Product Environmental Footprint Category Rules (PEFCRs)

Packed water

Version 1.0 of April 23rd, 2018

(accepted by the PEF/OEF Steering Committee on April 19th, 2018)

Time validity: December 31st, 2020

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Acronyms

AF	Allocation Factor
AR	Allocation Ratio
BoC	Bill of Components
BoM	Bill of Materials
BP	Bonne Practique
B2B	Business to Business
B2C	Business to Consumer
CF	Characterization Factor
CFF	Circular Footprint Formula
CFF-M	Circular Footprint Formula – Modular form
CPA	Classification of Products by Activity
DNM	Data Needs Matrix
DQR	Data Quality Rating
DC	Distribution Centre
EA	Economic Allocation
EoL	End-of-Life
EF	Environmental Footprint
EI	Environmental Impact
EC	European Commission
FU	Functional Unit
GR	Geographical Representativeness
GWP	Global Warming Potential
g	gram
GHG	Greenhouse Gas
GE	Gross Energy intake
HD	Helpdesk
HDPE	High Density PolyEthylene
HOD	Home Office Delivery
horeca	hotel, restaurant and café
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ILCD	International Reference Life Cycle Data System
JRC	Joint Research Centre
kg	kilogram
km	kilometre
kWh	kilowatt hour
LCA	Life Cycle Assessment
LCDN	Life Cycle Data Network
LCIA	Life Cycle Impact Assessment
LCI	Life Cycle Inventory
LT	Lifetime

L	Litre
LDPE	Low Density PolyEthylene
MJ	Mega Joules
m	metre
mL	milliLitre
NACE	Nomenclature Générale des Activités Economiques dans les Communautés Européennes
NDA	Non Disclosure Agreement
NGO	Non-Governmental Organisation
NMVOC	Non-methane volatile compounds
o-PP	oriented PolyPropylene
PC	PolyCarbonate
PE	PolyEthylene
PET	PolyEthylene Terephthalate
P	Precision
PCR	Product Category Rules
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
RF	Reference Flow
RP	Representative Product
SMGP	Single Market for Green Products
SC	Steering Committee
SS	Supporting study
SMRS	Sustainability Measurement & Reporting System
SB	System Boundary
TAB	Technical Advisory Board
TS	Technical Secretariat
TeR	Technological Representativeness
TiR	Time Representativeness
UNEP	United Nations Environment Programme
UUID	Universally Unique Identifier

Definitions

Activity data	This term refers to information which is associated with processes while modelling Life Cycle Inventories (LCI). In the PEF Guide it is also called "non-elementary flows". The aggregated LCI results of the process chains that represent the activities of a process are each multiplied by the corresponding activity data and then combined to derive the environmental footprint associated with that process (See Figure 1). Examples of activity data include quantity of kilowatt-hours of electricity used, quantity of fuel used, output of a process (e.g. waste), number of hours equipment is operated, distance travelled, floor area of a building, etc. In the context of PEF the amounts of ingredients from the bill of material (BOM) shall always be considered as activity data.
Benchmark	A standard or point of reference against which any comparison can be made. In the context of PEF, the term 'benchmark' refers to the ***average*** environmental performance of the representative product sold in the EU market. A benchmark may eventually be used, if appropriate, in the context of communicating environmental performance of a product belonging to the same category.
Bottled drinking water	Bottled drinking water, also known as table water, may originate from various sources, including groundwater, surface water and municipal supply. It must comply with national and EU drinking water regulations, which are different to the rules governing natural mineral water and spring waters. It is commonly treated and disinfected for taste. Purification by chemical and physical treatment, such as chlorination and reverse osmosis, is common practice. Minerals may be restored to this water.
Company-specific data	It refers to directly measured or collected data from one or multiple facilities (site-specific data) that are representative for the activities of the company. It is synonymous to "primary data". To determine the level of representativeness a sampling procedure can be applied.
Cradle to grave	An assessment, including raw material extraction, processing, distribution, storage, use, and disposal or recycling stages. All relevant inputs and outputs are considered for all of the stages of the life cycle.
Downstream	Occurring along a product supply chain after the point of referral.

Electricity tracking	Electricity tracking[1] is the process of assigning electricity generation attributes to electricity consumption.
Input	Product, material or energy flow that enters a unit process. Products and materials include raw materials, intermediate products and co-products. (International Organisation for Standardization (ISO) 14040:2006)
Life cycle	Consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal. (ISO 14040:2006)
Life cycle approach	Takes into consideration the spectrum of resource flows and environmental interventions associated with a product or organisation from a supply chain perspective, including all stages from raw material acquisition through processing, distribution, use, and end-of-life processes, and all relevant related environmental impacts (instead of focusing on a single issue).
Life cycle assessment	Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle. (ISO 14040:2006)

[1] https://ec.europa.eu/energy/intelligent/projects/en/projects/e-track-ii

Natural mineral water	Natural mineral water originates from protected underground water sources and must be safe to drink at source, in its natural state, without disinfection or chemical treatment. Natural mineral water can only come from specific designated groundwater sources, such as natural exists or boreholes. It has a distinctive mineral composition, which always remains stable and which may give properties favourable to health to the water; the constituents must remain unaltered from the point of origin at source right to the final consumer, and must be stated on the label. According to Directive 2009/54/EC of the European Parliament and of the Council of 18 June 2009 on the exploitation and marketing of natural mineral waters (European Union 2009), there are 3 categories of effervescent natural mineral waters: (i) naturally carbonated natural mineral waters, (ii) natural mineral water fortified with gas from the spring and (iii) carbonated natural mineral water (the added carbon dioxide has an origin other than the water table or deposit from which the water comes).
Output	Product, material or energy flow that leaves a unit process. Products and materials include raw materials, intermediate products, co-products and releases. (ISO 14040:2006)
Primary data	This term refers to data from specific processes within the supply-chain of the company applying the PEFCR. Such data may take the form of activity data, or foreground elementary flows (life cycle inventory). Primary data are site-specific, company-specific (if multiple sites for the same product) or supply-chain-specific. Primary data may be obtained through meter readings, purchase records, utility bills, engineering models, direct monitoring, material/product balances, stoichiometry, or other methods for obtaining data from specific processes in the value chain of the company applying the PEFCR. In this Guidance, primary data is synonym of "company-specific data" or "supply-chain specific data".
Product	Any goods or service. (ISO 14040:2006)
Product environmental footprint category rules (PEFCRs)	Are product-type-specific, life-cycle-based rules that complement general methodological guidance for PEF studies by providing further specification at the level of a specific product category. PEFCRs can help to shift the focus of the PEF study towards those aspects and parameters that matter the most, and hence contribute to increased relevance, reproducibility and consistency.

Representative product	The “representative product” may or may not be a real product that one can buy on the EU market. Especially when the market is made up of different technologies, the “representative product” can be a virtual (non-existing) product built, for example, from the average EU sales-weighted characteristics of all technologies around. A PEFCR may include more than one representative product if appropriate.
Sealed container	It refers to a container which is closed by a seal in order to avoid the violation or the contamination of its content.
Secondary data	It refers to data not from specific process within the supply-chain of the company applying the PEFCR. This refers to data that is not directly collected, measured, or estimated by the company, but sourced from a third-party life-cycle-inventory database or other sources. Secondary data includes industry-average data (e.g., from published production data, government statistics, and industry associations), literature studies, engineering studies and patents, and can also be based on financial data, and contain proxy data, and other generic data. Primary data that go through a horizontal aggregation step are considered as secondary data.
Spring water	Spring water comes from a named and recognised underground source. It must be microbiologically safe and wholesome to drink and where it must be bottled directly at source without disinfection or any chemical treatment. The main differences between spring water and natural mineral water are that a stable mineral balance is not a requirement for spring waters (though this is often the case) and mineral composition need not be stated on the label (though many producers nevertheless choose to do so). Also, for chemical parameters, spring water must only meet conventional drinking water standards (as for tap water). There is no formal recognition process for spring waters (as there is for natural mineral water) but quality monitoring and protection of the source must be maintained.
System boundary	Definition of aspects included or excluded from the study. For example, for a “cradle-to-grave” EF analysis, the system boundary should include all activities from the extraction of raw materials through the processing, distribution, storage, use, and disposal or recycling stages.

System boundary diagram	Graphic representation of the system boundary defined for the PEF study.
Functional unit	The functional unit defines the qualitative and quantitative aspects of the function(s) and/or service(s) provided by the product being evaluated; the unit of analysis definition answers the questions “what?”, “how much?”, “how well?”, and “for how long?”
Upstream	Occurring along the supply chain of purchased goods/services prior to entering the system boundary.

1 Introduction

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 B.2.7).

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

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 the chosen option.*

2 General information about the PEFCR

2.1 Technical secretariat

Table 1 Technical secretariat

Name of the organization	Type of organization	Name of the members (not mandatory)
European Federation of Bottled Waters (EFBW) (Coordinator)	Industry	Patricia Fosselard, Ermis Panagiotopoulos
European Container Glass Federation (FEVE)	Industry	Fabrice Rivet, Romeo Pavanello
PETCORE Europe	Industry	Patrick Peuch, replaced by Christian Crepet the 31/03/2017, Casper Van Den Dungen (Plastic Recyclers Europe), Antonio Furfari
Union Européenne des Transporteurs Routiers (UETR)	Industry	Lode Verkinderen
Danone Waters*	Industry	Philippe Diercxsens
Ferrarelle*	Industry	Giuseppe Dadà
Nestlé Waters*	Industry	Bernard Pruvost
San Benedetto	Industry	Davide Manzato, Tullio Versace (since July 2015) with the support of the Italian Environment Ministry (Pieter Ravaglia) and the University of Padova (Alessandro Manzardo, Andrea Loss)
Spadel	Industry	An de Schryver (left on June 2015), Patrick Jobé (since June 2015)
Quantis	Consultant	Violaine Magaud, Sebastien Humbert, Simone Pedrazzini

where * indicates that the organization is a company that performed a supporting study.

2.2 Consultations and stakeholders

A first public consultation was performed from September 24th, 2014 to October 22nd, 2014. A first physical consultation has been held in Brussels on October 08th, 2014 where the definition of PEF

product category, the scope of PEFCR and the definition of the representative product were presented and commented. A first draft PEFCR has been carried out and provided as the deliverable required after the completion of the PEF Screening step (including the critical review of the PEF screening report and model by the European Commission and a third-party review panel). The first draft PEFCR has been submitted to virtual consultation in June 2015 and the comments have been implemented. On October 1st, 2015, the Environmental Footprint Steering Committee approved the draft, thus resulting in launching the PEF supporting studies. Three supporting studies have been finalized in May 2016 and the key learnings have been considered in this new draft PEFCR version.
The development of this PEFCR can be followed on the dedicated page for the PEFCR for packed water through this main page: https://webgate.ec.europa.eu/fpfis/wikis/display/EUENVFP/
After each consultation, comments were analysed and answers were provided on the EF wiki space. When relevant, the PEFCR was adapted accordingly.

Table 2 Consultations and stakeholders

	1st consultation	2nd consultation	3rd consultation
Type	Online and physical	Online	Online
Start	24.09.2014	26.06.2015	29.07.2016
End	22.10.2014	26.07.2015	08.09.2016
Duration	4 weeks	4 weeks	6 weeks
Number of participating stakeholders (online)	3	8	9
Name of organisations	The International EPD System (EPD International AB), Brewers of Europe, ACE	Nestlé Vevey, CEWEP, The International EPD System, Gerolsteiner Brunnen GmbH & Co. KG, Royal Canin, Belgium Federal, thinkstep AG, San Benedetto SpA	ALTRAN ITALIA, ASSOVETRO – Associazione Nazionale Degli industriali del Vetro, British Glass, BV Glass, DG ENV - European commission, ENEA, on behalf of MATTM (*Ministero dell'Ambiente e della Tutela del Territorio e del Mare*), FEVE - The European Container Glass Federation, FCSIV - Fédération des chambres syndicales des industries du verre, Polish Glass

			Manufacurers Federation
Number of participating stakeholders (physical)	10	Not applicable	Not applicable
Number of comments	27	102	47

2.3 Review panel and review requirements of the PEFCR

Table 3 Review panel

Name of the member	Affiliation	Role
Frederic Croison	Deloitte (France)	Chair
Benedikt Kauertz	IFEU (Germany)	
Stéphane Arditi	European Environmental Bureau (EEB)	

The reviewers have verified that the following requirements have been fulfilled:

- *The PEFCR has been developed in accordance with the requirement provided in the PEFCR Guidance Version 6.3, and where appropriate in accordance with the requirements provided in the most recent approved version of the PEF Guide, and supports creation of credible and consistent PEF profiles,*
- *The functional unit, allocation and calculation rules are adequate for the product category under consideration,*
- *Company-specific and secondary datasets used to develop this PEFCR are relevant, representative, and reliable,*
- *The selected LCIA indicators and additional environmental information are appropriate for the product category under consideration and the selection is done in accordance with the guidelines stated in the PEFCR Guidance Version 6.3 and the most recent approved version of the PEF Guide,*
- *The benchmark(s) is(are) correctly defined, and*
- *Both LCA-based data and the additional environmental information prescribed by the PEFCR give a description of the significant environmental aspects associated with the product.*

The detailed review report is provided in Annex 4 of this PEFCR.

2.4 Review statement

This PEFCR has been developed in compliance with Version 6.3 of the PEFCR Guidance, and with the PEF Guide adopted by the Commission on 9 April 2013.

The representative product(s) correctly describe the average product(s) sold in Europe for the product group in scope of this PEFCR[2].

PEF studies carried out in compliance with this PEFCR would reasonably lead to reproducible results and the information included therein may be used to make comparisons and comparative assertions under the prescribed conditions (see chapter on limitations).
The review panel would like to emphasize the positive and constructive attitude of the TS during the review process. No major issues remain untreated at the end of the review process.
Regarding the global review process, the panel notes that the evolutive and "instable" context in which the review was performed (interruption of the review process several months during the remodelling exercise, successive modifications of the reference document (PEFCR Guidance), etc.) may have generated additional effort from the panel members to fulfil the review. However this specific context was completely understandable according to the experimental nature of the Pilot phase.
In addition to these elements, the panel concludes that the review helped enhance the quality of the PEFCR for packed water. Following this process, the reviewers certify that:

- The PEFCR is consistent with the guidelines of the PEF guide and the Guidance previously mentioned;
- Methodological rules (functional unit, allocation, calculation rules, etc.) are adequate for the product category;
- The environmental indicators and additional environmental information are appropriate for the product category and in accordance with the guidelines of the PEF guide and the Guidance;
- The benchmark are correctly defined (definition of performance classes are excluded from the scope of the PEFCR during the Pilot phase);
- Both LCA-based data and the additional environmental information prescribed by the PEFCR give a description of the significant environmental aspects associated with the product.

In view of the update of the PEFCR and future use of the document by EF practitioners, the reviewers propose that in case of any major changes in the PEF guide or in the PEFCR Guidance or in case of major methodological breakthrough which may concern the product category, the PEFCR should be revised before December 31st 2020.

2.5 Geographic validity

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

2.6 Language

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

[2] Note: see "Additional information related to representative products used in PEFCR development" in ANNEX B.4 - Other Annexes.

2.7 Conformance to other documents

This PEFCR has been prepared in conformance with the following documents (in prevailing order):
PEFCR Guidance 6.3
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

3 PEFCR scope

The product category for this PEFCR includes **packed water not sweetened nor flavoured**.
According to EFBW's website (EFBW 2014), water includes **3 varieties**: **i) natural mineral water, ii) spring water and iii) bottled drinking water**, and can be **still or carbonated**[3] (also known as effervescent or sparkling water).[4] All these varieties are in the scope of this document.
The entire life cycle (cradle to grave) of packed water shall be assessed.
For information, there is a limitation on the application of comparison or comparative assertion between different types of packaging materials of packed waters. Since the multi-functionality of packaging is not fully captured, **this PEFCR is not meant to support specific comparison or comparative assertion between packaging materials** (see section 3.6.).

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[3] It contains carbon dioxide gas which may be naturally occurring or may be added.

[4] **Natural mineral water** originates from protected underground water sources and must be safe to drink at source, in its natural state, without disinfection or chemical treatment. Natural mineral water can only come from specific designated groundwater sources, such as natural exists or boreholes. It has a distinctive mineral composition, which always remains stable and which may give properties favourable to health to the water; the constituents must remain unaltered from the point of origin at source right to the final consumer, and must be stated on the label. According to Directive 2009/54/EC of the European Parliament and of the Council of 18 June 2009 on the exploitation and marketing of natural mineral waters (European Union 2009), there are 3 categories of effervescent natural mineral waters: (i) naturally carbonated natural mineral waters, (ii) natural mineral water fortified with gas from the spring and (iii) carbonated natural mineral water (the added carbon dioxide has an origin other than the water table or deposit from which the water comes).
Spring water comes from a named and recognised underground source. It must be microbiologically safe and wholesome to drink, and must be bottled directly at source without disinfection or any chemical treatment. The main differences between spring water and natural mineral water are that a stable mineral balance is not a requirement for spring waters (though this is often the case) and mineral composition need not be stated on the label (though many producers nevertheless choose to do so). Also, for chemical parameters, spring water must only meet conventional drinking water standards (as for tap water). There is no formal recognition process for spring waters (as there is for natural mineral water) but quality monitoring and protection of the source must be maintained.
Bottled drinking water, also known as table water, may originate from various sources, including groundwater, surface water, municipal supply, but also desalinated water. It must comply with national and EU drinking water regulations, which are different to the rules governing natural mineral water and spring waters. It is commonly treated and disinfected for taste. Purification by chemical and physical treatment, such as chlorination and reverse osmosis, is common practice. Minerals may be restored to this water.
According to Canadean (2013), natural mineral water represents 83% of the European packed water market, spring water represents 14% and bottled drinking water represents 3%. In the Europe, 51.6 billion litres of bottled water were consumed in 2012.

3.1 Product classification

The CPA code for the products included in this PEFCR is: C 11.07.11, under the classification: “Manufactured products” → “Beverage” → “Soft drinks, mineral waters and other bottled waters” → “Mineral waters and soft drinks”; (soft drinks are excluded from the scope).

3.2 Representative product(s)

The main function of the product is to provide water from sealed containers ready to be drunk at the mouth contributing to hydration. Some **alternative applications** are present on the market which correspond to the main three sub-categories listed here:

- “**other channels**” applications which include the “on the go” application (characterized by an easily transportable and useable products) and the “at home” application (characterized by products mainly used within a domestic context);
- “**at horeca**” application considers products mainly used at a hotel, restaurant or café; and
- “**at the office**” application considers products mainly used within a professional context.

Three different representative products are considered in this PEFCR, one for each of the following product sub-categories: “other channels”, “at horeca” and “at the office”. The key information for each representative product is presented in Table 4 and illustrated in Figure 1.

Table 4 The three representative products considered in this PEFCR

Sub-categories:	unit	“other channels”	“at horeca”	“at the office”
Primary packaging (main body)				
Material	n/a	PET	Glass	PC
Volume	L	1.5	1.0	18.9
System	n/a	one-way	refillable	refillable (HOD)
Name of the representative product				
		PET one-way 1.5L	Glass refillable 1.0L [5]	HOD PC refillable 5 gallons

Note: 5 gallons = 18.9 liters

Note: the PET considered in these representative products does not include recycled PET; nevertheless 0% of recycled PET content (see also Annex C of Guidance 6.3) does not fit to the real situation in the member states (according to feedback from review panel). This assumption related to representative product overestimates the impact.

[5] This most dominant representative product is especially relevant for restaurants, cafés and hotels. Regarding fast-food and snack entities (i.e., "small restaurants"), PET-based packed water products could be a significant part of this sub-category. Please see "PEFCR_PackedWater_DrafPEFCR_2014-11-17_Quantis.pdf" available on the dedicated webpage (https://webgate.ec.europa.eu/fpfis/wikis/display/EUENVFP/) for a more detailed discussion on this point."

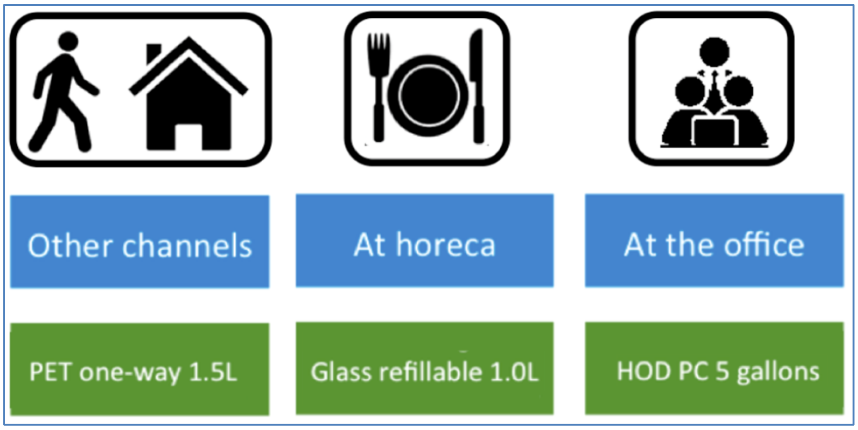


Figure 1 Illustration of the sub-categories (blue) and the representative products (green)

A representative bill of material (mainly focused on packaging) for each representative product was determined based on inputs of the Technical Secretariat (TS), public studies or category guidance already existing. All representative products are based on real products and regarding the primary packaging assumptions, the data refer mainly to still water.
According to Canadean (2013), in 2013 the still water represents about 60% of the European market. The following fractions of carbonated water are considered for each representative product: 40% for the "PET one-way 1.5L" and "Glass refillable 1.0L", and 0% (i.e., still water) for "HOD PC refillable 5 gallons".
Additional information is detailed in "Additional information related to representative products used in PEFCR development" in ANNEX B.4 - Other Annexes.
The screening study is available upon request to the TS coordinator that has the responsibility of distributing it with an adequate disclaimer about its limitations.

