel - 4 legs chair* | kg | | 0.8 | Metal working, average for steel product manufacturing {RER}\| processing \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Cutting-bending- steel - 4 legs chair* | *MJ* | | *1.6* | Electricity, medium voltage {COUNTRY}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Powder coating - 4 legs chair* | *m2* | | *0.12* | Powder coat, steel {RER}\| powder coating, steel \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Polypropylene – shell PP | kg | | 0.35 | Polypropylene, granulate {GLO}\| market for \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Injection moulding- | kg | | 0.35 | Injection moulding | Ecoinvent | n/a | n/ | n/a | n/a | n/a | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| shell PP | | | | {RER}\| processing \| APOS, U | | | a | | | | |

**Table 7. Transport**

| *Process name** | *Unit of measurement (output)* | *Default (per FU)* | | | *Default dataset* | *Dataset source* | ~~*UUID*~~ | *Default DQR* | | | | *Most relevant [Y/N]* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Distance* | *Utilisation ratio** | *Empty return* | | | | *P* | *TiR* | *GR* | *TeR* | |
| *Supply_hardware chair* | *Kg*km* | *300* | | | *Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Supply_armrest* | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Supply_castors* | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Supply_connecting structure* | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Supply_chair base* | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ton, EURO5 \| APOS, U | | | | | | | |
| *Supply_chair cover* | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Supply_gas cylinder* | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *Supply_mechanism chair* | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Supply_mesh backrest | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Supply_shell chair | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| Supply_upholstered backrest | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ton, EURO5 \| APOS, U | | | | | | | |
| Supply_upholstered seat | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

*The applicant of this PEFCR shall always check the utilisation ratio applied in the default dataset and adapt it accordingly.

## *5.2 Manufacturing chair packaging*

**Table 8. Manufacturing chair packaging**

| ***Process name**** | ***Unit of measurement (output)*** | ***Default*** | | | | ***UUID*** | ***Default DQR*** | | | | ***Most relevant process [Y/N]*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***$R_1$*** | ***Amount per FU*** | ***Dataset*** | ***base*** | | *P* | *TiR* | *GR* | *TeR* | |
| *Cardboard - packaging* | *kg* | | *3.2* | *Corrugated board box {GLO}\| market for corrugated board box \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | *N* |
| *PE film - packaging* | | | *0.5* | *Packaging film, low density polyethylene {GLO}\| market for \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | *N* |

**Table 9. Transport packaging**

| ***Process name**** | ***Unit of measurement (output)*** | ***Default (per FU)*** | | | ***Default dataset*** | ***Dataset source*** | ***~~UUID~~*** | ***Default DQR*** | | | | ***Most relevant [Y/N]*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***Distance*** | ***Utilisation ratio**** | ***Empty return*** | | | | *P* | *TiR* | *GR* | *TeR* | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Supply_ Packaging chair* | Kg*km | 300 | | | Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

*The applicant of this PEFCR shall always check the utilisation ratio applied in the default dataset and adapt it accordingly.

## 5.3 Manufacturing chair.

**Table 10. Office chair Manufacturing**

| ***Process name**** | ***Unit of measurement (output)*** | ***Default*** | | | | ***UUID*** | ***Default DQR*** | | | | ***Most relevant process [Y/N]*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***$R_1$*** | ***Amount per FU*** | ***Dataset*** | ***base*** | | *P* | *TiR* | *GR* | *TeR* | |
| *ASSEMBLY CHAIR* | | | | | | | | | | | |

These processes are already described in chapter 4.1.

## 5.4 Distribution

**Table 11. Transport**

| ***Process name**** | ***Unit of measurement (output)*** | ***Default (per FU)*** | | | ***Default dataset*** | ***Dataset source*** | ***~~UUID~~*** | ***Default DQR*** | | | | ***Most relevant [Y/N]*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***Distance*** | ***Utilisation ratio**** | ***Empty return*** | | | | *P* | *TiR* | *GR* | *TeR* | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *DISTRIBUTION LORRY* | *Kg*km* | *1000 km* | | | *Transport, freight, lorry 16-32 metric ton, EURO5 {RER}\| transport, freight, lorry 16-32 metric ton, EURO5 \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |
| *DISTRIBUTION SHIP* | *Kg*Km* | *10.000 km* | | | *Transport, freight, sea, transoceanic ship {GLO}\| market for \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

*The applicant of this PEFCR shall always check the utilisation ratio applied in the default dataset and adapt it accordingly.