3.3 Functional unit and reference flow

The FU is ***to provide 100 ml of water from sealed containers ready to be drunk at the mouth contributing to hydration***. Table 5 *defines the key aspects used to define the FU.*

Table 5 Key aspects of the FU

What?	To provide water from sealed containers ready to be drunk at the mouth contributing to hydration
How much?	100 ml
*How well?**	To satisfy the quality requirements set at National and / or at EU level for the following varieties: i) natural mineral water, ii) spring water and iii) bottled drinking water, and can be still or carbonated (also known as effervescent or sparkling water) *The differences in quality requirements could not be incorporated so far. This limitation is recognized and requires further developments in order to improve fair comparisons.*
*How long?**	For the functional unit, the duration is "at one take", due to the low quantity (100 ml) The duration is related to the product conservation (i.e. up to the best before date), which depends on multiple parameters such as type of product (still or carbonated water), type of packaging and specific storage conditions, but is usually 2 years for still waters (independently of the packaging material), and for carbonated waters 9 to 12 months for PET containers and 24 months for glass containers. However, water can always be drunk even long time after the end of the "Best before date".

* The description of the functional unit does not capture adequately the function(s) of packaging: in particular 1) the duration ("how long") and 2) the level of quality ("how well") are not specific to the function provided by the packaging.
As a result, there is a limitation on the application of comparison or comparative assertion between different packaging materials of packed waters. Since the multi-functionality of packaging is not fully captured, **this PEFCR is not meant to support specific comparison or comparative assertion between packaging materials**.

The reference flow is the amount of product needed to fulfil the defined function and shall be measured as the ratio between the functional unit and the capacity of the product (volume/quantity of water per product, i.e. contained in primary packaging). All quantitative input and output data collected in the study shall be calculated in relation to this reference flow.

Water can always be drunk even long time after the end of the "Best before date". The "Best before date" is specific to each company. For still waters, the "Best before date" is rather homogenous for all brands: the majority define it as 2 years independently of the packaging material used. For carbonated waters, the "Best before date" must be appropriate to the permeability of the packaging materials (bottle and cap). The majority of PET containers has a "Best before date" of 9

to 12 months, while glass containers have a “Best before date” of 24 months. The choice of the “Best before date” by a company may imply changes of packaging type and specific storage conditions.
Since the stay of containers of packed water in the warehouse is in average limited to few weeks or less, this value for storage time is much smaller than the value of the "Best before date", therefore in this PEFCR, the “Best before date” is not taken into account in the functional unit and its value has therefore no direct consequence to the PEF results.

3.4 System boundary

The following life cycle stages and processes shall be included in the system boundary:

Table 6 Life cycle stages

Life cycle stage	***Short description of the processes included***
Packaging materials[6]	The life cycle stage “Packaging materials” includes the packaging raw materials production, the forming processes of packaging, and the transport of materials to water factory. Transportation of used empty refillable containers back to water factory is included in the stage “Packaging materials[7]”.
Manufacturing	The life cycle stage “Manufacturing” includes the steps of water extraction, containers filling and grouping, gas production for carbonated water and washing and sterilization of refillable containers. The life cycle stage “Manufacturing” includes the energy and water consumption of the entire water factory, i.e. it includes the energy and water consumption of the different facilities and activities on water factory site (e.g. air conditioning, heating, washing of the lines, loss rates). Those additional consumptions can be added in the sub-stage “Water extraction, filling and grouping”.
Distribution	The life cycle stage “Distribution” includes the different transport steps for distribution, as well as storage in warehouses and retailer (only for “Other channels” subcategory).
Use	The life cycle stage “Use” includes the chilling operations at final user, the gas emissions of carbonated water, but also glass and plastic cup (if any) production and end-of-life and dishwashing.
Packaging end-of-life	The life cycle stage “Packaging end-of-life” includes the transport and treatment of the different packaging waste (primary, secondary and

[6] This life cycle stage corresponds to raw material acquisition and processing
[7] In the current version of this PEFCR, transportation of used empty refillable containers back to water factory is included in the stage “Packaging materials” rather than in “Manufacturing” or “Distribution”. This might be adapted in a next revision of the document.

	tertiary packaging)[8].

The Figure 2 presents the system boundary diagram that shall be applied.

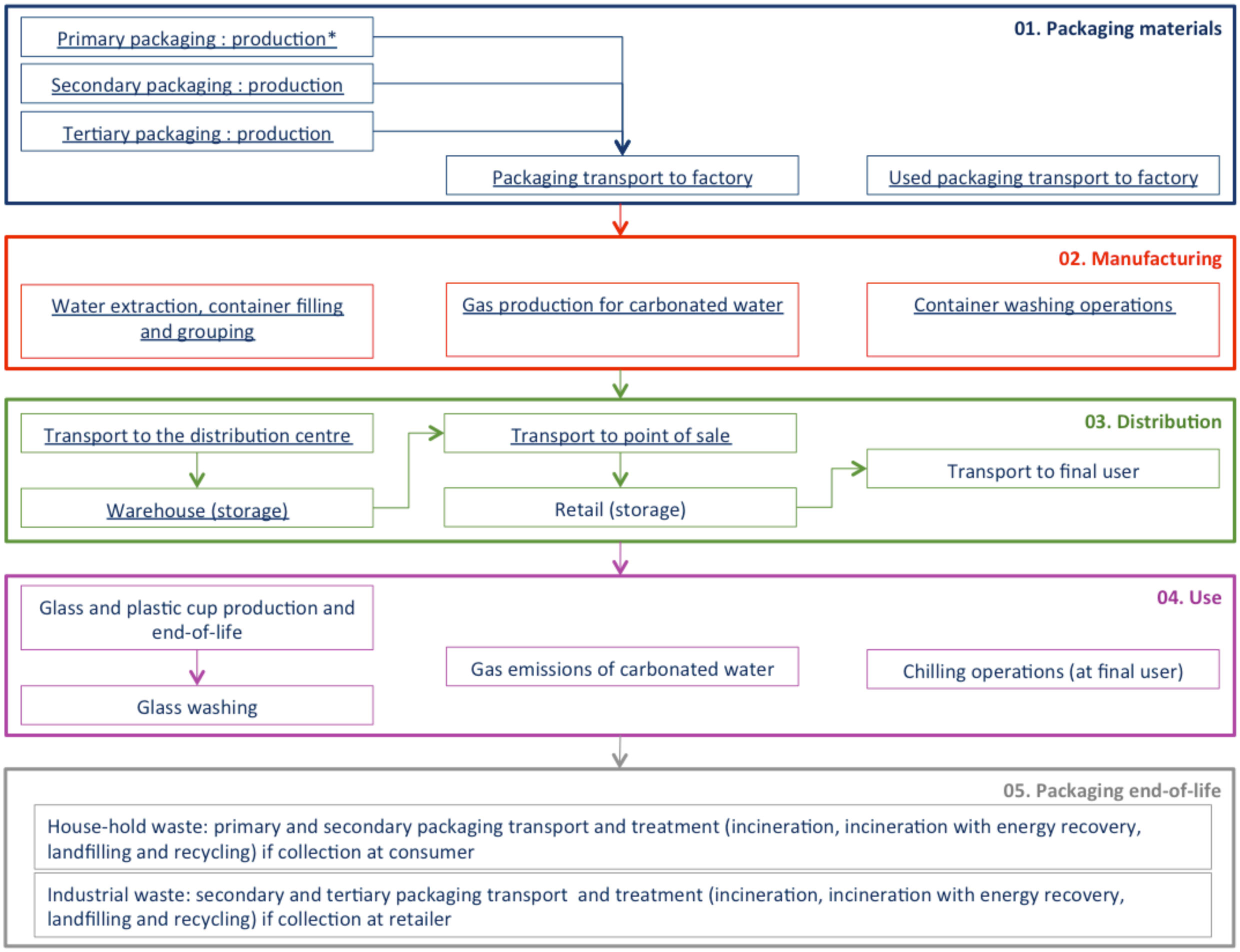


Figure 2 System boundaries and details on each life cycle stage considered. Processes forming the foreground system are underlined.

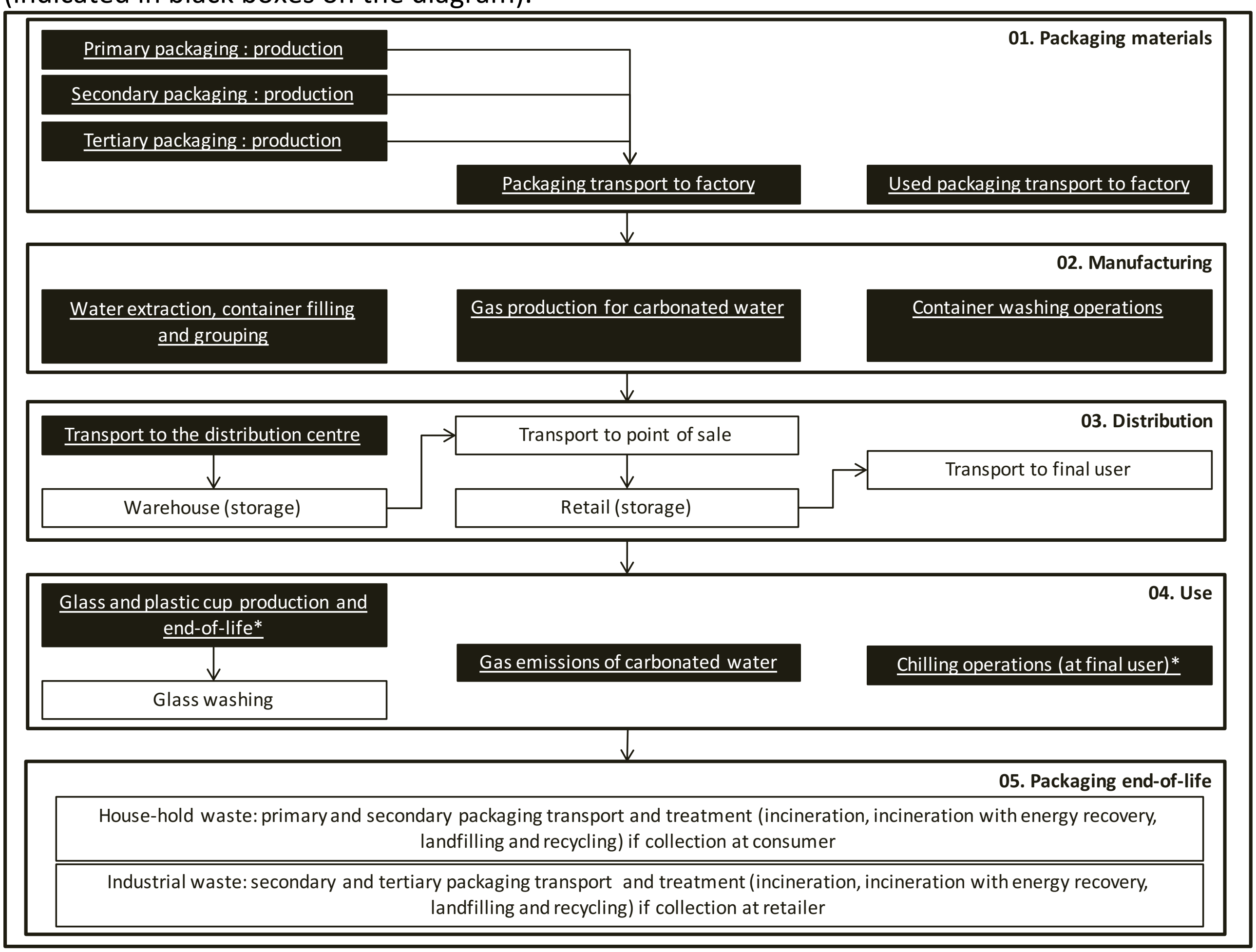
* Production steps in "01. Packaging materials" shall include: i) production of raw materials and ii) processing (e.g., PET injection in order to make preforms, blow moulding of the PET preforms, heating and moulding for the glass making, PC extrusion into a hollow tube, PC blow moulding of the desired container).

Note: The life cycle stage "Manufacturing" includes the energy and water consumption of the entire water factory, i.e. it includes the energy and water consumption of the different facilities and activities on water factory site (e.g. air conditioning, heating, washing of the lines, loss rates). Those additional consumptions can be added in the sub-stage "Water extraction, filling and grouping".

[8] The packaging end-of-life is the only waste considered in the life cycle stage "end-of-life" for water. For example, the end-of-life of a glass that could be used in the use stage is included within the use stage, and not in the "end-of-life" stage.

Note: Gas production for carbonated water includes all the operations necessary to carbonation of water, i.e. gas production or gas extraction, gas transportation, gas storage and gas injection. Note: Losses of material during packaging forming processes shall be taken into account at least for primary packaging elements They should be taken into account for secondary and tertiary packaging, whenever possible. The applicant shall justify why packaging losses were not considered for secondary and tertiary packaging, if applicable.

Within each of these stages, all identifiable "upstream" inputs are included to provide a comprehensive view of the product system. Those upstream inputs are included in the background datasets. When relevant, infrastructure is also included. In this way, the production chains of all inputs are traced back to the original extraction of raw materials.
The Figure 3 presents the diagram of the processes for which company-specific data are required (indicated in black boxes on the diagram).



** Corresponds to processes for which company-specific data are required only for HOD systems*

Figure 3 Processes for which company-specific data are required (indicated in black).

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

- Water factory infrastructures, including building and machinery.

Each PEF study done in accordance with this PEFCR shall provide in the PEF study a diagram indicating the organizational boundary, to highlight those activities under the control of the organization and those falling into Situation 1, 2 or 3 of the data need matrix.

3.5 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.

Table 7 List of the impact categories to be used to calculate the PEF profile

Impact category	*Indicator*	*Unit*	*Recommended default LCIA method*
Climate change[9]	*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*~~[9]			
~~*– Climate change – land use and land transformation*~~[9]			
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*	*disease incidence*	*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**	*Comparative Toxic Unit for ecosystems (CTU_e)*	*CTUe*	*USEtox model, (Rosenbaum et al, 2008)*

[9] The sub-indicators 'Climate change - biogenic' and 'Climate change - land use and land transformation' shall not be reported separately because their contribution to the total climate change impact, based on the benchmark results, is less than 5% each."

Impact category	Indicator	Unit	Recommended default LCIA method
Land use	• *Soil quality index*[10] • *Biotic production* • *Erosion resistance* • *Mechanical filtration* • *Groundwater replenishment*	• *Dimensionless (pt)* • *kg biotic production*[11] • *kg soil* • m^3 *water* • m^3 *groundwater*	• *Soil quality index based on LANCA (EC-JRC)*[12] • *LANCA (Beck et al. 2010)* • *LANCA (Beck et al. 2010)* • *LANCA (Beck et al. 2010)* • *LANCA (Beck et al. 2010)*
*Water use***	*User deprivation potential (deprivation-weighted water consumption)*	m^3 *world* $_{eq}$	*Available WAter REmaining (AWARE) Boulay et al., 2016*
Resource use, minerals and metals	*Abiotic resource depletion (ADP ultimate reserves)*	*kg Sb* $_{eq}$	*CML 2002 (Guinée et al., 2002) and van Oers et al. 2002.*
Resource use, fossils	*Abiotic resource depletion – fossil fuels (ADP-fossil)*	*MJ*	*CML 2002 (Guinée et al., 2002) and van Oers et al. 2002*

*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.
** The results for water use might be overestimated and shall therefore be interpreted with caution. Some of the EF datasets tendered during the pilot phase and used in this PEFCR/OEFSR include inconsistencies in the regionalization and elementary flow implementations. This problem has nothing to do with the impact assessment method or the implementability of EF methods, but occurred during the technical development of some of the datasets. The PEFCR/OEFSR remains valid and usable. The affected EF datasets will be corrected by mid-2019. At that time it will be possible to review this PEFCR/OEFSR accordingly, if seen necessary.

The full list of normalization factors and weighting factors are available in Annex 1 - List of EF normalisation factors and weighting factors.
The full list of characterization factors (EC-JRC, 2017a) is available at this link http://eplca.jrc.ec.europa.eu/LCDN/developer.xhtml

3.6 Limitations

Limitation valid for any PEF results

The results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. This disclaimer shall to be put in any PEF report.

Limitation related to the multi-functionality of the packaging

Packaging is included in the scope of the PEFCR as it is an integral part of the final packed water products. In accordance with the PEF Pilot Guidance Version 6.3, paragraph 6.3, “Meaningful comparisons can only be made when products are capable of fulfilling the same function (as expressed in the functional unit)”and “an equally important objective is to enable comparisons and comparative assertions in all cases when this is considered feasible, relevant and appropriate”.

[10] This index is the result of the aggregation, performed by JRC, of the 4 indicators provided by LANCA model as indicators for land use
[11] This refers to occupation. In case of transformation the LANCA indicators are without the year (a)
[12] Forthcoming document on the update of the recommended Impact Assessment methods and factors for the EF

Packaging is a multi-functional product: according to a report of the UNEP/SETAC Life Cycle Initiative, "the most important role of packaging is to protect and contain the product during distribution and storage. When designed intelligently, it can ensure product safety—particularly important for food and beverages—and minimize losses. In the food and beverage industry, packaging also serves to preserve the product and prevent spoilage, provide information, provide convenience and portion control, and market to the consumer"[13].

However, the multi-functionality of packaging is not fully captured by the current LCA and PEF method'[14] in particular in the context of comparison or comparative assertions. In the PEFCR of packed water, the description of the functional unit does not capture adequately the function(s) of packaging: e.g., the duration ("how long") and the level of quality ("how well") are not specific to the function provided by the packaging. As a result, there is a limitation on the application of comparison or comparative assertion between different packaging materials of packed water. Since the multi-functionality of packaging is not fully captured, this PEFCR is not meant to support specific comparison or comparative assertion between packaging materials.

Limitation related to the representative product of the sub-category "Other channels"

The PET considered in these representative products does not include recycled PET; nevertheless 0% of recycled PET content (see also Annex C of Guidance 6.3) does not fit to the real situation in the member states (according to feedback from review panel). This assumption related to representative product overestimates the impact.

4 Most relevant impact categories, life cycle stages and processes

4.1 Sub-category "other channels"

The most relevant impact categories for the sub-category "other channels*" in scope of this PEFCR are the following*:

- Climate change,
- Resource use, fossils,
- Resource use, mineral and metals.

The most relevant life cycle stages for the sub-category "other channels*" in scope of this PEFCR are the following:*

- Packaging materials,
- Distribution,
- Use,
- Packaging end-of-life.

The most relevant processes for the sub-category "other channels" in scope of this PEFCR are the following.

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[13] UNEP/SETAC Life Cycle Initiative, 2013: An Analysis of Life Cycle Assessment in Packaging for Food & Beverage Applications

[14] Outcomes of the EF TAB meeting, 31st May 2016

Table 8 List of the most relevant processes for the sub-category "other channels"

Impact category	Processes
Climate change	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	PET granulates, bottle grade| via purified terephthalic acid (PTA) and ethylene glycol| production mix, at plant| 192.17 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Passenger car, average| technology mix, gasoline and diesel driven, Euro 3-5, passenger car| consumption mix, to consumer| engine size from 1,4l up to >2l {GLO} [LCI result] (from life cycle stage Distribution)
	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	Injection moulding| plastic injection moulding| production mix, at plant| for PP, HDPE and PE {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Aluminium ingot (copper main solute)| primary production, aluminium casting and alloying| single route, at plant| 2.7 g/cm3 {EU-28+3} [LCI result] (from life cycle stages Use)
	Waste incineration of PET| waste-to-energy plant with dry flue gas treatment, including transport and pre-treatment| production mix, at consumer| polyethylene terephthalate waste {EU-28+EFTA} [LCI result] (from life cycle stages Packaging end-of-life)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution)
	Stretch blow moulding| stretch blow moulding| production mix, at plant| 3% loss, 5MJ electricity consumption {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Thermal energy from light fuel oil (LFO)| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing)
Resource use, fossils	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturint, Distribution, Use)
	PET granulates, bottle grade| via purified terephthalic acid (PTA) and ethylene glycol| production mix, at plant| 192.17 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	Passenger car, average| technology mix, gasoline and diesel driven, Euro 3-5, passenger car| consumption mix, to consumer| engine size from 1,4l up to >2l {GLO} [LCI result] (from life cycle stages Distribution)

	Injection moulding| plastic injection moulding| production mix, at plant| for PP, HDPE and PE {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use)
	Plastic Film, PE| raw material production, plastic extrusion| production mix, at plant| grammage: 0.0943 kg/m2 {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Screw cap, HDPE| raw material production, plastic injection moulding| production mix, at plant| 0.91- 0.96 g/cm3, 28 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Aluminium ingot (copper main solute)| primary production, aluminium casting and alloying| single route, at plant| 2.7 g/cm3 {EU-28+3} [LCI result] (from life cycle stages Use)
Resource use, mineral and metals	PET granulates, bottle grade| via purified terephthalic acid (PTA) and ethylene glycol| production mix, at plant| 192.17 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Copper cathode| production mix| at plant| per kg {EU-28+3} [LCI result] (from life cycle stages Use)

4.2 Sub-category "at horeca"

The most relevant impact categories for the sub-category "at horeca" *in scope of this PEFCR are the following*:

- Climate change,
- Photochemical ozone formation, human health,
- Acidification,
- Resource use, fossils,
- Resource use, mineral and metals.

The most relevant life cycle stages for the sub-category "at horeca" *in scope of this PEFCR are the following:*

- Packaging materials,
- Distribution,
- Use,
- Packaging end-of-life.

Table 9 List of the most relevant processes for the sub-category "at horeca"

Impact category	Processes
Climate change	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	Ring pull cap, aluminium| metal production, cap manufacturing| production mix, at plant| aluminium with plastic inner liner {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)

	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution)
	Container glass, virgin| Virgin container glass (all sizes) to be used for glass bottles and food jars| Production mix. Technology mix. EU-28 + EFTA| 1 kg of formed and finished container glass {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use, Packaging end-of-life)
	Container glass, ER, Recycled Content 100% (provided by FEVE) - Aggregated | Recycled container glass (all sizes) to be used for glass bottles and food jars | Production mix. Technology mix. EU-28 + EFTA | 1 kg of formed and finished container glass {EU-27} [LCI result] (from life cycle stages Packaging materials, Use, Packaging end-of-life)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	HDPE granulates| Polymerisation of ethylene| production mix, at plant| 0.91- 0.96 g/cm3, 28 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Articulated lorry transport, Euro 4, Total weight 7,5-12 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| 7,5 t - 12t gross weight / 5t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution)
	Aluminium ingot (copper main solute)| primary production, aluminium casting and alloying| single route, at plant| 2.7 g/cm3 {EU-28+3} [LCI result] (from life cycle stages Use)
Photochemical ozone formation, human health	C 001 | Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	Container glass, ER, Recycled Content 100% (provided by FEVE) - Aggregated | Recycled container glass (all sizes) to be used for glass bottles and food jars | Production mix. Technology mix. EU-28 + EFTA | 1 kg of formed and finished container glass {EU-27} [LCI result] (from life cycle stages Packaging materials, Use, Packaging end-of-life)
	Articulated lorry transport, Euro 4, Total weight 7,5-12 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| 7,5 t - 12t gross weight / 5t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution)
	Ring pull cap, aluminium| metal production, cap manufacturing| production mix, at plant| aluminium with plastic inner liner {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
Acidification	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation]

	(from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	Ring pull cap, aluminium| metal production, cap manufacturing| production mix, at plant| aluminium with plastic inner liner {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	C 002 | Articulated lorry transport, Euro 4, Total weight 7,5-12 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| 7,5 t - 12t gross weight / 5t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution)
	Container glass, ER, Recycled Content 100% (provided by FEVE) - Aggregated | Recycled container glass (all sizes) to be used for glass bottles and food jars | Production mix. Technology mix. EU-28 + EFTA | 1 kg of formed and finished container glass {EU-27} [LCI result] (from life cycle stages Packaging materials, Use, Packaging end-of-life)
	Copper cathode| production mix| at plant| per kg {EU-28+3} [LCI result] (from life cycle stages Use)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	Container glass, virgin| Virgin container glass (all sizes) to be used for glass bottles and food jars| Production mix. Technology mix. EU-28 + EFTA| 1 kg of formed and finished container glass {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use, Packaging end-of-life)
[redacted]	
Resource use, fossils	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Use, Packaging end-of-life)
	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	HDPE granulates| Polymerisation of ethylene| production mix, at plant| 0.91- 0.96 g/cm3, 28 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Use)
	Ring pull cap, aluminium| metal production, cap manufacturing| production mix, at plant| aluminium with plastic inner liner {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials)
	Container glass, ER, Recycled Content 100% (provided by FEVE) - Aggregated | Recycled container glass (all sizes) to be used for glass bottles and food jars | Production mix. Technology mix. EU-28 + EFTA | 1 kg of formed and finished container glass {EU-27} [LCI result] (from life cycle stages Packaging materials, Use, Packaging end-of-life)
	Container glass, virgin| Virgin container glass (all sizes) to be used for glass bottles and food jars| Production mix. Technology mix. EU-28 + EFTA| 1 kg of formed and finished container glass {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use, Packaging end-of-life)
[redacted]	
	Copper cathode| production mix| at plant| per kg {EU-28+3} [LCI result]

Resource use, mineral and metals	(from life cycle stages Use)
	Aluminium ingot (copper main solute)| primary production, aluminium casting and alloying| single route, at plant| 2.7 g/cm3 {EU-28+3} [LCI result] (from life cycle stages Use)
	Steel electrogalvanized coil| steel sheet electrogalvanization| single route, at plant| 1.5 mm sheet thickness, 0.02 mm zinc thickness {EU-28+EFTA} [LCI result] (from life cycle stages Use)
	Steel cold rolled coil| blast furnace route| single route, at plant| carbon steel {EU-28+EFTA} [LCI result] (from life cycle stages Use, Packaging end-of-life)
Resource use, mineral and metals (WITHOUT THE USE STAGE)	Steel cold rolled coil| blast furnace route| single route, at plant| carbon steel {EU-28+EFTA} [LCI result] (from life cycle stages Packaging end-of-life)
	Soda production| technology mix| production mix, at plant| 100% active substance {RER} [LCI result] (from life cycle stages Manufacturing)
	Container glass, ER, Recycled Content 100% (provided by FEVE) - Aggregated | Recycled container glass (all sizes) to be used for glass bottles and food jars | Production mix. Technology mix. EU-28 + EFTA | 1 kg of formed and finished container glass {EU-27} [LCI result] (from life cycle stages Packaging materials, Packaging end-of-life)
	Container glass, virgin| Virgin container glass (all sizes) to be used for glass bottles and food jars| Production mix. Technology mix. EU-28 + EFTA| 1 kg of formed and finished container glass {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Packaging end-of-life)

4.3 Sub-category “at the office”

The most relevant impact categories for the sub-category “at the office” *in scope of this PEFCR are the following*:

- Climate change,
- Resource use, fossils,
- Acidification,
- Particulate matter.

The most relevant life cycle stages for the sub-category “at the office” *in scope of this PEFCR are the following:*

- Packaging materials,
- Manufacturing,
- Distribution,
- Use.

Table 10 List of the most relevant processes for the sub-category “at the office”

Impact category	Processes
Climate change	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result]

	(from life cycle stages Manufacturing, Distribution, Use)
	PP granulates| polymerisation of propene| production mix, at plant| 0.91 g/cm3, 42.08 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use)
	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution)
	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
	Injection moulding| plastic injection moulding| production mix, at plant| for PP, HDPE and PE {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use)
	Articulated lorry transport, Euro 4, Total weight 7,5-12 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| 7,5 t - 12t gross weight / 5t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Distribution)
Climate change (WITHOUT THE USE STAGE)	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution)
	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
	Articulated lorry transport, Euro 4, Total weight 7,5-12 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| 7,5 t - 12t gross weight / 5t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Distribution)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
Particulate matter	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	PP granulates| polymerisation of propene| production mix, at plant| 0.91 g/cm3, 42.08 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use)
	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
	Injection moulding| plastic injection moulding| production mix, at plant| for PP, HDPE and PE {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use)

	Waste incineration of PP| waste-to-energy plant with dry flue gas treatment, including transport and pre-treatment| production mix, at consumer| polypropylene waste {EU-28+EFTA} [LCI result] (from life cycle stages Packaging end-of-life)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
Particulate matter (WITHOUT THE USE STAGE)	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
	Articulated lorry transport, Euro 4, Total weight 7,5-12 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| 7,5 t - 12t gross weight / 5t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Distribution)
	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution)
	Soda production| technology mix| production mix, at plant| 100% active substance {RER} [LCI result] (from life cycle stages Manufacturing)
Acidification	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
	PP granulates| polymerisation of propene| production mix, at plant| 0.91 g/cm3, 42.08 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use)
	Articulated lorry transport, Euro 4, Total weight 7,5-12 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| 7,5 t - 12t gross weight / 5t payload capacity {EU-28+3} [Unit process, single operation] (from life cycle stages Distribution)
	Injection moulding| plastic injection moulding| production mix, at plant| for PP, HDPE and PE {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use)
Resource use, fossils	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)

	PP granulates| polymerisation of propene| production mix, at plant| 0.91 g/cm3, 42.08 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Use)
	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
[redacted]	
Resource use, fossils (WITHOUT THE USE STAGE)	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution)
	Diesel mix at refinery| from crude oil| production mix, at refinery| 10 ppm sulphur, 7.23 wt.% bio components {EU-28+3} [LCI result] (from life cycle stages Packaging materials, Distribution, Packaging end-of-life)
	Electricity grid mix 1kV-60kV| AC, technology mix| consumption mix, at consumer| 1kV - 60kV {EU-28+3} [LCI result] (from life cycle stages Manufacturing, Distribution, Use)
	LDPE granulates| Polymerisation of ethylene| production mix, at plant| 0.91- 0.96 g/cm3, 28 g/mol per repeating unit {EU-28+EFTA} [LCI result] (from life cycle stages Packaging materials, Packaging end-of-life)

5 Life cycle inventory

All newly created processes shall be EF-compliant.

Sampling is not allowed.

5.1 List of mandatory company-specific data

This section describes in detail the requirements regarding the collection of company-specific data.

Most of company-specific data are related to the description of the packed water product (i.e., mainly water and packaging specificities) and to the transport processes. In addition, in some cases, some use and packaging end-of-life specificities are known by the companies.

5.1.1 Life cycle stage: packaging materials

This section describes in detail the requirements regarding the collection of company-specific data for the life cycle stage "packaging materials". The mandatory company-specific data to be collected and default datasets to be used (when relevant) are listed in the tables below for primary packaging, secondary packaging, tertiary packaging and Packaging transport to water factory respectively.

Primary packaging production

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*	
Primary body											
Type of material	Composition of packaging	-	For virgin PET: PET granulates, bottle grade| via purified terephthalic acid (PTA) and ethylene glycol| production mix, at plant| 192.17 g/mol per repeating unit {EU-28+EFTA} [LCI result]	http://lcdn.thinkstep.com/Node/	61042919-2439-45d0-ba10-66e221167a24	1	1	2	2	1	
			For recycled PET: Polyethylene terephthalate (PET) granulate secondary no metal fraction | from post-consumer plastic waste, via grinding, metal separation, washing, pelletization | single route, at consumer | plastic waste without metal fraction {EU-28} [Partly terminated system]	n/a	60dd82e4-46d0-4735-a8ad-94e708a2b92a	n/a	n/a	n/a	n/a	n/a	Not EF-compliant (data gap provided by the EC)
			For virgin Glass: Container glass, virgin ; Virgin container glass (all sizes) to be used for glass bottles and food	http://lcdn.thinkstep.com/No	5ccf94ab-173c-	2	2	2	2	2	

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*	
			jars ; Production mix. Technology mix. EU-28 + EFTA	de/	4688-bcc8-d434166be45e						
			For recycled Glass: Container glass, ER, Recycled Content 100% (provided by FEVE) - Aggregated ; Recycled container glass (all sizes) to be used for glass bottles and food jars ; Production mix. Technology mix. EU-28 + EFTA	http://soda.rdc.yp5.be/showProcess.xhtml?uuid=ab4e945f-9955-4414-b3fb-d42507cc4e2d&stock=FEVE_EF_comp	ab4e945f-9955-4414-b3fb-d42507cc4e2d	2	2	2	2		
			For virgin poly-carbonate: Polycarbonate (PC) granulate ; Technology mix, dipenyl carbonate route and phosgene route ; production mix, at plant	http://lcdn.thinkstep.com/Node/	e7202044-f727-4aa7-bfc4-a8cfd1ed5812	1	1	2	2	1	

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*	
			For secondary polycarbonate: Recycling of polypropylene (PP) plastic | from post-consumer waste, via washing, granulation, pelletization | production mix, at plant | 90% recycling rate {US} [Partly terminated system]	n/a	47a967ec-a648-4ede-afb6-23a2289baef9	n/a	n/a	n/a	n/a	n/a	Not EF-compliant (data gap provided by the EC)
			For other packaging materials	http://lcdn.thinkstep.com/Node/							
Recycled content (R1)	Measurement	%	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Mass of packaging	Measurement	kg/ product	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Volume	Volume indicated on the packaging	ml/ product	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Number of rotations	See section 6.1	Rotations/ product	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Primary body plastic forming processes – Injection moulding[15] (When run by the company)											

[15] Regarding plastic forming processes, to differentiate the energy and water consumption for plastic packaging forming processes and the energy and water consumption for other manufacturing processes, it can be assumed that electricity and natural gas consumption are the same as for the screening study for manufacturing processes (i.e., water withdrawal (not including packed water) = 0.63 l/l; electricity consumption = 0.01 kWh/l; natural gas consumption = 0.013 MJ/l), and the left over energy consumption of the water factory can be allocated to plastic packaging forming processes.

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*	
Electricity	Measurement	kWh/ kg of injected plastic	See section 5.9	http://lcdn.thinkstep.com/Node/	n/a	n/a	n/a	n/a	n/a	n/a	Depends on the manufacturing plant location
Natural gas	Measurement	MJ/ kg of injected plastic	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3} [LCI result]	http://lcdn.thinkstep.com/Node/	2c25b96c-81e8-455a-b305-31d657b23579	1	1	1	2	1	
Water for cooling	Measurement	l/ kg of injected plastic	Tap water technology mix at user per kg water	https://lcdn.quantis-software.com/PEF/	be64f962-1daf-4dec-89e6-c4dcad15c4df	2	2	2	2	2	
Primary body plastic forming processes – Stretch blow moulding[Erreur ! Le signet n'est pas défini.,15] (When run by the company)											
Electricity	Measurement	kWh/ kg of	See section 5.9	http://lcd	n/a	n/a	n/a	n/a	n/a	n/a	Depends

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*	
		injected plastic		n.thinkstep.com/Node/							on the manufacturing plant location
Water for cooling	Measurement	l/ kg of injected plastic	Tap water technology mix at user per kg water	https://lcdn.quantis-software.com/PEF/	be64f962-1daf-4dec-89e6-c4dcad15c4df	2	2	2	2	2	
Primary body plastic forming processes (When not run by the company)											
Injection moulding	n/a	kg of injected plastic	Injection moulding plastic injection moulding production mix, at plant for PP, HDPE and PE	http://lcdn.thinkstep.com/Node/	aaa28831-39f1-42e3-bd83-a06889d54f35	2	3	3	2	2	
pipes extrusion (for HOD, pipes extrusion used rather than injection	n/a	kg of extruded plastic	Pipes extrusion; pipe production by plastic extrusion ; production mix, at plant	http://lcdn.thinkstep.com/Node/	6b8ab474-e7c1-49ca-a61f-	2	2	2	2	2	

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*	
moulding, followed by stretch blow moulding))					00e511ee9c14						
Stretch blow moulding	n/a	kg of stretched plastic	Stretch blow moulding stretch blow moulding production mix, at plant 3% loss, 5MJ electricity consumption	http://lcdn.thinkstep.com/Node/	6d55b9c3-ac73-424a-8a68-b76cf0e162d3	2	2	3	2	2	
Cap											
Weight and type of cap	Measurement	g	Screw cap, aluminium metal production, cap manufacturing production mix, at plant aluminium with plastic inner liner	http://lcdn.thinkstep.com/Node/	d33b520d-caa9-454a-bf9f-fa06d9bb99ca	2	2	2	2	2	Type of cap depends on the type of packaging
			Ring pull cap, aluminium metal production, cap manufacturing production mix, at plant aluminium with plastic inner liner	http://lcdn.thinkstep.com/Node/	78ec7b2d-d90a-4bda-b9b6-	2	2	2	2	2	

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*	
					1448cd a302cf						
			Screw cap, HDPE raw material production, plastic injection moulding production mix, at plant 0.91- 0.96 g/cm3, 28 g/mol per repeating unit	http://lcdn.thinkstep.com/Node/	fa433faf-53fe-4fd1-a6c7-40ded5eee307	2	2	2	2	2	
			Screw cap, PP raw material production, plastic injection moulding production mix, at plant 0.91 g/cm3, 42.08 g/mol per repeating unit	http://lcdn.thinkstep.com/Node/	05a26a08-1ab5-4523-b25f-41b9be0ffc76	2	2	2	2	2	
			Other material	http://lcdn.thinkstep.com/Node/	n/a	n/a	n/a	n/a	n/a	n/a	
Label											

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*	
Surface (or weight) and type of cap	Measurement (or supplier indications)	m^2	Label, OPP PP extrusion and stretching, label production production mix, at plant thickness: 100 µm, grammage: 0,0915 kg/m2	http://lcdn.thinkstep.com/Node/	fd07cf58-bb02-49c7-9935-ae0100c379b3	2	2	2	2	2	Type of label depends on the type of packaging Weight of label can be converted into m2 by using the density of each default dataset
		m^2	Label, PP Polymerisation of propene, label production by extrusion production mix, at plant 0.91 g/cm3, 42.08 g/mol per repeating unit	http://lcdn.thinkstep.com/Node/	46d6da37-bee1-44f8-bd28-f615d827c41c	2	2	2	2	2	
		m^2	Label, plastic Polymerisation of ethylene, label production by extrusion production mix, at plant thickness: 100 µm, grammage: 0.0943 kg/m2	http://lcdn.thinkstep.com/Node/	3087a31b-a9f1-4fad-ad9b-2d7b88111f60	2	2	2	2	2	
		m^2	Label, paper Kraft pulping process, label production production mix, at plant thickness: 77 µm, grammage: 90 g/m2	http://lcdn.thinkstep.com/Node/	7db01ade-8476-4c20-9c0b-	2	2	2	2	2	

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*	
					7faff30 d9f9f						

Secondary packaging production

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*	
Secondary packaging (plastic film)											
Surface (or weight) of plastic film	Measurement	m^2	Plastic Film, PE raw material production, plastic extrusion production mix, at plant grammage: 0.0943 kg/m2	http://lcdn.thinkstep.com/Node/	cc8ee5f1-84b3-4e04-bae3-6a531aafb606	1	1	2	2	1	Weight of plastic film can be converted into m^2 by using the density of the default dataset
Capacity (number of primary	Measurement/palletization	Number of primary pack/ secondary	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	To calculate the

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*	
packaging per secondary packaging)		pack									amount of packaging per FU
Secondary packaging (crate)											
Weight and type of material of crate	Measurement	kg	Virgin HDPE: HDPE granulates| Polymerisation of ethylene| production mix, at plant| 0.91- 0.96 g/cm3, 28 g/mol per repeating unit {EU-28+EFTA} [LCI result]	http://lcdn.thinkstep.com/Node/	a3aefe5b-33c9-4f0c-87ec-d0291445cc61	1	1	1	2	1	
			For secondary HDPE: Recycling of polypropylene (PP) plastic | from post-consumer waste, via washing, granulation, pelletization | production mix, at plant | 90% recycling rate {US} [Partly terminated system]	n/a	47a967ec-a648-4ede-afb6-23a2289baef9	n/a	n/a	n/a	n/a	n/a	Not EF-compliant (data gap provided by the EC)
Recycled content (R1)	Supplier specifications	%	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Capacity (number of primary packaging per	Measurement/palletization	Number of primary pack/ secondary	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	To calculate the amount of

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*	
secondary packaging)		pack									packaging per FU
Number of rotations	See section 6.1	Rotations/ product	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	To calculate the amount of packaging per FU

Tertiary packaging production

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*	
Tertiary packaging (plastic shrink, wrap)											
Surface (or weight) of plastic shrink	Measurement	m^2	Plastic shrink, wrap raw material production, plastic extrusion production mix, at plant thickness: 120 µm, grammage: 0,11016 kg/m2	http://lcdn.thinkstep.com/Node/	017de0d2-c8f8-4208-b1b5-357a815f2dd8	2	2	2	2	2	Weight of plastic shrink can be converted into m^2 by using the density of the default dataset
Recycled content (R1)	Measurement	%	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Capacity (number of primary packaging per secondary packaging)	Measurement(palletization	Number of primary pack/ tertiary pack	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	To calculate the amount of packaging per FU
Tertiary packaging (Slipsheet/tray)											
Weight and type of material	Measurement	kg	Solid board Kraft Pulping Process, pulp pressing and drying production mix, at plant >220 g/m2	http://lcdn.thinkstep.com/No	7ce6b8c1-3542-	2	2	1	2	2	

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*	
				de/	4dcd-a038-978cdaee063e						
Recycled content (R1)	Supplier specifications	%	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Capacity (number of primary packaging per secondary packaging)	Measurement/Palletization	Number of primary pack/ tertiary pack	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	To calculate the amount of packaging per FU
Tertiary packaging (Rack)											
Weight and type of material	Measurement or supplier specifications	kg	PP granulates| polymerisation of propene| production mix, at plant| 0.91 g/cm3, 42.08 g/mol per repeating unit {EU-28+EFTA} [LCI result]	http://lcdn.thinkstep.com/Node/	eb6c15a5-abcd-4d1a-ab7f-fb1cc364a130	1	1	1	2	1	
Recycled content (R1)	Supplier specifications	%	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

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*	
Capacity (number of primary packaging per secondary packaging)	Measurement/Palletization	Number of primary pack/ tertiary pack	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	To calculate the amount of packaging per FU
Number of rotations	See section 6.1	Rotations/ product	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	To calculate the amount of packaging per FU
Tertiary packaging (pallet)											
Type of material	Supplier specifications	n/a	Wood pallet: Pallet, wood (80x120) sawing, piling, nailing single route, at plant 25 kg/piece, nominal loading capacity of 1000kg	http://lcdn.thinkstep.com/Node/	3203d6d8-2760-4b7b-b1c6-f82681e9e2f3	2	2	2	2	2	Default weight: 25 kg/piece (to be used to calculate amount/weight of pallet per FU) Default rotation rate: 25
		n/a	Plastic pallet: Pallet, plastic (80x120) raw material	http://lcdn.thinkste	9ccf3c17-	2	2	2	2	2	Default weight: 25

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*	
			production, plastic injection moulding production mix, at plant weight per piece: 25 kg, nominal loading capacity of 1000kg	p.com/Node/	b378-441a-b5b8-238ce225be4b						kg/piece (to be used to calculate amount/weight of pallet per FU) Default rotation rate: 50
Capacity (number of primary packaging per tertiary packaging)	Measurement	Number of primary pack/ tertiary pack	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	To calculate the amount of packaging per FU

Packaging transport to water factory

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*	
Transport to	Measurement	tonne.km	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven,	http://lcdn.thinkste	938d5ba6-	1	1	1	2	1	Depends

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*	
water factory			Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} Or most appropriate dataset depending on the mode of transport	p.com/Node/	17e4-4f0d-bef0-481608681f57						on the mode of transport

5.1.2 Life cycle stage: manufacturing

This section describes in detail the requirements regarding the collection of company-specific data for the life cycle stage "manufacturing". The data to be collected and default data (when relevant) are listed in the table below.