## *5.5 Use & Maintenance*

**Table 12. Use and Maintenance**

| ***Process name**** | ***Unit of measurement (output)*** | ***Default*** | | | | ***UUID*** | ***Default DQR*** | | | | ***Most relevant process [Y/N]*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***$R_1$*** | ***Amount per FU*** | ***Dataset*** | ***Database*** | | *P* | *TiR* | *GR* | *TeR* | |
| *Maintenance chair (cleaning)* | *l* | | *7.5* | *Tap water {Europe without Switzerland}\| market for \| APOS, U* | Ecoinvent | n/a | n/a | n/a | n/a | n/a | |

## 5.6 End of life

**Table 13. End of life**

| Process name* | Unit of measurement (output) | Default | | | | UUID | Default DQR | | | | Most relevant process [Y/N] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $R_1$ | Amount per FU | Dataset | Database | | P | TiR | GR | TeR | |
| End of life chair | kg | | 12.7 | Municipal solid waste {CH}\| treatment of, sanitary landfill \| APOS, U; Particleboard recycling CFF; Steel recycling CFF; Glass recycling CFF | | | | | | | |
| End of life packaging paper and cardboard | kg | | 3.2 | 15.01.01 Packaging paper and cardboard – R CFF | | | | | | | |
| End of life packaging plastics | kg | | 0.5 | 15.01.02Packaging plastics – R CFF | | | | | | | |

[

These processes are modelled according to the data in chapter 4.8.

# 6. PEF results

## *6.1 Benchmark values*

The results of the PEF screening conducted on the representative product are reported in the following tables:

**Table 14.- Characterised benchmark values for RP –Office chair**

| Impact Category | Units | Total | Production - chair component | Production - chair packaging | Assembly - chair | Distribution | Use and maintenance | End of life |
|---|---|---|---|---|---|---|---|---|
| **Climate change, fossil** | kg CO2 eq | 92,132 | 77,883 | 5,051 | 8,727 | 1,808 | 0,003 | -1,340 |
| **Climate change, biogenic** | kg CO2 eq | 11,195 | 3,823 | 4,179E-02 | 3,542E-02 | 3,699E-04 | 5,357E-06 | 7,295 |
| **Climate change, land use & transf** | kg CO2 eq | 1,358 | 1,337 | 3,052E-02 | 1,017E-02 | 7,294E-04 | 4,158E-06 | -0,021 |
| **Ozone depletion** | kg CFC-11 eq | 4,910E-06 | 3,382E-06 | 3,562E-07 | 1,035E-06 | 3,146E-07 | 2,610E-10 | -1,779E-07 |
| **Human toxicity, non-cancer effects** | CTUh | 9,153E-06 | 8,077E-06 | 8,889E-07 | 4,149E-07 | 1,865E-07 | 1,190E-09 | -4,156E-07 |
| **Human toxicity, cancer effects** | CTUh | 3,799E-06 | 3,676E-06 | 6,459E-08 | 4,735E-08 | 1,262E-08 | 2,851E-10 | -1,847E-09 |
| **Particulate matter** | kg PM2.5 eq | 6,557E-02 | 6,195E-02 | 3,042E-03 | 3,229E-03 | 1,324E-03 | 1,715E-06 | -3,983E-03 |
| **Ionizing radiation HH** | kBq U235 eq | 3,937 | 1,776 | 0,310 | 0,515 | 0,119 | 2,691E-04 | 1,217 |
| **Photochemical ozone formation** | kg NMVOC eq | 0,277 | 0,229 | 0,017 | 0,019 | 1,496E-02 | 7,708E-06 | -3,611E-03 |
| **Acidification** | molc H+ eq | 0,674 | 0,584 | 0,024 | 0,054 | 2,310E-02 | 1,607E-05 | -1,132E-02 |
| **Terrestrial eutrophication** | molc N eq | 1,666 | 1,480 | 0,058 | 0,099 | 5,502E-02 | 2,772E-05 | -2,589E-02 |
| **Freshwater eutrophication** | kg P eq | 6,798E-03 | 6,296E-03 | 2,502E-04 | 3,195E-04 | 2,751E-05 | 2,377E-07 | -9,596E-05 |
| **Marine eutrophication** | kg N eq | 1,295E-01 | 9,692E-02 | 6,688E-03 | 6,229E-03 | 4,931E-03 | 2,316E-06 | 1,477E-02 |
| **Freshwater ecotoxicity** | CTUe | 90,102 | 80,454 | 5,877 | 1,937 | 2,815 | 3,895E-03 | -0,986 |
| **Land use** | kg C deficit | 192,966 | 172,511 | 19,380 | 8,516 | 5,616 | 3,501E-03 | -13,061 |
| **Water resource depletion** | m3 water eq | 0,606 | 0,489 | 2,949E-03 | 0,116 | 3,246E-04 | 1,229E-03 | -3,465E-03 |
| **Mineral, fossil &** | kg Sb eq | 2,078E- | 1,365E-03 | 2,147E-04 | 3,738E-05 | 1,471E-05 | 5,779E-08 | 4,469E- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ren resource depletion | | 03 | | | | | | 04 |