Water extraction, container filling and grouping

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 elementary flow to be used*	*Elementary flow source (i.e. node)*	*UUID*	*TiR*	*TeR*	*GR*	*P*	*DQR*	
Packed water	Yearly measurement	l/l packed water	Water, resource from water. The elementary flow has to be adapted according to the location of water extraction.	The elementary flows are available in all the	Depends on the regionalisatio	n/a	n/a	n/a	n/a	n/a	Water elementary flow is regionaliz

				nodes	n of the elementary flow						ed, and therefore depends on the manufacturing plant location
Net water consumption (total water consumption - return water) not including packed water	Yearly measurement	l/l packed water	Water, resource from water. The elementary flow has to be adapted according to the location of water extraction.	The elementary flows are available in all the nodes	Depends on the regionalisation of the elementary flow	n/a	n/a	n/a	n/a	n/a	Water elementary flow is regionalized, and therefore depends on the manufacturing plant location

Gas production for carbonated process

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/elementary flow to be used*	*Dataset/elementary flow source (i.e. node)*	*UUID*	*TiR*	*TeR*	*GR*	*P*	*DQR*	
Gas for carbonated water production: amount of gas used per liter of carbonated water (including losses during bottling and filling process)	Yearly measurement	g/l carbonated packed water	Carbon dioxide, gaseous, for carbonated water| CO2 from light fuel oil, ASCO process for beverage industry, 1000 kg CO2 per hour capacity| market mix|[16] (See Appendix 3 for list of inputs and outputs related to this dataset)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Depends on the process used for producing CO_2
Gas losses during bottling and filling process		g/l carbonated water	Elementary flow: carbon dioxide (fossil), to air, unspecified	The elementary flows are available in all the nodes	08a91e70-3ddc-11dd-923d-0050c249004 8	n/a	n/a	n/a	n/a	n/a	Elementary flow

16 Note: Depends on the type of process used to produce the gas used in carbonated water
It can also be:

- Amount of water of higher CO_2 concentration added to adjust the amount of gas per liter (then the elementary flow to be used would be "water, resource from water", to be adapted according to the regionalization of water extraction
- CO_2 is an output or co-product of another industrial process
- The water is naturally carbonated, with therefore no impact for gas production (and no dataset or elementary flow to be used)

Container washing operations

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*	
Fraction of container washed after used	Calculated based on section 6.1	%	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Water used	Yearly measurement	l/container washed or l/l packed water[17]	Tap water| technology mix| at user| per kg water	https://lcdn.quantis-software.com/PEF/	212b8494-a769-4c2e-8d82-9a6ef61baad7	2	2	2	2	2	
Electricity consumption	Yearly measurement	kWh/container washed or kWh/l packed water[17]	Country-specific residual grid mix See section 5.9 for electricity modelling rules	http://lcdn.thinkstep.com/Node/	n/a	n/a	n/a	n/a	n/a	n/a	Depends on the manufacturing plant location
Natural gas consumption	Yearly measurement	MJ/container washed or MJ/l packed water	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-	http://lcdn.thinkstep.com/Node/	81675341-f1af-44b0-	1	1	1	2	1	

[17] Of the activity data are expressed per liter of container washed, they should be converted per liter of packed water to match the functional unit.

			28+3}		81d3-d108caef5c28						
Soda (NaOH)	Yearly measurement	g/container washed or g/l packed water	Soda production| technology mix| production mix, at plant| 100% active substance	http://ecoinvent.lca-data.com/	546d4097-a453-4706-ac17-389325a04b6f	2	2	1	2	2	
Hydrochloloric acid (HCl)	Yearly measurement	g/container washed or g/l	Hydrochloric acid production technology mix production mix, at plant 100% active substance	http://ecoinvent.lca-data.com/	d5953cab-21fd-44ea-ab3a-17a44ed3c260	2	1	1	2	2	

5.1.3 Life cycle stage: distribution

This section describes in detail the requirements regarding the collection of company-specific data for the life cycle stage "distribution". The data to be collected and default data (when relevant) are listed in the tables below for transport from water factory to distribution center, transport from distribution center to point of sale, and storage in warehouses and at retailer respectively.

Transport from water factory to distribution center

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*	
Weight of product and total packaging	Calculation based on total weight of all the packaging	*kg*	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Transport from distribution center to point of sale

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*	
Weight of product and total packaging	Calculation based on total weight of all the packaging	*kg*	Not applicable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Warehouse (storage)

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*	
Volume of the product and its packaging at warehouse	Measurement/product specifications	m^3	No EF-compliant dataset for storage at warehouse. Datasets used to model storage at the warehouses are described in section 6.3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Retail (storage)

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*	
Volume of the product and its packaging at warehouse	Measurement/product specifications	m^3	No EF-compliant dataset for storage at retailer. Datasets used to model storage at the retailers are described in section 6.3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

5.1.4 Life cycle stage: use

This section describes in detail the requirements regarding the collection of company-specific data for the life cycle stage "use". The data to be collected and default data (when relevant) are listed in the tables below for glass or plastic cup production and end-of-life, chilling operations (at final user), and gas emissions of carbonated water respectively.

Glass or plastic cup production and end-of-life (if any, for HOD system only)

See section 5.11 for specific rules of modelling materials and waste

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*	
Specific end-of-life routes of plastic cup		%	Recycling: Recycling of polypropylene (PP) plastic | from post-consumer waste, via washing, granulation, pelletization | production mix, at plant | 90% recycling rate {US} [Partly terminated system]		47a967ec-a648-4ede-afb6-23a2289baef9	n/a	n/a	n/a	n/a	n/a	
		%	Incineration: Waste incineration of PP| waste-to-energy plant with dry flue gas treatment, including transport and pre-treatment| production mix, at consumer| polypropylene waste {EU-28+EFTA} [LCI result]	http://lcdn.thinkstep.com/Node/	0be82a64-cbe6-43c4-98f9-69045c145aa0	2	1	1	2	1	
		%	Landfilling: Landfill of plastic waste| landfill including leachate treatment and with transport without collection and pre-treatment| production mix (region specific sites), at landfill site	http://lcdn.thinkstep.com/Node/	f2bea0f5-e4b7-4a2c-9f34-	2	2	2	2	2	

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*	
			{EU-28+EFTA} [LCI result]		4eb32495cbc6						

Chilling operations (at final user) (for HOD system only)

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*	
Electricity consumption for cooling	Yearly measurement	kWh	Country-specific consumption grid mix See section 5.9 for electricity modelling rules	http://lcdn.thinkstep.com/Node/	n/a	n/a	n/a	n/a	n/a	n/a	Depends on the use location

Gas emissions of carbonated water

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*	
Gas losses during use stage (corresponds to the amount of gas included in one liter of carbonated water)		g/l carbonated water	Elementary flow: carbon dioxide (fossil), to air, unspecified	The elementary flows are available in all the nodes	08a91e70-3ddc-11dd-923d-0050c2490048	n/a	n/a	n/a	n/a	n/a	Elementary flow

5.2 List of processes expected to be run by the company

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

- Forming processes of primary packaging (except for glass bottles)
- Water extraction, container filling and grouping
- Gas production for carbonated process
- Container washing operations
- Transport from water factory to distribution center (in some cases)

As a first approach, primary data shall be used for processes expected to be run by the company, and those information are already reported in section 5.1. For non-mandatory company-specific data, default values are presented in table below. The concerned sub-stages are the following:

- Water extraction, container filling and grouping
- Transport from water factory to distribution center (in some cases)

Life cycle sub-stage: Water extraction, container filling and grouping

Data collection requirements for water extraction, container filling and grouping:

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 data*	*Default data source*	*Default dataset to be used*	*Dataset source (i.e. node)*	*UUID*	*TiR*	*GR*	*TeR*	*P*	*DQR*	
Electricity consumption	Yearly consumption	kWh/l packed water	0.01	EFBW 2013	See section 5.9	http://lcdn.thinkstep.com/Node/	n/a	n/a	n/a	n/a	n/a	n/a	Depends on the use location
Natural gas consumption	Yearly consumption	MJ/l packed water	0.013	EFBW 2013	Thermal energy from natural gas| technology mix regarding firing and flue gas cleaning| production mix, at heat plant| MJ, 100% efficiency {EU-28+3}	http://lcdn.thinkstep.com/Node/	81675341-f1af-44b0-81d3-d108caef5c28	1	1	1	2	1	
LPG/Propane combustion	Yearly consumption	kg/l packed water	0.0002	EFBW 2013									

Life cycle sub-stage: Transport from water factory to distribution center (in some cases)

Data collection requirements for transport from water factory to distribution center (in some cases)

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 data*	*Default data source*	*Default dataset to be used*	*Dataset source (i.e. node)*	*UUID*	*TiR*	*GR*	*TeR*	*P*	*DQR*	
Distance	Measurement	km	500 for PET packaging	UETR and Technical Secretariat	Truck, with the most appropriate dataset depending on the mode of transport	http://lcdn.thinkstep.com/Node/	n/a	n/a	n/a	n/a	n/a	n/a	Depends on the mode of transport
		km	500 for glass bottle packaging	UETR and Technical Secretariat	Truck, with the most appropriate dataset depending on the mode of transport	http://lcdn.thinkstep.com/Node/	n/a	n/a	n/a	n/a	n/a	n/a	Depends on the mode of transport
		km	200 for HOD packaging	UETR and Technical Secretariat	Truck, with the most appropriate dataset depending on the mode of transport	http://lcdn.thinkstep.com/Node/	n/a	n/a	n/a	n/a	n/a	n/a	Depends on the mode of transport
Empty return ratio	Measurement	(-)	0.2 for Truck 40t	UETR	Copy 1 | Articulated lorry transport, Euro 4, Total weight >32 t	http://lcdn.thinkstep.com/Node/	938d5ba6-17e4-4f0d-bef0-	1	1	1	2	1	

					| diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3}		481608681f57						

5.3 Data gaps

Mandatory company-specific data

For the specific case of water and energy consumption for forming processes (when relevant), solutions to define the data are given if no primary data are available at a process level but only at the level of entire water factory, in order to differentiate the energy and water consumption for plastic packaging forming processes and the energy and water consumption for other manufacturing processes.

Other data

In this PEFCR, the recommendations regarding default data to be used when no primary data are provided. Therefore, no data gaps are foreseen. According to European Commission (2013), "data gaps exist when there is no specific or generic data available that is sufficiently representative of the given process in the product's life cycle".

5.4 Data quality requirements

The data quality of each dataset and the total EF study shall be calculated and reported. The calculation of the DQR shall be based on the following formula with 4 criteria:

$$DQR = \frac{\overline{Te_R}+\overline{G_R}+\overline{Ti_R}+\overline{P}}{4} \qquad \text{[Equation 1]}$$

where TeR is the Technological-Representativeness, GR is the Geographical-Representativeness, TiR is the Time-Representativeness, and P is the Precision/uncertainty. The representativeness (technological, geographical and time-related) characterises to what degree the processes and products selected are depicting the system analysed, while the precision indicates the way the data is derived and related level of uncertainty.

The next chapters provide tables with the criteria to be used for the semi-quantitative assessment of each criterion. If a dataset is constructed with company-specific activity data, company -specific emission data and secondary sub-processes, the DQR of each shall be assessed separately.

5.4.1 Company-specific datasets

The score of criterion P cannot be higher than 3 while the score for TiR, TeR, and GR cannot be higher than 2 (the DQR score shall be ≤1.6). The DQR shall be calculated at the level-1 disaggregation, before any aggregation of sub-processes or elementary flows is performed. The DQR of company-specific datasets shall be calculated as following:

1) Select the most relevant sub-processes and direct elementary flows that account for at least 80% of the total environmental impact of the company-specific dataset, listing them from the most contributing to the least contributing one.

2) Calculate the DQR criteria TeR, TiR, GR and P for each most relevant process and each most relevant direct elementary flow. The values of each criterion shall be assigned based on Table B.5.

2.a) Each most relevant elementary flow consists of the amount and elementary flow naming (e.g. 40 g carbon dioxide). For each most relevant elementary flow, evaluate the 4 DQR criteria named Te_{R-EF}, Ti_{R-EF}, G_{R-EF}, P_{EF} in NOTE: in case the newly developed dataset has most relevant processes filled in by non-EF compliant datasets (and thus without DQR), then these datasets cannot be included in step 4 and 5 of the DQR calculation. (1) The weight of step 3 shall be recalculated for the EF-compliant datasets only. Calculate the environmental contribution of each most-relevant EF compliant process and elementary flow to the total environmental impact of all most-relevant EF compliant processes and elementary flows, in %. Continue with step 4 and 5. (2) The weight of the non-EF compliant dataset (calculated in step 3) shall be used to increase the DQR criteria and total DQR accordingly. For example:

- Process 1 carries 30% of the total dataset environmental impact and is ILCD entry level compliant. The contribution of this process to the total of 80% is 37.5% (the latter is the weight to be used).
- Process 1 carries 50% of the total dataset environmental impact and is EF compliant. The contribution of this process to all most-relevant EF compliant processes is 100%. The latter is the weight to be used in step 4.

After step 5, the parameters $\overline{Te_R}, \overline{G_R}, \overline{Ti_R}, \overline{P}$ and the total DQR shall be multiplied with 1.375.

. It shall be evaluated for example, the timing of the flow measured, for which technology the flow was measured and in which geographical area.

2.b) Each most relevant process is a combination of activity data and the secondary dataset used. For each most relevant process, the DQR is calculated by the applicant of the PEFCR *as a combination of the 4 DQR criteria for activity data and the secondary dataset: (i) Ti_R and P shall be evaluated at the level of the activity data (named $Ti_{R\text{-}AD}$, P_{AD}) and (ii) Te_R, Ti_R and G_R shall be evaluated at the level of the secondary dataset used (named $Te_{R\text{-}SD}$, $Ti_{R\text{-}SD}$ and $G_{R\text{-}SD}$). As Ti_R is evaluated twice, the mathematical average of $Ti_{R\text{-}AD}$ and $Ti_{R\text{-}SD}$ represents the Ti_R of the most relevant process.*

3) Calculate the environmental contribution of each most-relevant process and elementary flow to the total environmental impact of all most-relevant processes and elementary flows, in % (weighted using 13 EF impact categories, with the exclusion of the 3 toxicity-related ones). For example, the newly developed dataset has only two most relevant processes, contributing in total to 80% of the total environmental impact of the dataset:

- *Process 1 carries 30% of the total dataset environmental impact. The contribution of this process to the total of 80% is 37.5% (the latter is the weight to be used).*
- *Process 1 carries 50% of the total dataset environmental impact. The contribution of this process to the total of 80% is 62.5% (the latter is the weight to be used).*

4) Calculate the Te_R, Ti_R, G_R and P criteria of the newly developed dataset as the weighted average of each criterion of the most relevant processes and direct elementary flows. The weight is the relative contribution (in %) of each most relevant process and direct elementary flow calculated in step 3.

5) The applicant of the PEFCR shall the total DQR of the newly developed dataset using the equation B.2, where $\overline{Te_R}, \overline{G_R}, \overline{Ti_R}, \overline{P}$ are the weighted average calculated as specified in point 4).

$$DQR = \frac{\overline{Te_R}+\overline{G_R}+\overline{Ti_R}+\overline{P}}{4} \qquad \textit{[Equation 2]}$$

NOTE: in case the newly developed dataset has most relevant processes filled in by non-EF compliant datasets (and thus without DQR), then these datasets cannot be included in step 4 and 5 of the DQR calculation. (1) The weight of step 3 shall be recalculated for the EF-compliant datasets only. Calculate the environmental contribution of each most-relevant EF compliant process and elementary flow to the total environmental impact of all most-relevant EF compliant processes and elementary flows, in %. Continue with step 4 and 5. (2) The weight of the non-EF compliant dataset (calculated in step 3) shall be used to increase the DQR criteria and total DQR accordingly. For example:

- Process 1 carries 30% of the total dataset environmental impact and is ILCD entry level compliant. The contribution of this process to the total of 80% is 37.5% (the latter is the weight to be used).
- Process 1 carries 50% of the total dataset environmental impact and is EF compliant. The contribution of this process to all most-relevant EF compliant processes is 100%. The latter is the weight to be used in step 4.
- After step 5, the parameters $\overline{Te_R}, \overline{G_R}, \overline{Ti_R}, \overline{P}$ and the total DQR shall be multiplied with 1.375.

Table 11 How to assess the value of the DQR criteria for datasets with company-specific information

	P_{EF} and P_{AD}	Ti_{R-EF} and Ti_{R-AD}	Ti_{R-SD}	Te_{R-EF} and Te_{R-SD}	G_{R-EF} and G_{R-SD}
1	*Measured/calculated <u>and</u> externally verified*	*The data refers to the most recent annual administration period with respect to the EF report publication date*	*The EF report publication date happens within the time validity of the dataset*	*The elementary flows and the secondary dataset reflect exactly the technology of the newly developed dataset*	*The data(set) reflects the exact geography where the process modelled in the newly created dataset takes place*
2	*Measured/calculated and internally verified, plausibility checked by reviewer*	*The data refers to maximum 2 annual administration periods with respect to the EF report publication date*	*The EF report publication date happens not later than 2 years beyond the time validity of the dataset*	*The elementary flows and the secondary dataset is a proxy of the technology of the newly developed dataset*	*The data(set) partly reflects the geography where the process modelled in the newly created dataset takes place*
3	*Measured/calculated/literature and plausibility not checked by reviewer OR Qualified estimate based on calculations plausibility checked by reviewer*	*The data refers to maximum three annual administration periods with respect to the EF report publication date*	*Not applicable*	*Not applicable*	*Not applicable*
4-5	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*

5.5 Data needs matrix (DNM)

All processes required to model the product and outside the list of mandatory company-specific (listed in section B.5.1) shall be evaluated using the Data Needs Matrix (see Table 12*). The DNM shall be used by the PEFCR applicant to evaluate which data is needed and shall be used within the* *modelling of its PEF, depending on the level of influence the applicant (company) has on the specific process. The following three cases are found in the DNM and are explained below:*

1. ***Situation 1**: the process is run by the company applying the PEFCR*
2. ***Situation 2**: the process is not run by the company applying the PEFCR but the company has access to (company-)specific information.*
3. ***Situation 3**: the process is not run by the company applying the PEFCR and this company does not have access to (company-)specific information.*

Table 12 Data Needs Matrix (DNM)[18]. *Disaggregated datasets shall be used.

		Most relevant process	Other process
Situation 1: process run by the company applying the PEFCR	**Option 1**	Provide company-specific data (as requested in the PEFCR) and create a company specific dataset partially disaggregated at least at level 1 (DQR ≤1.6). Calculate the DQR values (for each criteria + total)	
	Option 2		Use default secondary dataset in PEFCR, in aggregated form (DQR ≤3.0). Use the default DQR values
Situation 2: process not run by the company applying the PEFCR but with access to (company-)specific information	**Option 1**	Provide company-specific data (as requested in the PEFCR) and create a company specific dataset partially disaggregated at least at level 1 (DQR ≤1.6). Calculate the DQR values (for each criteria + total)	
	Option 2	Use company-specific activity data for transport (distance), and substitute the sub-processes used for electricity mix and transport with supply-chain specific PEF compliant datasets (DQR ≤3.0).* Re-evaluate the DQR criteria within the product specific context	
	Option 3		Use company-specific activity data for transport (distance), and substitute the sub-processes used for electricity mix and transport with supply-chain specific PEF compliant datasets (DQR ≤4.0). Use the default DQR values
Situation 3: process not run by the company applying the PEFCR and without access to (company)-specific information	**Option 1**	Use default secondary dataset, in aggregated form (DQR ≤3.0). Re-evaluate the DQR criteria within the product specific context	
	Option 2		Use default secondary dataset in PEFCR, in aggregated form (DQR ≤4.0) Use the default DQR values

[18] The options described in the DNM are not listed in order of preference

5.5.1 Processes in situation 1

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

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

Situation 1/Option 1

For all processes run by the company and where the company applying the PEFCR uses company specific data. The DQR of the newly developed dataset shall be evaluated as described in section B.5.4.1.

Situation 1/Option 2

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

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

5.5.2 Processes in situation 2

When a process is not run by the company applying the PEFCR, but there is access to company-specific data, then there are two possible options:

- *The company applying the PEFCR has access to extensive supplier-specific information and wants to create a new EF-compliant dataset[19] (Option 1);*
- *The company has some supplier-specific information and want to make some minimum changes (Option 2).*
- *The process is not in the list of most relevant processes and the company prefers to use a secondary dataset (option 3).*

[19] The review of the newly created dataset is optional

Situation 2/Option 1

For all processes run by the company and where the company applying the PEFCR uses company specific data. The DQR of the newly developed dataset shall be evaluated as described in section 5.4.1.

Situation 2/Option 2

Company-specific activity data for transport are used and the sub-processes used for electricity mix and transport with supply-chain specific PEF compliant datasets are substituted starting from the default secondary dataset provided in the PEFCR.

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

The applicant of the PEFCR shall make the DQR values of the dataset used context-specific by re-evaluating Te_R and Ti_R, using the table(s) provided below. The criteria G_R shall be lowered by 30%[20] and the criteria P shall keep the original value.

Situation 2/Option 3

For the non-most relevant processes, the applicant may use the corresponding secondary dataset listed in the PEFCR together with its DQR values.

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

Table 13 How to assess the value of the DQR criteria when secondary datasets are used.

	TiR	*TeR*	G_R
1	*The EF report publication date happens within the time validity of the dataset*	*The technology used in the EF study is exactly the same as the one in scope of the dataset*	*The process modelled in the EF study takes place in the country the dataset is valid for*
2	*The EF report publication date happens not later than 2 years beyond the time validity of the dataset*	*The technologies used in the EF study is included in the mix of technologies in scope of the dataset*	*The process modelled in the EF study takes place in the geographical region (e.g. Europe) the dataset is valid for*
3	*The EF report publication date happens not later than 4 years beyond the time validity of the dataset*	*The technologies used in the EF study are only partly included in the scope of the dataset*	*The process modelled in the EF study takes place in one of the geographical regions the dataset is valid for*
4	*The EF report publication date happens not later than 6 years beyond the time validity of the dataset*	*The technologies used in the EF study are similar to those included in the scope of the dataset*	*The process modelled in the EF study takes place in a country that is not included in the geographical region(s) the dataset is valid for, but sufficient similarities are estimated based on expert judgement.*
5	*The EF report publication date happens later than 6 years after the time validity of the dataset*	*The technologies used in the EF study are different from those included in the scope of the dataset*	*The process modelled in the EF study takes place in a different country than the one the dataset is valid for*

[20] In situation 2, option 2 it is proposed to lower the parameter G_R by 30% in order to incentivize the use of company specific information and reward the efforts of the company in increasing the geographic representativeness of a secondary dataset through the substitution of the electricity mixes and of the distance and means of transportation.

5.5.3 Processes in situation 3

When a process is not run by the company applying the PEFCR and the company does not have access to company-specific data, there are two possible options:

- *It is in the list of most relevant processes (situation 3, option 1)*
- *It is not in the list of most relevant processes (situation 3, option 2)*

Situation 3/Option 1

In this case, the applicant of the PEFCR shall make the DQR values of the dataset used context-specific by re-evaluating Te_R, Ti_R and G_r, using the table(s) provided. The criteria P shall keep the original value.

Situation 3/Option 2

For the non-most relevant processes, the applicant shall use the corresponding secondary dataset listed in the PEFCR together with its DQR values.

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

5.6 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):

- *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*
  - *http://soda.rdc.yp5.be/*
- *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 that has been modelled according to the modelling requirements included in the Guidance version 6.3. In such case this information shall be included in the "limitations" 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.*

5.7 How to calculate the average DQR of the study

In order to calculate the average DQR of the EF study, the applicant shall calculate separately the TeR, TiR, GR and P for the EF study as the weighted average of all most relevant processes, based on their relative environmental contribution to the total single score (excluding the 3 toxicity-related ones). The calculation rules explained in chapter B.5.4 shall be used.

5.8 Allocation rules

5.8.1 Multi-processes and multi-products at water factory

Processing allocation - situation A: detailed data are available on specific processes at water factory

Energy and water consumption shall be allocated as much as possible to specific processing stages and product flows (step 1 in ISO 14044). There shall be therefore a distinction between

- Energy and water consumption for forming processes of plastic packaging
- Energy and water consumption for water extraction, container filling and grouping
- Energy, water and goods consumption for container washing operations of refillable packaging

Processing allocation - situation B: data is only available at the water factory level

In any case, energy and water consumption related to water extraction, container filling and grouping is calculated according to the total amount of packed water produced per year.

- Energy and water consumption for water extraction, filling and grouping:
    - In any case, energy and water consumption related to water extraction, container filling and grouping is calculated according to the total amount of packed water produced per year, and is the same for any type of product
    - If data are not available, the following data for energy and water consumption for manufacturing processes shall be used (Source: Screening study)
        - Water withdrawal (not including packed water) = 0.63 l/l packed water;
        - Electricity consumption = 0.01 kWh/l packed water
        - Natural gas consumption = 0.013 MJ/l packed water
        - LPG/propane: 0.0002 kg/l packed water
    - The left-over energy and water consumption of the water factory shall be allocated to plastic bottle forming processes and container washing operations
- To allocate the left-over energy and water consumption of the water factory between forming processes of plastic packaging and container washing operations of refillable packaging, it is necessary to have detailed primary data on at least one of those 2 processes (both processes require mandatory company-specific data).
    - The energy and water consumption of the other process can be calculated as the left-over of energy and water consumption

5.8.2 Allocation for multi-functionality in end-of-life situations

Packaging end-of-life is modelled according to recommendations provided by the European Commission to deal with multi-functionality in end-of-life situations (see section 7.18 of Guidance Version 6.3).

The modelling details are provided in section 5.11.

5.9 Electricity modelling

The guidelines in this section shall only be used for the processes where company-specific information is collected (situation 1 / Option 1 & 2 / Option 1 of the DNM).

The following electricity mix shall be used in hierarchical order:

- *(i) Supplier-specific electricity product shall be used if:*
  - *(a) available, and*
  - *(b) the set of minimum criteria to ensure the contractual instruments are reliable is met.*
- *(ii) The supplier-specific total electricity mix shall be used if:*
  - *(a) available, and*
  - *(b) the set of minimum criteria that to ensure the contractual instruments are reliable is met.*
- *(iii) As a last option the 'country-specific residual grid mix, consumption mix' shall be used (available at http://lcdn.thinkstep.com/Node/). Country-specific means the country in which the life cycle stage occurs. This may be an EU country or non-EU country. The residual grid mix characterizes the unclaimed, untracked or publicly shared electricity. This prevents double counting with the use of supplier-specific electricity mixes in (i) and (ii).*

Note: if for a country, there is a 100% tracking system in place, case (i) shall be applied.

Note: for the use stage, the consumption grid mix shall be used.

The environmental integrity of the use of supplier-specific electricity mix depends on ensuring that contractual instruments (for tracking) ***reliably and uniquely convey claims to consumers****. Without this, the PEF lacks the accuracy and consistency necessary to drive product/corporate electricity procurement decisions and accurate consumer (buyer of electricity) claims. Therefore, a set of minimum criteria that relate to the integrity of the contractual instruments as reliable conveyers of environmental footprint information has been identified. They represent the minimum features necessary to use supplier-specific mix within PEF studies.*

Set of minimal criteria to ensure contractual instruments from suppliers:
A supplier-specific electricity product/mix may only be used when the applicant ensures that any contractual instrument meets the criteria specified below. If contractual instruments do not meet the criteria, then 'country-specific residual grid mix, consumption mix' shall be used in the modelling.

A contractual instrument used for electricity modelling shall:

1. *Convey attributes:*

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

2. *Be a unique claim:*

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

3. *Be as close as possible to the period to which the contractual instrument is applied.*

[The TS may provide more information following the guidance]

Modelling 'country-specific residual grid mix, consumption mix':
Datasets for residual grid mix, per energy type, per country and per voltage have been purchased by the European Commission and are available in the dedicated node (http://lcdn.thinkstep.com/Node/). In case the necessary dataset is not available, an alternative dataset shall be chosen according to the procedure described in section B.5.8. If no dataset is available, the following approach may be used:

Determine the country consumption mix (e.g. X% of MWh produced with hydro energy, Y% of MWh produced with coal power plant) and combined them with LCI datasets per energy type and country/region (e.g. LCI dataset for the production of 1MWh hydro energy in Switzerland):

- *Activity data related to non-EU country consumption mix per detailed energy type shall be determined based on:*

  - *Domestic production mix per production technologies*
  - *Import quantity and from which neighbouring countries*
  - *Transmission losses*
  - *Distribution losses*
  - *Type of fuel supply (share of resources used, by import and / or domestic supply)*

  These data may be found in the publications of the International Energy Agency (IEA).

- *Available LCI datasets per fuel technologies in the node. The LCI datasets available are generally specific to a country or a region in terms of:*

  - *Fuel supply (share of resources used, by import and / or domestic supply),*
  - *Energy carrier properties (e.g. element and energy contents)*

- *Technology standards of power plants regarding efficiency, firing technology, flue-gas desulphurisation, NOx removal and de-dusting.*

Allocation rules:

Table B. 9. ***Allocation rules for electricity.***

Process	***Physical relationship***	***Modelling instructions***
Water extraction, container filling and grouping	Volume	-
Container washing operations	Volume	-
Primary packaging production	Mass of packaging	Regarding PET packaging, to differentiate the energy and water consumption for PET bottle forming processes and the energy and water consumption for other manufacturing processes, it shall be assumed that electricity and natural gas consumption are the same as for the screening study for manufacturing processes (i.e., water withdrawal (not including packed water) = 0.63 l/l; electricity consumption = 0.01 kWh/l; natural gas consumption = 0.013 MJ/l), and the left over energy consumption of the water factory can be allocated to PET bottle forming processes.

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

A specific electricity type may be allocated to one specific product in the following conditions:

a. *The production (and related electricity consumption) of a product occurs in a separate site (building), the energy type physical related to this separated site may be used.*

b. *The production (and related electricity consumption) of a product occurs in a shared space with specific energy metering or purchase records or electricity bills, the product specific information (measure, record, bill) may be used.*

c. *All the products produced in the specific plant are supplied with a public available PEF study. The company who wants to make the claim shall make all PEF studies available. The allocation rule applied shall be described in the PEF study, consistently applied in all PEF studies connected to the site and verified. An example is the 100% allocation of a greener electricity mix to a specific product.*

On-site electricity generation:

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

- *No contractual instruments have been sold to a third party: the own electricity mix (combined with LCI datasets) shall be modelled.*

- *Contractual instruments have been sold to a third party: the 'country-specific residual grid mix, consumption mix' (combined with LCI datasets) shall be used.*

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

- *If possible, apply subdivision.*
- *Subdivision applies both to separate electricity productions or to a common electricity production where you can allocate based on electricity amounts the upstream and direct emissions to your own consumption and to the share you sell out of your company (e.g. if a company has a wind mill on its production site and export 30% of the produced electricity, emissions related to 70% of produced electricity should be accounted in the PEF study.*
- *If not possible, direct substitution shall be used. The country-specific residual consumption electricity mix shall be used as substitution[21].*
- *Subdivision is considered as not possible when upstream impacts or direct emissions are closely related to the product itself.*

5.10 Climate change modelling

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

1. *Climate change – fossil: This sub-category includes emissions from peat and calcination/carbonation of limestone. The emission flows ending with '(fossil)' (e.g., 'carbon dioxide (fossil)'' and 'methane (fossil)') shall be used if available.*
2. *Climate change – biogenic: This sub-category covers carbon emissions to air (CO_2, CO and CH_4) originating from the oxidation and/or reduction of biomass by means of its transformation or degradation (e.g. combustion, digestion, composting, landfilling) and CO_2 uptake from the atmosphere through photosynthesis during biomass growth – i.e. corresponding to the carbon content of products, biofuels or aboveground plant residues such as litter and dead wood. Carbon exchanges from native forests[22] shall be modelled under sub-category 3 (incl. connected soil emissions, derived products, residues). The emission flows ending with '(biogenic)' shall be used.*
   A simplified modelling approach shall be used when modelling the foreground emissions: Only the emission 'methane (biogenic)' is modelled, while no further biogenic emissions and uptakes from atmosphere are included. When methane emissions can be both fossil or biogenic, the release of biogenic methane shall be modelled first and then the remaining fossil methane.
   The product life cycle or part of the life cycle does not have a carbon storage beyond 100 years and therefore credits from biogenic carbon storage shall not be modelled.
3. C*limate change – land use and land transformation: This sub-category accounts for carbon uptakes and emissions (CO_2, CO and CH_4) originating from carbon stock changes caused by*

[21] For some countries, this option is a best case rather than a worst case.

[22] Native forests – represents native or long-term, non-degraded forests. Definition adapted from table 8 in Annex V C(2010)3751 to Directive 2009/28/EC.

land use change and land use. This sub-category includes biogenic carbon exchanges from deforestation, road construction or other soil activities (incl. soil carbon emissions). For native forests, all related CO_2 emissions are included and modelled under this sub-category (including connected soil emissions, products derived from native forest[23] *and residues), while their CO_2 uptake is excluded. The emission flows ending with '(land use change)' shall be used.*

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

The GHG emissions and removals arising from direct land use change shall be assessed for any input to the life cycle of a product originating from that land and shall be included in the assessment of GHG emissions. The emissions arising from the product shall be assessed on the basis of the default land use change values provided in PAS 2050:2011 Annex C, unless better data is available. For countries and land use changes not included in this annex, the emissions arising from the product shall be assessed using the included GHG emissions and removals occurring as a result of direct land use change in accordance with the relevant sections of the IPCC (2006). The assessment of the impact of land use change shall include all direct land use change occurring not more than 20 years, or a single harvest period, prior to undertaking the assessment (whichever is the longer). The total GHG emissions and removals arising from direct land use change over the period shall be included in the quantification of GHG emissions of products arising from this land on the basis of equal allocation to each year of the period[24]*.*

1) Where it can be demonstrated that the land use change occurred more than 20 years prior to the assessment being carried out, no emissions from land use change should be included in the assessment.

2) Where the timing of land use change cannot be demonstrated to be more than 20 years, or a single harvest period, prior to making the assessment (whichever is the longer), it shall be assumed that the land use change occurred on 1 January of either:

- *the earliest year in which it can be demonstrated that the land use change had occurred; or*

[23] Following the instantaneous oxidation approach in IPCC 2013 (Chapter 2).

[24] In case of variability of production over the years , a mass allocation should be applied.

- *on 1 January of the year in which the assessment of GHG emissions and removals is being carried out.*

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

1. *where the country of production is known and the previous land use is known, the GHG emissions and removals arising from land use change shall be those resulting from the change in land use from the previous land use to the current land use in that country (additional guidelines on the calculations can be found in PAS 2050-1:2012);*
2. *where the country of production is known, but the former land use is not known, the GHG emissions arising from land use change shall be the estimate of average emissions from the land use change for that crop in that country (additional guidelines on the calculations can be found in PAS 2050-1:2012);*
3. *where neither the country of production nor the former land use is known, the GHG emissions arising from land use change shall be the weighted average of the average land use change emissions of that commodity in the countries in which it is grown.*

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

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

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

The sub-category 'Climate change-biogenic' shall be reported separately: No.

The sub-category 'Climate change-land use and land transformation' shall be reported separately: No.

5.11 Modelling of wastes and recycled content

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

The Circular Footprint Formula is used to model the End-of-Life of products as well as the recycled content and is a combination of "material + energy + disposal", i.e.:

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

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

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

With the following parameters:

A: *allocation factor of burdens and credits between supplier and user of recycled materials.*

B: *allocation factor of energy recovery processes: it applies both to burdens and credits. It shqll be set to zero for all PEF studies.*

Qs_{in}: *quality of the ingoing secondary material, i.e. the quality of the recycled material at the point of substitution.*

Qs_{out}: *quality of the outgoing secondary material, i.e. the quality of the recyclable material at the point of substitution.*

Q_p: *quality of the primary material, i.e. quality of the virgin material.*

R_1: *it is the proportion of material in the input to the production that has been recycled from a previous system.*

R_2: *it is the proportion of the material in the product that will be recycled (or reused) in a subsequent system. R2 shall therefore take into account the inefficiencies in the collection and recycling (or reuse) processes. R2 shall be measured at the output of the recycling plant.*

R_3: *it is the proportion of the material in the product that is used for energy recovery at EoL.*

$E_{recycled}$ (E_{rec}): *specific emissions and resources consumed (per functional unit) arising from the recycling process of the recycled (reused) material, including collection, sorting and transportation process.*

$E_{recyclingEoL}$ (E_{recEoL}): *specific emissions and resources consumed (per functional unit) arising from the recycling process at EoL, including collection, sorting and transportation process.*

E_v: *specific emissions and resources consumed (per functional unit) arising from the acquisition and pre-processing of virgin material.*

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

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

$E_{SE,heat}$ and $E_{SE,elec}$: *specific emissions and resources consumed (per functional unit) that would have arisen from the specific substituted energy source, heat and electricity respectively.*

ED: *specific emissions and resources consumed (per functional unit) arising from disposal of waste material at the EoL of the analysed product, without energy recovery.*

$X_{ER,heat}$ and $X_{ER,elec}$: *the efficiency of the energy recovery process for both heat and electricity.*

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

The following parameters shall be applied:

- A default values: refer to Annex C of Guidance Version 6.3.
- Default quality ratios: refer to Annex C of Guidance Version 6.3.
- Default R1 values for all default material datasets (in case no company-specific values are available): refer to Annex C of Guidance Version 6.3. They shall be set to 0% when no application-specific data is available.
- Default R2 values to be used in case no company-specific values are available: refer to Annex C of Guidance Version 6.3 except for HOD for which 100% default value shall be used.

6 Life cycle stages

6.1 Packaging materials

This section gives the details on packaging raw materials and production for respectively primary, secondary, tertiary packaging and packaging transport to water factory for the three subcategories.

Reusable packaging: modelling approach

The raw material consumption, the energy and goods consumption for forming processes, and the supply transport to water factory *of reusable packaging shall be calculated by dividing the actual weight of the packaging by the number of reuse/rotations.*

The transportation of used empty packaging back to water factory shall be calculating by multiplying the weight of the empty packaging transported by the following factor:

$$1 - \frac{1}{number\ of\ reuse}$$

Number of reuse: calculation rules

For the refillable packaging (primary or secondary), the reuse rate shall be calculated using supply-chain-specific data only. The two different modelling approaches are presented below.

Reuse rate is the number of times a packaging material is used (e.g., filled) at the factory. This is often also called trip rates, reuse time or number of rotations. This may be expressed as the absolute number of reuse or as % of reuse rate. For example: a reuse rate of 80% equals 5 reuses. Equation 1 describes the conversion:

$$\text{Number of reuse} = \frac{1}{100\% - \%\ reuse\ rate} \qquad \text{[Equation 1]}$$

The number of reuse applied here refers to the total number of uses during the life of a packaging. It includes both the first use and all the following reuses.

A packaging return system can be organized by the company owning the packaging material (company owned pools) or can be organized at a higher level by a third party e.g., the government or a pooler (third party operated pools). This may have an influence on the lifetime of the material as well as the data source to be used. Therefore, it is important to separate these two return systems.

For company owned packaging pools the reuse rate shall be calculated using supply-chain-specific data. Depending on the data available within the company, two different calculation approaches may be used (see Option a and b presented below). Returnable glass bottles are used as example but the calculations also apply for other company owned reusable packaging.

Option a: The use of supply-chain-specific data, based on accumulated experience over the lifetime of the previous glass bottle pool. This is the most accurate way to calculate the reuse rate of bottles for the previous bottle pool and can be a proper estimate for the current bottle pool. The following supply-chain-specific data is collected (see wiki page 'Access to documents of common interest' https://webgate.ec.europa.eu/fpfis/wikis/display/ EUENVFP/):

- Number of bottles filled during the lifetime of the bottle pool (#Fi)
- Number of bottles at initial stock plus purchased over the lifetime of the bottle pool (#B)

$$\text{Reuse rate of the bottle pool} = \frac{\# F_i}{\# B} \qquad \text{[Equation 2]}$$

$$\text{The net glass use (kg glass/l beverage)} = \frac{\#B \times (kg\ glass/bottle)}{\#F_i} \qquad \text{[Equation 3]}$$

This calculation option shall be used:

i. With data of the previous bottle pool when the previous and current bottle pool are comparable. Meaning, the same product category, similar bottle characteristics (e.g., size), comparable return systems (e.g., way of collection, same consumer group and outlet channels), etc.
ii. With data of the current bottle pool when future estimations/extrapolations are available on (i) the bottle purchases, (ii) the volumes sold, and (iii) the lifetime of the bottle pool.