Table 15 - Normalised benchmark values for RP Office chair

| Impact Category | Totale | Production - chair component | Production - chair packaging | Assembly - chair | Distribution | Use and maintenance | End of life |
|---|---|---|---|---|---|---|---|
| Climate change, fossil | 9,993E-03 | 8,447E-03 | 5,479E-04 | 9,465E-04 | 1,961E-04 | 3,048E-07 | -1,453E-04 |
| Cliamte change, biogenic | 1,214E-03 | 4,146E-04 | 4,532E-06 | 3,842E-06 | 4,012E-08 | 5,810E-10 | 7,912E-04 |
| Climate change, land use & transf | 1,473E-04 | 1,450E-04 | 3,310E-06 | 1,103E-06 | 7,911E-08 | 4,510E-10 | -2,223E-06 |
| Ozone depletion | 2,273E-04 | 1,566E-04 | 1,649E-05 | 4,790E-05 | 1,456E-05 | 1,208E-08 | -8,235E-06 |
| Human toxicity, non-cancer effects | 1,717E-02 | 1,515E-02 | 1,668E-03 | 7,784E-04 | 3,499E-04 | 2,232E-06 | -7,797E-04 |
| Human toxicity, cancer effects | 1,030E-01 | 9,963E-02 | 1,750E-03 | 1,283E-03 | 3,420E-04 | 7,728E-06 | -5,006E-05 |
| Particulate matter | 1,725E-02 | 1,630E-02 | 8,006E-04 | 8,498E-04 | 3,485E-04 | 4,512E-07 | -1,048E-03 |
| Ionizing radiation HH | 3,484E-03 | 1,572E-03 | 2,740E-04 | 4,556E-04 | 1,054E-04 | 2,381E-07 | 1,077E-03 |
| Photochemical ozone formation | 8,724E-03 | 7,238E-03 | 5,337E-04 | 5,941E-04 | 4,720E-04 | 2,431E-07 | -1,139E-04 |
| Acidification | 1,424E-02 | 1,235E-02 | 5,026E-04 | 1,138E-03 | 4,885E-04 | 3,398E-07 | -2,394E-04 |
| Terrestrial eutrophication | 9,467E-03 | 8,410E-03 | 3,279E-04 | 5,630E-04 | 3,126E-04 | 1,575E-07 | -1,471E-04 |
| Freshwater eutrophication | 4,593E-03 | 4,254E-03 | 1,691E-04 | 2,159E-04 | 1,859E-05 | 1,606E-07 | -6,484E-05 |
| Marine eutrophication | 7,665E-03 | 5,735E-03 | 3,958E-04 | 3,686E-04 | 2,917E-04 | 1,370E-07 | 8,740E-04 |
| Freshwater ecotoxicity | 1,031E-02 | 9,205E-03 | 6,724E-04 | 2,217E-04 | 3,220E-04 | 4,457E-07 | -1,128E-04 |
| Land use | 2,580E-03 | 2,306E-03 | 2,591E-04 | 1,138E-04 | 7,508E-05 | 4,680E-08 | -1,746E-04 |
| Water resource depletion | 7,442E-03 | 6,009E-03 | 3,623E-05 | 1,420E-03 | 3,988E-06 | 1,510E-05 | -4,257E-05 |
| Mineral, fossil & ren resource depletion | 2,058E-02 | 1,351E-02 | 2,126E-03 | 3,701E-04 | 1,456E-04 | 5,722E-07 | 4,424E-03 |

### *6.2 PEF profile*

The applicant shall calculate the PEF profile of its product in compliance with all requirements included in this PEFCR. The following information shall be included in the PEF report:

- full life cycle inventory;
- characterised results in absolute values, for all impact categories (including toxicity; as a table);
- normalised and weighted result in absolute values, for all impact categories (including toxicity; as a table);
- the aggregated single score in absolute values

Together with the PEF report, the applicant shall develop an aggregated EF-compliant dataset of its product in scope. This dataset shall be made available on the EF node ( http://eplca.jrc.ec.europa.eu/EF-node). The disaggregated version may stay confidential.

### *6.3 Additional environmental information*

*Optional*

### *6.4 Other impact results*

*[This chapter is optional and may only be included in the PEFCR when the TS decides to add one or two toxicity impact categories to the list of most relevant impact categories. In this case, the TS may decide to display here the characterised results from the selected ICs toxicity.]*

## 7. References