The data shall be supply-chain-specific and shall be verified by an external verification, including the reasoning of this method choice.

Option b: When no real data is tracked the calculation shall be done partly based on assumptions. This option is less accurate due to the assumptions made and therefore conservative/safe estimates shall be used. The following data is needed:

- Average number of rotations of a single bottle, during one calendar year (if not broken). One loop consists of filling, delivery, use, back to brewer for washing (#Rot)
- Estimated lifetime of the bottle pool (LT, in years)
- Average percentage of loss per rotation. This refers to the sum of losses at consumer and the bottles scrapped at filling sites (%Los)

$$\text{Reuse rate of the bottle pool} = \frac{LT}{(LT \times \%Los) + \left(\frac{1}{\#Rot}\right)} \qquad \text{[Equation 4]}$$

This calculation option shall be used when option a) is not applicable (e.g., the previous pool is not usable as reference). The data used shall be verified by an external verification, including the reasoning of this method choice.

Modelling the recycled content (if applicable)

The following formula is used to model the recycled content:

$$(1-R_1)E_V + R_1 \times \left(AE_{recycled} + (1-A)E_V \times \frac{Q_{Sin}}{Q_p}\right)$$

The R_1 values applied shall be supply-chain or default as provided in the table above, in relation with the DNM. Material-specific values based on supply market statistics are not accepted as a proxy. The applied R_1 values shall be subject to PEF study verification.

When using supply-chain specific R_1 values other than 0, traceability throughout the supply chain is necessary. The following general guidelines shall be followed when using supply-chain specific R_1 values:

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

Default parameters for A and Q_{sin}/Q_p were selected from Annex C and are listed in the two following tables.

Table 14: Selection of default values for A according to Annex C of PEF Guidance Version 6.3

Category	**Material**	**Application**	**Value for A parameter**
Metals	Steel	packaging	0.2
	Aluminum	packaging - cans	0.2
		packaging - liquid beverage carton	0.2
Paper	Paper	packaging - corrugated - pads/box/inserts	0.2
		packaging - carton board/inserts	0.2
		packaging - solid board box	0.2
		packaging - solid board box - bleached	0.2
		packaging - liquid beverage carton	0.2
Plastics	PET	packaging - bottle	0.5
	PE	MATERIAL	0.5
	PP	MATERIAL	0.5

	Polycarbonate PC	packaging - water	0.5
	Generic plastics	packaging - generic	0.5
		packaging - liquid beverage carton	0.5
Glass	Glass	packaging - container glass unspecified colour	0.2
		packaging - container glass colourless (flint)	0.2
		packaging - container glass green colour	0.2
		packaging - container glass amber colour	0.2

Table 15: Default values for Qsin/Qp according to Annex C of PEF Guidance Version 6.3

Material	***Default value (Qsin/Qp)***	***Comments***
Glass	*1*	
Steel	*1*	
Aluminium	*1*	
Other metals	*1*	
Paper and cardboard	*0.85*	*This value shall be used when the recycling process doesn't consider fibre losses*
Paper and cardboard	*1*	*This value shall be used when the recycling process considers fibre losses*
PET - SSP recycling	*1*	
PET mechanical recycling	*0,9*	
PP	*0.9*	
HDPE	*0.9*	
LDPE film	*0.75*	

The data to be collected and default data (when relevant) are listed in the tables below for primary packaging, secondary packaging and tertiary packaging respectively. The EF-compliant secondary datasets to be used and corresponding UUID and DQR are listed in the comprehensive tables presented in section 5.1.1.

Table 16 ***Primary packaging production (raw material acquisition and processing) expressed per primary packaging (and not per functional unit) - Capitals indicate those processes expected to be run by the company***

Process and key parameters		***Unit***	**Default data**			**Default dataset, UUID and DQR**	***Most relevant process [Y/N]***
			"Other channels"	**"At horeca"**	**"At the office"**		
Amount per primary packaging							
Main body	Material	n/a	-	-	-	See section 5.1.1	Y

Process and key parameters		***Unit***	**Default data**			**Default dataset, UUID and DQR**	***Most relevant process [Y/N]***
			"Other channels"	**"At horeca"**	**"At the office"**		
	R1	%	-	-	-	-	Y
	Volume	L	-	-	-	-	Y
	Weight	g	-	-	-	-	Y
	FORMING PROCESS (in some cases)[25]	n/a	-	-	-	See section 5.1.1	Y
	ROTATIONS	u	-	-	-	-	Y
Cap	Material	n/a	Screw cap, HDPE Ring pull cap, aluminium LDPE, HDPE, PE			See section 5.1.1	N
	R1	%	/	/	-	-	N
	Weight	g	-	-	-	-	N
	Forming process (to add it not using a "cap" default dataset)	n/a	/	/	-	See section 5.1.1	N
Label	Material	n/a	Label, PP Label, paper Label, plastic			See section 5.1.1	N
	R1	%	/	/	-	-	N
	Weight	g	-	-	-	-	N

Table 17 *Secondary packaging production (capitals indicate those processes expected to be run by the company)*

Process and key parameters		***Unit***	**Default data**			**Default dataset, UUID and DQR**	***Most relevant process [Y/N]***
			"Other channels"	**"At horeca"**	**"At the office"**		
	Amount per secondary packaging (plastic film, crate or cardboard)						
Secondary	Material	n/a	-	-	-	See section 5.1.1	Y
	R1	%	-	-	-	-	Y

[25] Not relevant for glass bottles

Process and key parameters		*Unit*	Default data			Default dataset, UUID and DQR	*Most relevant process [Y/N]*
			"Other channels"	"At horeca"	"At the office"		
packaging	Weight	g	-	-	-	-	Y
	ROTATIONS	u				-	Y
	Capacity (number of primary packaging per secondary packaging)	u	-	-	-	-	Y

Table 18 *Tertiary packaging production (raw material acquisition and processing) expressed per tertiary packaging (and not per functional unit) - Capitals indicate those processes expected to be run by the company*

Process and key parameters		*Unit*	Default data			Default dataset, UUID and DQR	*Most relevant process [Y/N]*
			"Other channels"	"At horeca"	"At the office"		
Amount per tertiary packaging							
Film	Material	n/a	Plastic shrink, wrap			See section 5.1.1	Y
	R1	%	-	-	-	-	Y
	Weight	g	-	-	-	-	Y
Slipsheet/tray	Material	n/a	-	-	-	See section 5.1.1	N
	R1	%	-	-	-	-	N
	Weight	g	-	-	-	-	N
Rack	Material	n/a	-	-	-	See section 5.1.1	Y
	R1	%	-	-	-	-	Y
	Weight	g	-	-	-	-	Y
	ROTATIONS	u				-	
Pallet	Material	n/a	Wood or plastic pallet (use default datasets for pallets)			See section 5.1.1	Y
	R1	%	-	-	-	-	Y
	Dimension	-	80x120 or 100x120			-	

Process and key parameters		***Unit***	**Default data**			**Default dataset, UUID and DQR**	***Most relevant process [Y/N]***
			"Other channels"	**"At horeca"**	**"At the office"**		
	Weight	g	-	-	-	See section 5.1.1	Y
	Rotations		Wooden pallet: 25 trips (PEF Guidance Version 6.3) Plastic pallets: 50 trips (PEF Guidance Version 6.3)			-	
Capacity (number of primary packaging per tertiary packaging)		u				-	

The details about the delivery of packaging materials to water factory are given in the following tables. *The reuse rate affects the quantity of transport that is needed per FU. The transport impact shall be calculated by dividing the one-way trip impact by the number of reuse of this packaging.* The EF-compliant secondary datasets to be used and corresponding UUID and DQR are listed in comprehensive tables presented in section 5.1.1.

It has to be noticed that the **transport of raw materials to packaging producers** (from resin producer to packaging producer for outsourced preforms, from resin producer to packaging producer for HOD bottles) shall be modelled according to PEF Guidance v6.3. The modelling rules are summarized below, and are presented in Table 21.

- For suppliers located within Europe:
  - 230 km by truck (>32 t, EURO 4; UUID 938d5ba6-17e4-4f0d-bef0-481608681f57), PEFCR specific utilisation ratio; and
  - 280 km by train (average freight train; UUID 02e87631-6d70-48ce-affd-1975dc36f5be); and
  - 360 km by ship (barge; UUID 4cfacea0-cce4-4b4d-bd2b-223c8d4c90ae).
- For suppliers located outside Europe:
  - 1000 km by truck (>32 t, EURO 4; UUID 938d5ba6-17e4-4f0d-bef0-481608681f57), for the sum of distances from harbour/airport to factory outside and inside Europe. PEFCR specific utilisation ratio; and
  - 18000 km by ship (transoceanic container; UUID 6ca61112-1d5b-473c-abfa-4accc66a8a63) or 10'000 km by plane (cargo; UUID 1cc5d465-a12a-43da-aa86-a9c6383c78ac).
  - If producers country (origin) is known: the adequate distance for ship and airplane should be determined using http://www.searates.com/services/routes-explorer or https://co2.myclimate.org/en/flight_calculators/newhttps://co2.myclimate.org/en/flight_calculators/new

- In case it is unknown if the supplier is located within or outside Europe, the transport shall be modelled as supplier being located outside Europe.

Table 19: *Transport (capitals indicate those processes expected to be run by the company)*

Process and key parameter*	***Default data***				***Default dataset, UUID and DQR***	***Most relevant [Y/N]***
	Mode of transport	***Distance (km)***	***Actual payload (tonnes)***	***Empty return rate (-)***		
Primary packaging supply to water factory						
From packaging producer to water factory (outsourced preforms, glass bottles, HOD PC bottles, etc…) or from raw materials producer (resin supplier) to water factory	-	-	-	-	See section 5.1.1	N
Transport of material to packaging producer *For PET bottles: transport of PET resin from resin producer to preforms producer*[26]	Truck 40t	230	21	0.3	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57	

[26] Based on Eurostat data (Eurostat 2013), 25% of PET resin is imported (i.e., produced outside Europe) and 75% is produced in Europe.

Process and key parameter*	***Default data***				***Default dataset, UUID and DQR***	***Most relevant [Y/N]***
	Mode of transport	***Distance (km)***	***Actual payload (tonnes)***	***Empty return rate (-)***		
					See Appendix 3 for node and DQR	
	Train	230	-	-	Freight train, average (without fuel) technology mix, electricity and diesel driven, cargo consumption mix, to consumer average train, gross tonne weight 1000t / 726t payload capacity UUID: 02e87631-6d70-48ce-affd-1975dc36f5be See Appendix 3 for node and DQR	N
	Ship	360	-	-	Barge technology mix, diesel driven, cargo consumption mix, to consumer 1500 t payload capacity UUID: 4cfacea0-cce4-4b4d-bd2b-223c8d4c90ae	

*Process and key parameter**	*Default data*				*Default dataset, UUID and DQR*	*Most relevant [Y/N]*
	Mode of transport	*Distance (km)*	*Actual payload (tonnes)*	*Empty return rate (-)*		
					See Appendix 3 for node and DQR	
Transport of material to packaging producer *For HOD PC bottles: transport of PC resin from resin producer to bottles producer*	Truck 40t	230	21	1	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	N
	Train	230	-	-	Freight train, average (without fuel) technology mix, electricity and diesel driven, cargo consumption mix, to consumer average train, gross tonne weight 1000t / 726t payload	

*Process and key parameter**	*Default data*				*Default dataset, UUID and DQR*	*Most relevant [Y/N]*
	Mode of transport	*Distance (km)*	*Actual payload (tonnes)*	*Empty return rate (-)*		
					capacity UUID: 02e87631-6d70-48ce-affd-1975dc36f5be See Appendix 3 for node and DQR	
	Ship	360	-	-	Barge technology mix, diesel driven, cargo consumption mix, to consumer 1500 t payload capacity UUID: 4cfacea0-cce4-4b4d-bd2b-223c8d4c90ae See Appendix 3 for node and DQR	
Cap, from cap producer to water factory	Truck 40t	-	7	0.2	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload	N

*Process and key parameter**	*Default data*				*Default dataset, UUID and DQR*	*Most relevant [Y/N]*
	Mode of transport	*Distance (km)*	*Actual payload (tonnes)*	*Empty return rate (-)*		
					capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	
Label, from label producer to water factory	Truck 40t	-	16	0.2	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	N
Secondary and tertiary packaging supply to water factory						
Plastic film, from plastic film producer to water factory	Truck 40t	-	21	0.2	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo|	N

*Process and key parameter**	*Default data*				*Default dataset, UUID and DQR*	*Most relevant [Y/N]*
	Mode of transport	*Distance (km)*	*Actual payload (tonnes)*	*Empty return rate (-)*		
					consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	
Crate, from crate producer to water factory	Truck 40t	-	6	0.2	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	N
Cardboard, from cardboard producer to water factory	Truck 40t	-	15	0.2	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer|	N

Process and key parameter*	Default data				Default dataset, UUID and DQR	Most relevant [Y/N]
	Mode of transport	Distance (km)	Actual payload (tonnes)	Empty return rate (-)		
					more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	
Pallet, from pallet producer to water factory	Truck 40t	-	10.9	0.2	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	N
Rack, from rack producer to water factory	Truck 40t	-	21	0.2	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload	N

*Process and key parameter**	*Default data*				*Default dataset, UUID and DQR*	*Most relevant [Y/N]*
	Mode of transport	*Distance (km)*	*Actual payload (tonnes)*	*Empty return rate (-)*		
					capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	
Collect of used empty bottles back to water factory (for reusable packaging only)						
Used empty packaging back to water factory – From point of sale to distribution center	Same mode of transport as from DC to point of sale (see section 6.3)	Same distance as from DC to point of sale (see section 6.3)	Calculated based on the number of used empty packaging in the truck (can be estimated as same number of full packaging from DC to point of sale	-	See Appendix 3	N
Used empty bottles back to water factory – From distribution center to water factory	Same mode of transport as from DC to point of sale (see section 6.3)	Same distance as from DC to point of sale (see section 6.3)	Calculated based on the number of used empty packaging in the truck (can be estimated as same number of full packaging from water factory)	-	See Appendix 3	N

*The applicant of this PEFCR shall always check the actual payload applied in the default dataset and adapt it accordingly.
The applicant shall report the DQR values (for each criterion + total) for all the datasets used.

6.2 Manufacturing

This section gives the details on manufacturing. The information is common for the three subcategories.
The data to be collected and default data (when relevant) are listed in the table below. The EF-compliant secondary datasets to be used and corresponding UUID and DQR are listed in comprehensive tables presented in section 5.1.2 and in Appendix 3.
It is important to note that when modelling the water extraction and the gas production for carbonated water (when relevant), the elementary flow used for water has to be adapted according to the location of water extraction.

Table 20: Manufacturing *(capitals indicate those processes expected to be run by the company)*

Process and key parameters*		***Unit***	**Default data**	**Default dataset, UUID and DQR**	***Most relevant process [Y/N]***
WATER EXTRACTION, CONTAINER FILLING AND GROUPING	Packed water	l/l packed water	-	See section 5.1.2	Y
	Net water consumption (total water consumption - return water) not including packed water	l/l packed water	-	See section 5.1.2	Y
	Electricity consumption	kWh/l packed water	0.01[27]	See section 5.2	Y
	Natural gas consumption	MJ/l packed water	0.013[27]	See section 5.2	Y
	LPG/propane combustion	kg/l packed water	0.0002[27]	See section 5.2	Y
GAS PRODUCTION (for carbonated water only)	Amount of gas used per liter of carbonated water (including losses during bottling and filling process)	g/l carbonated water	-	See section 5.2	N
	Gas losses during bottling and filling process	g/l carbonated water	-	See section 5.1.2	N
CONTAINER WASHING OPERATIONS (for reusable packaging only)	Fraction of container washed after used	%	-	-	Y
	Water used	l/container washed or l/l packed water	-	See section 5.1.2	N

[27] If no company-specific data are available, the following default data shall be used (Source: EFBW 2013)

Process and key parameters*		***Unit***	**Default data**	**Default dataset, UUID and DQR**	***Most relevant process [Y/N]***
	Electricity consumption	kWh/container washed or kWh/l packed water	-	See section 5.1.2	Y
	Natural gas consumption (MJ)	MJ/container washed or MJ/l packed water	-	See section 5.1.2	Y
	NaOH (g)	g/container washed or g/l packed water	-	See section 5.1.2	Y
	HCl (g)	g/container washed or g/l packed water		See section 5.1.2	N

The applicant shall report the DQR values (for each criterion + total) for all the datasets used.
The waste of products used during the manufacturing shall be included in the modelling (e.g. loss rates during filling and grouping, refillable packaging broken during washing, etc…).

6.3 Distribution stage

This section gives the details on distribution for the three subcategories. It includes the different transport steps for distribution, as well as storage in warehouses and retailer (only for "Other channels" subcategory).

The transport from factory to final client (including consumer transport) shall be modelled within this life cycle stage. The final client is defined as the final point of use. It is the final consumer who purchased the packed water for "other channels", the client of the restaurant for the subcategory "at horeca", and the employee of the company for the subcategory "at the office".

The details about the distribution transports are given in the following tables for the three subcategories respectively. *In case supply-chain-specific information is available for one or several transport parameters, they may be applied following the Data Needs Matrix.* The EF-compliant secondary datasets to be used and corresponding UUID and DQR are listed in comprehensive tables presented in section 5.1.2 and in Appendix 3.

Table 21: *Distribution transportation for the subcategory "Other channels" (capitals indicate those processes expected to be run by the company)*

Process and key parameter*	***Default data***				***Default dataset, UUID and DQR***	***Most relevant [Y/N]***
	Mode of transport	***Distance (km)***	***Actual payload (tonnes)***	***Empty return rate (-)***		
FROM WATER FACTORY TO CUSTOMER DEPOT/DISTRIBUTION CENTER	Truck 40t	500	-	-	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	Y
From distribution center to point of sale	Truck 40t	100[28]	18[29]	0.5[29]	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-	N

[28] EFBW expert judgment

[29] UETR

Process and key parameter*	***Default data***				***Default dataset, UUID and DQR***	***Most relevant [Y/N]***
	Mode of transport	***Distance (km)***	***Actual payload (tonnes)***	***Empty return rate (-)***		
					bef0-481608681f57 See Appendix 3 for node and DQR	
From point of sale to final user	This distribution stage is modelled according to the approach described in PEF Guidance Version 6.3, presented below the table.				Passenger car, average technology mix, gasoline and diesel driven, Euro 3-5, passenger car consumption mix, to consumer engine size from 1,4l up to >2l UUID: 1ead35dd-fc71-4b0c-9410-7e39da95c7dc See Appendix 3 for node and DQR	N

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

Modelling approach from point of sale to final client (source: PEF Guidance Version 6.3, section 7.14.1.3 and section 7.14.3)

- 62%: 5 km, by passenger car (average; UUID 1ead35dd-fc71-4b0c-9410-7e39da95c7dc). The allocation factor shall be calculated as the volume of the product transported divided by 0.2 m^3.
- 5%: 5 km round trip, by van (lorry <7.5t, EURO 3 with utilisation ratio of 20%[6]; UUID aea613ae-573b-443a-aba2-6a69900ca2ff)
- 33%: no impact modelled

Table 22: *Distribution transportation for the subcategory “At horeca” (capitals indicate those processes expected to be run by the company)*

Process and key parameter*	***Default data***				***Default dataset, UUID and DQR***	***Most relevant [Y/N]***
	Mode of transport	***Distance (km)***	***Actual payload (tonnes)***	***Empty return rate (-)***		
FROM WATER FACTORY TO CUSTOMER DEPOT/DISTRIBUTION CENTER	Truck 40t	500	-	-	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57 See Appendix 3 for node and DQR	Y
From distribution center to point of sale	Truck 3.5t – 20t (maxi load 5.4 tonnes)	100 (delivery round, i.e., 50 km on average)	4.3[30]	0.5[30]	Articulated lorry transport, Euro 4, Total weight 7,5-12 t (without fuel) diesel driven, Euro 4, cargo consumption mix, to consumer 7,5 t - 12t gross weight / 5t	N

[30] UETR

Process and key parameter*	***Default data***				***Default dataset, UUID and DQR***	***Most relevant [Y/N]***
	Mode of transport	***Distance (km)***	***Actual payload (tonnes)***	***Empty return rate (-)***		
					payload capacity UUID: 8d5157a3-8922-4c0c-9dd9-df8a71c5b7d5 See Appendix 3 for node and DQR	

Table 23: ***Distribution transportation for the subcategory "At the office" (capitals indicate those processes expected to be run by the company)***

Process and key parameter*	***Default data***				***Default dataset, UUID and DQR***	***Most relevant [Y/N]***
	Mode of transport	***Distance (km)***	***Actual payload (tonnes)***	***Empty return rate (-)***		
FROM WATER FACTORY TO CUSTOMER DEPOT/DISTRIBUTION CENTER	Truck 40t	200	-	-	Articulated lorry transport, Euro 4, Total weight >32 t | diesel driven, Euro 4, cargo| consumption mix, to consumer| more than 32t gross weight / 24,7t payload capacity {EU-28+3} UUID: 938d5ba6-17e4-4f0d-bef0-481608681f57	Y

					See Appendix 3 for node and DQR	
From distribution center to point of sale	Truck 3.5t – 20t (maxi load 5.4 tonnes)	100 (delivery round, i.e., 50 km on average)	4.3[31]	0.2[30]	Articulated lorry transport, Euro 4, Total weight 7,5-12 t (without fuel) diesel driven, Euro 4, cargo consumption mix, to consumer 7,5 t - 12t gross weight / 5t payload capacity UUID: 8d5157a3-8922-4c0c-9dd9-df8a71c5b7d5 See Appendix 3 for node and DQR	N

The information for the storage at distribution center and at retailer (only relevant for the category "Other Channels") during the distribution are mainly default data based on PEF Guidance Version 6.3, section 7.15.1 and section 7.15.2. The following elements are included in this dataset: electricity usage, energy consumption, water use and wastewater treatment. (See Section 5.9 for further details on electricity modelling). Details are provided in Table 24 below. Additional elements are included in this dataset, and are presented in Appendix 3 together with the default EF-compliant datasets to be used as background and their corresponding UUID and DQR.

Table 24 Energy and refrigerant consumption at DCs and at retail

[31] UETR

Parameter	***Per surface area (per m².year)***	***Volume of products stored per surface area of building***	***Per volume product stored (per m³.year)***
General electricity consumption at DC	30 kWh	An average DC of 30'000 m^2 can store 60'000 m^3 of products	15 kWh
General energy at DC (natural gas burned in boiler)	360 MJ		180 MJ
General electricity consumption at retail (general energy consumption for the entire building surface)	300 kWh[32]	An average retailer of 2'000m^2 can store 2'000 m^3 of products	300 kWh

Average storage times at the distribution centre and at the retailer shall be based on primary data when available. When no primary data are available, the average default storage times presented in Table 25 shall be used.

In addition, a volume factor has to be applied, which takes into account the fact that more space than the actual volume of the product itself is needed, Average volume factors for ambient product storage are presented in Table 25 (source: PEF Guidance Version 6.3). The ambient storage volume is calculated according to Equation below:

$$Ambient\ storage\ volume = Volume\ of\ the\ product\ x\ Average\ volume\ factor$$

Table 25: Distribution: storage at distribution center/customer depot and at retailer *(capitals indicate those processes expected to be run by the company)*

Process and key parameters		***Unit***	**Default data**	***Most relevant process [Y/N]***
Distribution center/customer depot	Storage duration	# weeks	4	N
	Average volume factor	[-]	4	N
	Volume of the product	m^3	-	N
Retailer*	Storage duration	# weeks	4	Y
	Average volume factor[32]	[-]	4	N
	Volume of the product	m^3	-	Y

[32] Note: the Packed Water TS considers the default values for retail storage (i. a general energy consumption of 300 kWh/m^2•year for the entire building surface and ii. a storage volume ratio at the retailer calculated as 4 times the product volume according to Guidance Version 6.3) are overestimated according to packed water context.

In addition, an average loss rate shall be taken into account for the losses during the distribution stage (overall consolidated value for transportation, storage and retail place), and is a default value based on PEF Guidance Version 6.3, Annex H, for the category "other beverages".

The average loss rate to be considered for distribution stage is 1%.

Those losses translate to an increase in packed water production to compensate for the actual amount of packed water that must be produced to achieve the functional unit, and to the treatment of the corresponding waste. The average loss rate for distribution stage shall therefore be modelled as follows:

- The additional packed water water production needed to compensate for the loss rate at distribution stage:
  - The impacts related to the loss rates shall be modelled as 1% of the Packaging materials and Manufacturing stage inputs and outputs
  - Those impacts can be calculated using the following equation:

$$\boldsymbol{E\ Distribution\ loss\ rate} = 0.01\times \boldsymbol{E\ Packaging\ materials} + 0.01\times\ \boldsymbol{E\ Manufacturing}$$

Where:

$\boldsymbol{E_{Distribution\ loss\ rate}}$: *specific emissions and resources consumed (per functional unit) related to the loss rates at distribution stage*

$\boldsymbol{E_{Packaging\ materials}}$: *specific emissions and resources consumed (per functional unit) for the life cycle stage "Packaging materials"*

$\boldsymbol{E_{Manufacturing}}$: *specific emissions and resources consumed (per functional unit) for the life cycle stage "Packaging material stage"*

- The waste treatment related to those losses are modelled according to end-of-life data presented in section 6.5.

The applicant shall report the DQR values (for each criterion + total) for all the datasets used.
The waste of products during the distribution and retail shall be included in the modelling.

6.4 Use stage

This section gives the details on the use stage for the three subcategories and the corresponding representative products.

The life cycle stage "Use" includes the chilling operations at final user, the gas emissions of carbonated water, but also glass (if any) production and dishwashing.

The data to be collected and default data (when relevant) are listed in the tables below for primary packaging, secondary packaging and tertiary packaging.

The following default sub-processes were modelled according to specications of the PEF Guidance v6.3:

- Beverage glass production and end-of-life, for use at consumer home or at horeca| flint glass production and end-of-life treatment| market mix|
- Dishwashing at consumer home (1 washing cycle)| domestic dishwasher use| market mix|
- Refrigerated storage at consumer home (1 litre-day)| domestic fridge use| market mix|

The data for modelling those three sub-processes and the default EF-compliant datasets to be used as background and their corresponding UUID and DQR for the processes are presented in Appendix 3. It has to be noticed that, according to section 5.9, the electricity mix to be used for the datasets "Dishwashing at consumer home" and for "Refrigerated storage at consumer home" shall be the country-specific consumption grid mix (rules for modelling the consumption grid mix are presented in section 5.9).

Table 26 *Use stage (capitals indicate those processes expected to be run by the company)*

Process and key parameters		**Unit**	**Default data**			***Default dataset, UUID and DQR***	***Most relevant process [Y/N]***
			"Other channels"	**"At horeca"**	**"At the office"**		
Glass or plastic cup production and end-of-life	Use of glass	Glass/l packed water	If a glass is used, 2.7 (PEF Guidance Version 6.3) This default value is not relevant for some easily transportable and useable formats (mainly for a "on the go" application) which are characterized by an easy opening and with a rather small format adapted to one single drinker.			Default sub-process: Beverage glass production and end-of-life, for use at consumer home or at horeca| flint glass production and end-of-life treatment | market mix| (See Appendix 3)	N
	Type of glass or cup	n/a	-	-	-		N
	Weight of glass	g	260g for glass or ceramic cup (PEF Guidance Version 6.3)				N
	Type of end-of-life treatment	L	For washable glass: default value for the material considered (Annex C of PEF Guidance Version 6.3) -				N
Glass washing	Type of glass washing for washable glass	n/a	Dishwashing, with an allocation for the glass of 2.5% of one cycle (PEF Guidance Version 6.3)			Default sub-process: Dishwashing at	Y

Process and key parameters		***Unit***	**Default data**			***Default dataset, UUID and DQR***	***Most relevant process [Y/N]***
			“Other channels”	**“At horeca”**	**“At the office”**		
						consumer home (1 washing cycle)| domestic dishwasher use| market mix|	
Gas emissions of carbonated water	Gas emissions of carbonated water	g/l carbonated water	- (Corresponds to the amount of gas per liter of carbonated water)			See section 5.1.4	N
Chilling operations at final user	Storage duration	day(s)	1.0	1.0	1.0	Default sub-process: Refrigerated storage at consumer home (1 litre-day)| domestic fridge use| market mix|	N
	Product chilled	%	30%	100%	100%		N
	Volume in fridge		*If stored in fridge: consider 3x the actual product volume (Source: PEF Guidance Version 6.3)*				N
	Electricity consumption for HOD	kWh/l. day of chilled product	n/a	-	-	See section 5.1.4	Y

In addition, an average loss rate shall be taken into account for the losses at final user (at consumer, at restaurant, at the office…), and is a default value based on PEF Guidance Version 6.3, Annex H, for the category “other beverages”.

The average loss rate to be considered at final user is 5%.

Those losses translate to an increase in packed water production to compensate for the actual amount of packed water that must be produced to achieve the functional unit, and to the treatment of the corresponding waste. The average loss rate for the use stage shall therefore be modelled as follows:

- The additional packed water water production needed to compensate for the loss rate at use stage:
  - The impacts related to the loss rates shall be modelled as 1% of the Packaging materials and Manufacturing stage inputs and outputs
  - Those impacts can be calculated using the following equation:

$$\boldsymbol{E\ Use\ loss\ rate} = 0.05 \times \boldsymbol{E\ Packaging\ materials} \quad + 0.05 \times \ \boldsymbol{E\ Manufacturing}$$

Where:

$E_{Use\ loss\ rate}$: *specific emissions and resources consumed (per functional unit) related to the loss rates at the use stage (at final user)*

$E_{Packaging\ materials}$: *specific emissions and resources consumed (per functional unit) for the life cycle stage "Packaging materials"*

$E_{Manufacturing}$: *specific emissions and resources consumed (per functional unit) for the life cycle stage "Packaging material stage"*

- The waste treatment related to those losses are modelled according to end-of-life data presented in section 6.5.

The applicant shall report the DQR values (for each criterion + total) for all the datasets used.
For the use stage the consumption grid mix shall be used. The electricity mix shall reflect the ratios of sales between EU countries/regions. To determine the ratio a physical unit shall be used (e.g. number of pieces or kg of product). Where such data are not available, the average EU consumption mix (EU-28 +EFTA), or region representative consumption mix, shall be used.

The waste of products during the use stage shall be included in the modelling.

6.5 Packaging end of life

The End-of-Life stage is a life cycle stage that in general includes the waste of the product in scope, such as the food waste, primary packaging, or the product left at its end of use.
The processes to be taken into account for the end of life are the treatment of all the components of primary, secondary and tertiary packaging, and corresponds to the exact same list of materials as for the life cycle stage "Packaging materials". The data to be considered for the end of life treatment of those different materials are default data provided in the Annex C of the PEF Guidance Version 6.3, except if better primary data are available. The transport from collection place to EOL treatment is included in the landfill, incineration and recycling EF-compliant default datasets, which are listed in Appendix 3 together with their corresponding UUID and DQR.

The value to be used are presented in Table 27 below, and detailed explanations are presented below the table.

Table 27 Parameter to be used for end of life modelling and default value to be used

Category	Value for R2	Value for R3	Value for A parameter	Value for B parameter	Values for XER,heat; XER,elec; ESE,heat; ESE, elec; and LHV
Primary or default value?	Primary Default data if no primary data are available	Default	Default	Default	Default
Default data	100% for HOD systems Values reported in spreadsheet "A - R1 - R2" of the Annex C of the PEF Guidance v6.3	Annex C of the PEF Guidance v6.3	Section B6.1 "Packaging materials" (or in spreadsheet "A - R1 - R2" of the Annex C of the PEF Guidance v6.3)	0	Included in the EF-compliant default datasets (see Appendix 3 together with their corresponding UUID and DQR).

- The values to be used for **R2** are dependent on the type of material and are country specific. Company-specific R_2 values (measured at the output of the recycling plant) shall be used when available. If no company-specific values are available, *application-specific R_2 values shall be used as listed* the spreadsheet "A - R1 - R2" of the Annex C of the PEF Guidance v6.3.
    - *If an R_2 value is not available for a specific country, then the European average shall be used.*
    - *If an R_2 value is not available for a specific application, the R_2 values of the material shall be used (e.g. materials average).*
    - *In case no R_2 values are available, R_2 shall be set equal to 0 or new statistics may be generated in order to assign an R_2 value in the specific situation.*
    - **For the specific case of HOD systems**, **R2 shall be set equal to 100%** (source: PlasticsEurope Polycarbonate Committee);
- The values to be used for **R3** are country specific only: **default values** shall be used for R3 for all the packaging materials treated in the same country, and are provided in the Annex C of the PEF Guidance v6.3.
- The values to be used for **A** are dependent on the type of material only. **Default values** shall be used for A, and are listed in section B6.1 "Packaging materials" and in the spreadsheet "A - R1 - R2" of the Annex C of the PEF Guidance v6.3;
- The value to be used for **B** shall be a **default value** and is equal to 0;
- The values to be used for **XER,heat; XER,elec, ESE,heat; ESE, elec; and LHV** shall be default values, and are already included in the EF-compliant default datasets (see Appendix 3 together with their corresponding UUID and DQR).

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

The end of life shall be modelled using the formula and guidance provided in chapter 5.11 'End of life modelling' of this PEFCR together with the parameters listed above.
Before selecting the appropriate R_2 value, an evaluation for recyclability of the material shall be done and the PEF study shall include a statement on the recyclability of the materials/products. The statement on the recyclability shall be provided together with an evaluation for recyclability that includes evidence for the following three criteria (as described by ISO 14021:1999, section 7.7.4 'Evaluation methodology'):

1. *The collection, sorting and delivery systems to transfer the materials from the source to the recycling facility are conveniently available to a reasonable proportion of the purchasers, potential purchasers and users of the product;*
2. *The recycling facilities are available to accommodate the collected materials;*
3. *Evidence is available that the product for which recyclability is claimed is being collected and recycled.*

Point 1 and 3 can be proven by recycling statistics (country specific) derived from industry associations or national bodies. Approximation to evidence at point 3 can be provided by applying for example the design for recyclability evaluation outlined in EN 13430 Material recycling (Annexes A and B) or other sector-specific recyclability guidelines if available[33].

Following the evaluation for recyclability, the appropriate R_2 values (supply-chain specific or default) shall be used. If one criteria is not fulfilled or the sector-specific recyclability guidelines indicate a limited recyclability an R_2 value of 0% shall be applied.

The reuse rate determines the quantity of packaging material (per product sold) to be treated at end of life. The amount of packaging treated at end of life shall be calculated by dividing the actual weight of the packaging by the number of times this packaging was reused.

7 PEF results

7.1 Benchmark values

7.1.1 Characterised benchmark values

Table 28 Characterised benchmark values for RP1 "Other channels" PET one-way 1500 ml - Impacts per FU (100 ml)

Impact category	Unit	Life cycle excl. use stage	Use stage
Climate change[34]	kg CO2 eq	2.33E-02	4.96E-03
Ozone depletion	kg CFC-11 eq	-1.99E-12	1.86E-11
Particulate matter	disease incidence	5.81E-10	2.05E-10
Ionising radiation, human health	kBq U235 eq	3.48E-03	1.59E-03

[33] E.g. the EPBP design guidelines (http://www.epbp.org/design-guidelines), or Recyclability by design (http://www.recoup.org/)
[34] The sub-indicators 'Climate change - biogenic' and 'Climate change - land use and land transformation' shall not be reported separately because their contribution to the total climate change impact, based on the benchmark results, is less than 5% each.

Impact category	Unit	Life cycle excl. use stage	Use stage
Photochemical ozone formation, human health	kg NMVOC eq	5.95E-05	9.23E-06
Acidification	mol H+ eq	7.51E-05	2.20E-05
Eutrophication, terrestrial	mol N eq	2.78E-04	3.44E-05
Eutrophication, freshwater	kg P eq	2.26E-07	1.67E-06
Eutrophication, marine	kg N eq	2.64E-05	4.87E-06
Land use	Dimensionless (pt)	1.26E-01	4.13E-02
Water use	m3 world eq	1.32E-02	3.83E-03
Resource use, fossils	MJ	3.86E-01	7.52E-02
Resource use, minerals and metals	kg Sb eq	7.11E-07	9.38E-08

Table 29 Characterised benchmark values for RP2 "At horeca" Glass bottle refillable 1000 ml - Impacts per FU (100 ml)

Impact category	Unit	Life cycle excl. use stage	Use stage
Climate change[34 above]	kg CO2 eq	2.02E-02	5.45E-03
Ozone depletion	kg CFC-11 eq	3.11E-11	4.63E-11
Particulate matter	disease incidence	4.58E-10	2.20E-10
Ionising radiation, human health	kBq U235 eq	1.55E-03	1.78E-03
Photochemical ozone formation, human health	kg NMVOC eq	7.46E-05	1.00E-05
Acidification	mol H+ eq	9.07E-05	2.35E-05
Eutrophication, terrestrial	mol N eq	3.94E-04	3.72E-05
Eutrophication, freshwater	kg P eq	2.14E-07	1.67E-06
Eutrophication, marine	kg N eq	3.62E-05	5.15E-06
Land use	Dimensionless (pt)	1.32E-01	4.47E-02
Water use	m3 world eq	8.82E-03	3.89E-03
Resource use, fossils	MJ	2.78E-01	8.32E-02
Resource use, minerals and metals	kg Sb eq	-3.60E-09	9.56E-08

Table 30 Characterised benchmark values for RP3 "At the office" HOD PC refillable 5 gallons - Impacts per FU (100 ml)

Impact category	Unit	Life cycle excl. use stage	Use stage
Climate change[34 above]	kg CO2 eq	7.95E-03	9.62E-03
Ozone depletion	kg CFC-11 eq	2.52E-11	2.39E-12
Particulate matter	disease incidence	1.49E-10	2.24E-10
Ionising radiation, human health	kBq U235 eq	5.77E-04	2.66E-03
Photochemical ozone formation, human health	kg NMVOC eq	2.56E-05	1.53E-05
Acidification	mol H+ eq	2.94E-05	2.39E-05
Eutrophication, terrestrial	mol N eq	1.34E-04	5.04E-05
Eutrophication, freshwater	kg P eq	1.17E-07	5.93E-08
Eutrophication, marine	kg N eq	1.24E-05	4.96E-06
Land use	Dimensionless (pt)	3.66E-02	4.95E-02

Impact category	Unit	Life cycle excl. use stage	Use stage
Water use	m3 world eq	8.62E-03	1.68E-03
Resource use, fossils	MJ	1.14E-01	1.91E-01
Resource use, minerals and metals	kg Sb eq	3.42E-09	2.21E-09

7.1.2 Normalised benchmark values

Table 31 Normalised benchmark values for RP1 "Other channels" PET one-way 1500 ml - Impacts per FU (100 ml)

Impact category	Life cycle excl. use stage	Use stage
Climate change[34 above]	3.01E-06	6.40E-07
Ozone depletion	-8.54E-11	7.97E-10
Particulate matter	9.12E-07	3.22E-07
Ionising radiation, human health	8.24E-07	3.78E-07
Photochemical ozone formation, human health	1.46E-06	2.27E-07
Acidification	1.35E-06	3.96E-07
Eutrophication, terrestrial	1.57E-06	1.94E-07
Eutrophication, freshwater	8.84E-08	6.55E-07
Eutrophication, marine	9.34E-07	1.72E-07
Land use	9.46E-08	3.09E-08
Water use	1.15E-06	3.34E-07
Resource use, fossils	5.91E-06	1.15E-06
Resource use, minerals and metals	1.23E-05	1.62E-06

Table 32 Normalised benchmark values for RP2 "At horeca" Glass bottle refillable 1000 ml - Impacts per FU (100 ml)

Impact category	Life cycle excl. use stage	Use stage
Climate change[34 above]	2.61E-06	7.02E-07
Ozone depletion	1.33E-09	1.98E-09
Particulate matter	7.20E-07	3.45E-07
Ionising radiation, human health	3.66E-07	4.22E-07
Photochemical ozone formation, human health	1.84E-06	2.46E-07
Acidification	1.63E-06	4.23E-07
Eutrophication, terrestrial	2.22E-06	2.10E-07
Eutrophication, freshwater	8.39E-08	6.56E-07
Eutrophication, marine	1.28E-06	1.82E-07
Land use	9.89E-08	3.35E-08
Water use	7.69E-07	3.39E-07
Resource use, fossils	4.26E-06	1.27E-06
Resource use, minerals and metals	-6.22E-08	1.65E-06

Table 33 Normalised benchmark values for RP3 "At the office" HOD PC refillable 5 gallons - Impacts per FU (100 ml)

Impact category	Life cycle excl. use stage	Use stage
Climate change[34 above]	1.03E-06	1.24E-06
Ozone depletion	1.08E-09	1.02E-10
Particulate matter	2.35E-07	3.52E-07
Ionising radiation, human health	1.37E-07	6.31E-07
Photochemical ozone formation, human health	6.30E-07	3.78E-07
Acidification	5.29E-07	4.31E-07
Eutrophication, terrestrial	7.58E-07	2.85E-07
Eutrophication, freshwater	4.57E-08	2.32E-08
Eutrophication, marine	4.37E-07	1.76E-07
Land use	2.74E-08	3.71E-08
Water use	7.52E-07	1.46E-07
Resource use, fossils	1.74E-06	2.93E-06
Resource use, minerals and metals	5.91E-08	3.81E-08

7.1.3 7.1.3 Weighted benchmark values

Table 34 Weighted benchmark values for RP1 "Other channels" PET one-way 1500 ml - Impacts per FU (100 ml)

Impact category	Unit	Life cycle excl. use stage	Use stage
Climate change[34 above]	Pt	6.67E-07	1.42E-07
Ozone depletion	Pt	-5.77E-12	5.38E-11
Particulate matter	Pt	8.70E-08	3.07E-08
Ionising radiation, human health	Pt	4.43E-08	2.03E-08
Photochemical ozone formation, human health	Pt	7.47E-08	1.16E-08
Acidification	Pt	8.98E-08	2.63E-08
Eutrophication, terrestrial	Pt	6.14E-08	7.60E-09
Eutrophication, freshwater	Pt	2.61E-09	1.93E-08
Eutrophication, marine	Pt	2.91E-08	5.38E-09
Land use	Pt	7.96E-09	2.61E-09
Water use	Pt	1.04E-07	3.01E-08
Resource use, fossils	Pt	5.27E-07	1.03E-07
Resource use, minerals and metals	Pt	9.93E-07	1.31E-07
Total	**Pt**	**2.69E-06**	**5.30E-07**

Table 35 Weighted benchmark values for RP2 "At horeca" Glass bottle refillable 1000 ml - Impacts per FU (100 ml)

Impact category	Unit	Life cycle excl. use stage	Use stage
Climate change[34 above]	Pt	5.79E-07	1.56E-07
Ozone depletion	Pt	9.00E-11	1.34E-10
Particulate matter	Pt	6.87E-08	3.29E-08
Ionising radiation, human health	Pt	1.97E-08	2.26E-08
Photochemical ozone formation, human health	Pt	9.37E-08	1.26E-08
Acidification	Pt	1.08E-07	2.81E-08
Eutrophication, terrestrial	Pt	8.70E-08	8.23E-09
Eutrophication, freshwater	Pt	2.48E-09	1.93E-08
Eutrophication, marine	Pt	4.00E-08	5.69E-09
Land use	Pt	8.33E-09	2.82E-09
Water use	Pt	6.95E-08	3.06E-08
Resource use, fossils	Pt	3.80E-07	1.14E-07
Resource use, minerals and metals	Pt	-5.02E-09	1.34E-07
Total	**Pt**	**1.45E-06**	**5.67E-07**

Table 36 Weighted benchmark values for RP3 "At the office" HOD PC refillable 5 gallons - Impacts per FU (100 ml)

Impact category	Unit	Life cycle excl. use stage	Use stage
Climate change[34 above]	Pt	2.27E-07	2.75E-07
Ozone depletion	Pt	7.30E-11	6.91E-12
Particulate matter	Pt	2.24E-08	3.35E-08
Ionising radiation, human health	Pt	7.35E-09	3.39E-08
Photochemical ozone formation, human health	Pt	3.21E-08	1.93E-08
Acidification	Pt	3.52E-08	2.86E-08
Eutrophication, terrestrial	Pt	2.96E-08	1.11E-08
Eutrophication, freshwater	Pt	1.35E-09	6.86E-10
Eutrophication, marine	Pt	1.36E-08	5.48E-09
Land use	Pt	2.31E-09	3.12E-09
Water use	Pt	6.79E-08	1.32E-08
Resource use, fossils	Pt	1.55E-07	2.61E-07
Resource use, minerals and metals	Pt	4.77E-09	3.08E-09
Total	**Pt**	**6.00E-07**	**6.89E-07**

7.2 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.

7.3 Additional technical information

N/A

7.4 Additional environmental information

Biodiversity is considered as relevant for this PEFCR: Yes.

Producers who apply this PEFCR should indicate if the company follows a specific program in terms of protecting and monitoring the catchment areas. Key information regarding the program shall be described, e.g., protection efforts put in place include limiting human activity with a relevant impact to the environment, banning the use of pesticides and replacing them with natural farmer practices, limiting the usage of underground water as irrigation water and improved farming techniques and organic agriculture, which represents benefit for ecosystem quality (biodiversity) compared to conventional practices.

For instance, if the requirements and guidelines outlined in "Guide to good hygienic practices for packaged water in Europe" (EFBW 2012) are followed, they should be reported. The most relevant sections of this reference document are reported here below.

In addition, if a specific standard is followed (for example, the standard developed by the European Centre for Mineral Water Research (CERAM)), the key information related to this standard should be reported.

8 Verification

The verification of an EF study/report carried out in compliance with this PEFCR shall be done according to all the general requirements included in Section 8 of the PEFCR Guidance Version 6.3 *and the requirements listed below.*

The verifier(s) shall verify that the EF study is conducted in compliance with this PEFCR.

These requirements will remain valid until an EF verification scheme is adopted at European level or alternative verification approaches applicable to EF studies/report are included in existing or new policies.

The verifier(s) shall validate the accuracy and reliability of the quantitative information used in the calculation of the study. As this can be highly resource intensive, the following requirements shall be followed:

- *the verifier shall check if the correct version of all impact assessment methods was used. For each of the most relevant impact categories, at least 50% of the characterisation factors (for each of the most* *relevant EF impact categories) shall be verified, while all normalisation and weighting factors of all ICs shall be verified. In particular, the verifier shall check that the characterisation factors correspond to those included in the EF impact assessment method the study declares compliance with[35];*

- *all the newly created datasets shall be checked on their EF compliancy (for the meaning of EF compliant datasets refer to Annex H of the Guidance). All their underlying data (elementary flows, activity data and sub processes) shall be validated;*
- *the aggregated EF-compliant dataset of the product in scope (meaning, the EF study) is available on the EF node (http://eplca.jrc.ec.europa.eu/EF-node).*
- *for at least 70% of the most relevant processes in situation 2 option 2 of the DNM, 70% of the underlying data shall be validated. The 70% data shall include all energy and transport sub processes for those in situation 2 option 2;*
- *for at least 60% of the most relevant processes in situation 3 of the DNM, 60% of the underlying data shall be validated;*
- *for at least 50% of the other processes in situation 1, 2 and 3 of the DNM, 50% of the underlying data shall be validated.*

In particular, it shall be verified for the selected processes if the DQR of the process satisfies the minimum DQR as specified in the DNM.
The selection of the processes to be verified for each situation shall be done ordering them from the most contributing to the less contributing one and selecting those contributing up to the identified percentage starting from the most contributing ones. In case of non-integer numbers, the rounding shall be made always considering the next upper integer.
These data checks shall include, but should not be limited to, the activity data used, the selection of secondary sub-processes, the selection of the direct elementary flows and the CFF parameters. For example, if there are 5 processes and each one of them includes 5 activity data, 5 secondary datasets and 10 CFF parameters, then the verifier(s) has to check at least 4 out of 5 processes (70%) and, for each process, (s)he shall check at least 4 activity data (70% of the total amount of activity data), 4 secondary datasets (70% of the total amount of secondary datasets), and 7 CFF parameters (70% of the total amount of CFF parameters), i.e. the 70% of each of data that could be possible subject of check.
The verification of the EF report shall be carried out by randomly checking enough information to provide reasonable assurance that the EF report fulfils all the conditions listed in section 8 of the PEFCR Guidance.

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10 Appendices

ANNEX 1 – List of EF normalisation and weighting factors

Global normalisation factors are applied within the EF. The normalisation factors as the global impact per person are used in the EF calculations.

Impact category	Unit	Normalisa-tion factor	Normalisa-tion factor per person	Impact assess-ment robustness	Inventory coverage completeness	Inventory robustness	Comment
Climate change	kg $CO_{2\ eq}$	5.35E+13	7.76E+03	I	II	I	
Ozone depletion	kg CFC-11 $_{eq}$	1.61E+08	2.34E-02	I	III	II	
Human toxicity, cancer	CTUh	2.66E+05	3.85E-05	II/III	III	III	
Human toxicity, non-cancer	CTUh	3.27E+06	4.75E-04	II/III	III	III	
Particulate matter	disease incidence	4.39E+06	6.37E-04	I	I/II	I /II	NF calculation takes into account the emission height both in the emission inventory and in the impact assessment.
Ionising radiation, human health	kBq U^{235} $_{eq}$	2.91E+13	4.22E+03	II	II	III	
Photochemical ozone formation, human health	kg NMVOC $_{eq}$	2.80E+11	4.06E+01	II	III	I/II	
Acidification	mol H+ $_{eq}$	3.83E+11	5.55E+01	II	II	I/II	
Eutrophication, terrestrial	mol N $_{eq}$	1.22E+12	1.77E+02	II	II	I/II	
Eutrophication, freshwater	kg P $_{eq}$	1.76E+10	2.55E+00	II	II	III	
Eutrophication, marine	kg N $_{eq}$	1.95E+11	2.83E+01	II	II	II/III	

Impact category	Unit	Normalisa-tion factor	Normalisa-tion factor per person	Impact assess-ment robustness	Inventory coverage completeness	Inventory robustness	Comment
Land use	pt	9.20E+15	1.33E+06	III	II	I I	The NF is built by means of regionalised CFs.
Ecotoxicity, freshwater	CTUe	8.15E+13	1.18E+04	II/III	III	III	
Water use	m^3 world $_{eq}$	7.91E+13	1.15E+04	III	I	II	The NF is built by means of regionalised CFs.
Resource use, fossils	MJ	4.50E+14	6.53E+04	III	I	II	
Resource use, minerals and metals	kg Sb $_{eq}$	3.99E+08	5.79E-02	III			

Weighting factors for Environmental Footprint

	Aggregated weighting set	Robustness factors	Calculation	**Final weighting factors**
WITHOUT TOX CATEGORIES	(50:50)	(scale 1-0.1)		
	A	B	C=A*B	C scaled to 100
Climate change	15.75	0.87	13.65	**22.19**
Ozone depletion	6.92	0.6	4.15	**6.75**
Particulate matter	6.77	0.87	5.87	**9.54**
Ionizing radiation, human health	7.07	0.47	3.3	**5.37**
Photochemical ozone formation, human health	5.88	0.53	3.14	**5.1**
Acidification	6.13	0.67	4.08	**6.64**
Eutrophication, terrestrial	3.61	0.67	2.4	**3.91**
Eutrophication, freshwater	3.88	0.47	1.81	**2.95**
Eutrophication, marine	3.59	0.53	1.92	**3.12**
Land use	11.1	0.47	5.18	**8.42**
Water use	11.89	0.47	5.55	**9.03**

WITHOUT TOX CATEGORIES	Aggregated weighting set (50:50)	Robustness factors (scale 1-0.1)	Calculation	**Final weighting factors**
	A	B	C=A*B	C scaled to 100
Resource use, minerals and metals	8.28	0.6	4.97	**8.08**
Resource use, fossils	9.14	0.6	5.48	**8.92**

ANNEX 2 - Check-list for the PEF study

Each PEF study shall include this annex, completed with all the requested information.

ITEM	***Included in the study (Y/N)***	***Section***	***Page***
Summary			
General information about the product			
General information about the company			
Diagram with system boundary and indication of the situation according to DNM			
List and description of processes included in the system boundaries			
List of co-products, by-products and waste			
List of activity data used			
List of secondary			

ITEM	***Included in the study (Y/N)***	***Section***	***Page***
datasets used			
Data gaps			
Assumptions			
Scope of the study			
(sub)category to which the product belongs			
DQR calculation of each dataset used for the most relevant processes and the new ones created.			
DQR (of each criteria and total) of the study			
If relevant description of specific program in terms of protecting and monitoring the catchment areas (see 7.4)			

ANNEX 3 – LCI data

Annex 3 is provided as the following document:

- PEFCR-PackedWater_Version1-2018-04-23 - Life cycle inventory.xlsx, available at http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR.htm

This Excel file includes the following:

- a comprehensive list of secondary datasets in the foreground and background systems to be used if applicable for the product in question;
- the generic data that shall be used for each process for each life cycle stage if no primary data are available;
- the DQR ratings for each dataset used as well as the DQRs calculated for the four benchmarks; and
- information on the nodes to access all EF-compliant datasets.

ANNEX 4 - Critical review report of the PEFCR

Annex 4 is provided as the following document which includes all findings of the review process and the actions taken by the TS to answer the reviewer comments:

- PEFCR-PackedWater_ Final review report _2018-03-12_V0.pdf”

ANNEX 5 - Other Annexes

Additional information related to representative products used in PEFCR development

Complete European market data are not available[36], nevertheless the following information (e.g., reflecting national situation) related to the different types of packaging material can be considered to justify the choices proposed in this document:

- "other channels": this sub-category includes "on the go" and "at home". The Technical Secretariat decided to merge them into a unique "other channels" sub-category. At this stage (according to available data) and since huge differences exist from one market to another one in Europe (with much bigger format in the geographies in the Southern part of Europe), the Technical Secretariat did not build a virtual average product and selected as representative product the "PET one-way 1.5L" for this sub-category since it is by far the dominant format in all countries. The analysis about the amount of packaging material used per liter shows very little changes from one format to another one (e.g., from "PET one-way 0.5L" to "PET one-way 1.5L"); but to assess the potential influence of this parameter, the Technical Secretariat will elaborate some sensitive analyses to measure impact of formats among for the same packaging material. The detailed information is presented below:
    - "on the go": Based on Italian data according to IRI (2013) (Italy represents one of the most important market of packed water producers and consumers in Europe), the market shares in terms of volumes (i.e., liters of water) are: 100% PET; other packaging materials (e.g., glass, beverage carton and aluminium) represents less than 1%. According to this information, the PET is the representative packaging material. The most dominant format for PET in this sub-category is the 0.5L. Note that many formats could be found in this sub-category; e.g., "PET one-way 0.25L", "PET one-way 0.33L", "PET one-way 0.50L", "PET one-way 0.75L", "PET one-way 1.00L"; the analysis of packaging material used per liter show very little change from one format to another one.
    - "at home": Based on Italian data according to IRI (2013) (Italy represents one of the most important market of packed water producers and consumers in Europe), the market shares in terms of volumes (i.e., liters of water) are: 99.70% PET; other packaging materials (e.g., glass, beverage carton and aluminium) represents less than 1%. According to this information, the PET is the representative packaging material. The most dominant format for PET in this sub-category is the 1.5L. Note that many formats could be found in this sub-category; e.g., "PET one-way 0.25L", "PET one-way 0.33L", "PET one-way 0.50L", "PET one-way 0.75L", "PET one-way 1.00L", "PET one-way 1.50L", "PET one-way 2.00L", "PET one-way 3.00L", "PET one-way 5.00L", "PET one-way 6.00L", "PET one-way 7.00L", "PET one-way 8.00L"; the analysis of packaging material used per liter show very little change from one format to another one.

[36] In parallel, efforts are still taking place to find European data to further support the choices of the Technical Secretariat.

- "at horeca": Based on Italian data according to IRI (2013) (Italy represents one of the most important market of packed water producers and consumers in Europe), the market shares in terms of volumes (i.e., liters of water) are: 55.44% glass, 44.54% PET; other packaging materials (e.g., beverage carton and aluminium) represents less than 1%. It's not straightforward to identify the representative packaging material and high discrepancies are observed depending on the reference. Up to now, the glass is considered the representative packaging material according to expert judgment. The most dominant format for glass in this sub-category is the refillable 1.0L. At this stage and since huge differences exist from one reference to another one, and significant changes from one market to another one in Europe, the Technical Secretariat did not build a virtual average product and selected as representative product the "Glass refillable 1.0L" for this sub-category since it is by far the dominant format in all countries. Note that many formats could be found in this sub-category: "Glass one-way 0.33L", "Glass one-way 0.50L", "Glass one-way 0.75L", "Glass one-way 1.00L", "Glass refillable 0.33L", "Glass refillable 0.50L", "Glass refillable 0.75L", "Glass refillable 1.00L", "PET one-way 0.50L", "PET one-way 0.75L", "PET one-way 1.00L", "PET one-way 1.50L", "can one-way 0.33L".
- "at the office": Based on information provided by the European Watercooler Association (EWA), the market is mostly represented by one format: the 5 gallons. Then the packaging material used in that segment is mainly represented by the polycarbonate (PC). Other PET blended materials are tested in many countries but without any stability in the choice of the blended material, so the Technical Secretariat decided to exclude PET material waiting for more information in the near future of the main choice of the industry. This is why the following representative product has been selected for this sub-category: "HOD PC refillable 5 gallons".

According to Zenith International (2014), the packaging materials considered with these representative products cover about 99% of the bottled water sold in 2012: 83% of the bottled water sold in EU28 was in PET, 12% was in glass and 5% was sold in other packaging materials such as PC.

According to Nielsen (2014) and considering both still and sparkling water, the class "1.0L < x ≤ 1.5L" (including "PET one-way 1.5L") represents 44.3% of the market in terms of value share, the class "0.75L < x ≤ 1.0L" (including "Glass refillable 1.0L") represents 20.4%, the class " x ≤ 0.5L" (including "PET one-way 0.5L") represents 14.7% and the class " x > 10L" (including "HOD PC 5 gallons") represents less than 1%. The rest (i.e., about 21%) is covered by other formats, e.g., 0.6L, 0.75L, 2L, 5L, ...

In addition, the representative products selected for the main applications addressed two key systems: the one-way systems ("PET one-way 1.5L") and the refillable systems ("Glass refillable 1.0L" and "HOD PC 5 gallons").

At this stage, the data regarding the primary packaging refers mainly to still water. According to Canadean (2013), in 2013 the still water represents about 60% of the European market. Still water is considered for the "HOD PC refillable 5 gallons"; and a mix composed by 40% of carbonated water is considered for the "PET one-way 1.5L" and "Glass refillable 1.0L".

Source: IRI, Infoscan and Beverage Wholesalers (2013).

Table 37 Italian market shares per type of packaging materials for the sub-categories "other channels" (including "on the go" and "at home") and "at horeca" in terms of volumes sold in 2013 according to IRI (2013)

	"other channels"		"at horeca"
	"on the go"	"at home"	
PET	100.00%	99.70%	44.54%
Glass	0.00%	0.30%	55.44%
Beverage carton	0.00%	0.00%	0.02%
Aluminium	0.00%	0.00%	0.00%
HDPE	0.00%	0.00%	0.00%
HOD PET	0.00%	0.00%	0.00%
HOD HDPE	0.00%	0.00%	0.00%
HOD PC	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%

Table 38 Italian market shares per packed water product for the sub-categories "other channels" (including "on the go" and "at home") and "at horeca" in terms of volumes sold in 2013 according to IRI (2013)

	"other channels"		"at horeca"
Packed water product	"on the go"	"at home"	
PET one-way 0.125L	0.00%	0.00%	0.00%
PET one-way 0.250L	0.21%	0.00%	0.04%
PET one-way 0.330L	2.14%	0.00%	0.38%
PET one-way 0.500L	90.09%	2.62%	17.17%
PET one-way 0.750L	0.27%	0.20%	0.00%
PET one-way 1.000L	7.30%	0.33%	9.13%
PET one-way 1.150L	0.00%	0.00%	0.00%
PET one-way 1.250L	0.00%	0.03%	0.00%
PET one-way 1.500L	0.00%	63.32%	17.82%
PET one-way 1.725L	0.00%	0.11%	0.00%
PET one-way 2.000L	0.00%	33.06%	0.00%
PET one-way 3.000L	0.00%	0.01%	0.00%
PET one-way 5.000L	0.00%	0.01%	0.00%
Glass one-way 0.100L	0.00%	0.00%	0.00%
Glass one-way 0.200L	0.00%	0.00%	0.01%
Glass one-way 0.250L	0.00%	0.00%	0.78%
Glass one-way 0.330L	0.00%	0.00%	0.10%
Glass one-way 0.375L	0.00%	0.00%	0.00%
Glass one-way 0.500L	0.00%	0.00%	0.22%
Glass one-way 0.750L	0.00%	0.00%	0.92%
Glass one-way 0.800L	0.00%	0.00%	0.00%
Glass one-way 0.900L	0.00%	0.00%	0.00%
Glass one-way 1.000L	0.00%	0.30%	1.69%
Brick one-way 0.50L	0.00%	0.00%	0.02%
Aluminium can one-way 0.250L	0.00%	0.00%	0.00%
Aluminium can one-way 0.330L	0.00%	0.00%	0.00%
HDPE one-way 5.000L	0.00%	0.00%	0.00%
HDPE one-way 6.000L	0.00%	0.00%	0.00%
HDPE one-way 8.000L	0.00%	0.00%	0.00%

HOD PET refillable 3 gallons	0.00%	0.00%	0.00%
HOD PET refillable 5 gallons	0.00%	0.00%	0.00%
HOD HDPE refillable 3 gallons	0.00%	0.00%	0.00%
HOD HDPE refillable 5 gallons	0.00%	0.00%	0.00%
HOD PC refillable 10.000L	0.00%	0.00%	0.00%
HOD PC refillable 3 gallons	0.00%	0.00%	0.00%
HOD PC refillable 18.000L	0.00%	0.00%	0.00%
HOD PC refillable 18.020L	0.00%	0.00%	0.00%
HOD PC refillable 5 gallons	0.00%	0.00%	0.00%
Glass refillable 0.200L	0.00%	0.00%	0.00%
Glass refillable 0.250L	0.00%	0.00%	0.02%
Glass refillable 0.330L	0.00%	0.00%	0.07%
Glass refillable 0.375L	0.00%	0.00%	0.01%
Glass refillable 0.400L	0.00%	0.00%	0.03%
Glass refillable 0.450L	0.00%	0.00%	0.00%
Glass refillable 0.500L	0.00%	0.00%	4.50%
Glass refillable 0.700L	0.00%	0.00%	0.14%
Glass refillable 0.750L	0.00%	0.00%	16.94%
Glass refillable 0.920L	0.00%	0.00%	0.00%
Glass refillable 1.000L	0.00%	0.00%	30.00%
Glass refillable 2.000L	0.00%	0.00%	0.01%
TOT TOTAL	100.00%	100.00%	100.00%