PEF (Product Environmental Footprint) – What It Is, and Benefits for SME's -

Webinar, 10 December 2020

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Technical info

- Listen-only mode
- Use Chat Function for Questions/Comments
- All Questions Will Be Answered
  - As much as possible in Q+A part
  - All questions will be answered in writing
- Slides, Recording and Q&A will be made available here

Environmental Footprint Initiative: Why?

For consumers

Choosing the right product and understanding labels

For green producers

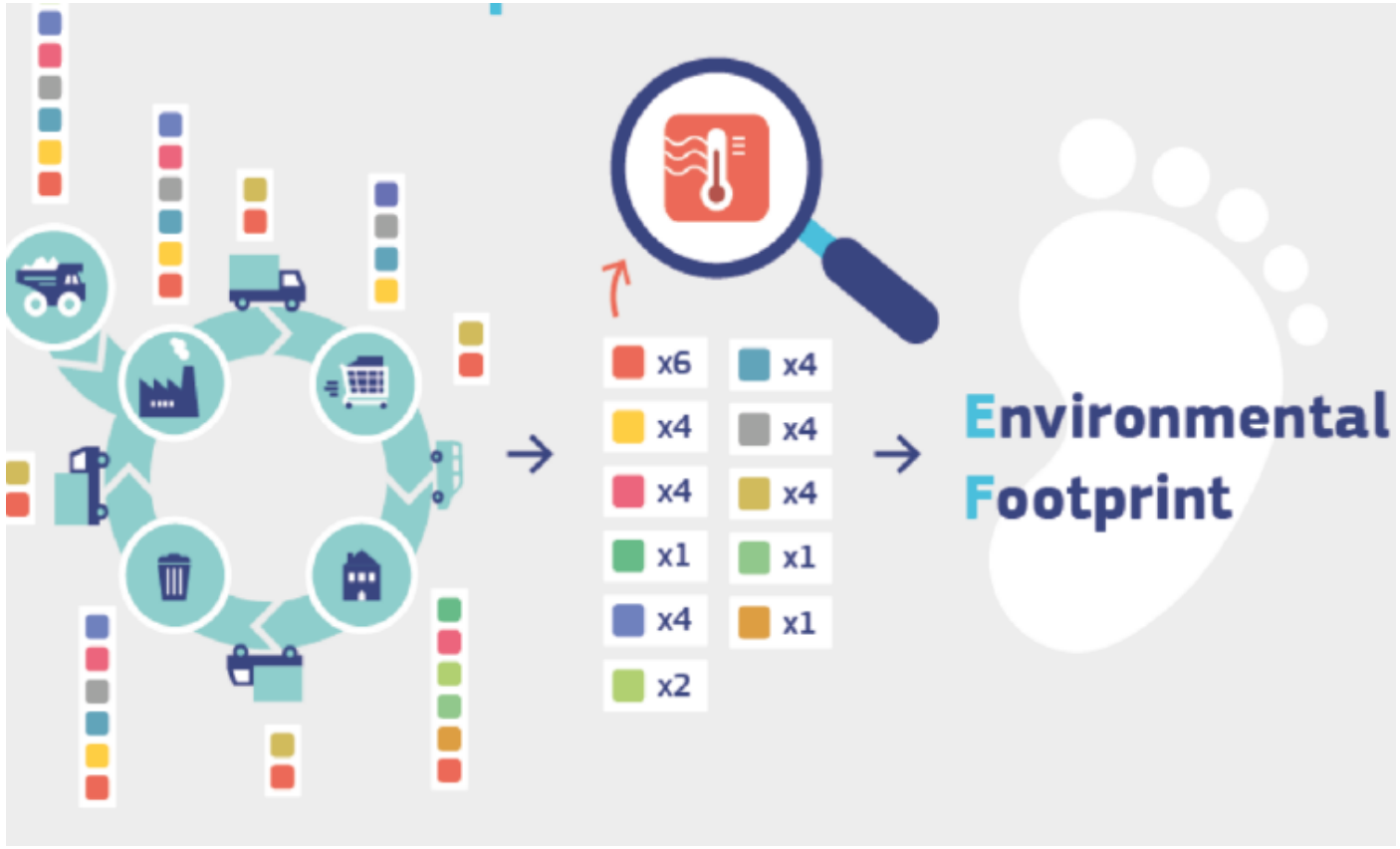
Fair competition against false green claims

Unlock opportunities for the circular and green economy

More harmonised approach for environmental information

Provide reliable and relevant environmental claims

Environmental Footprint: How?



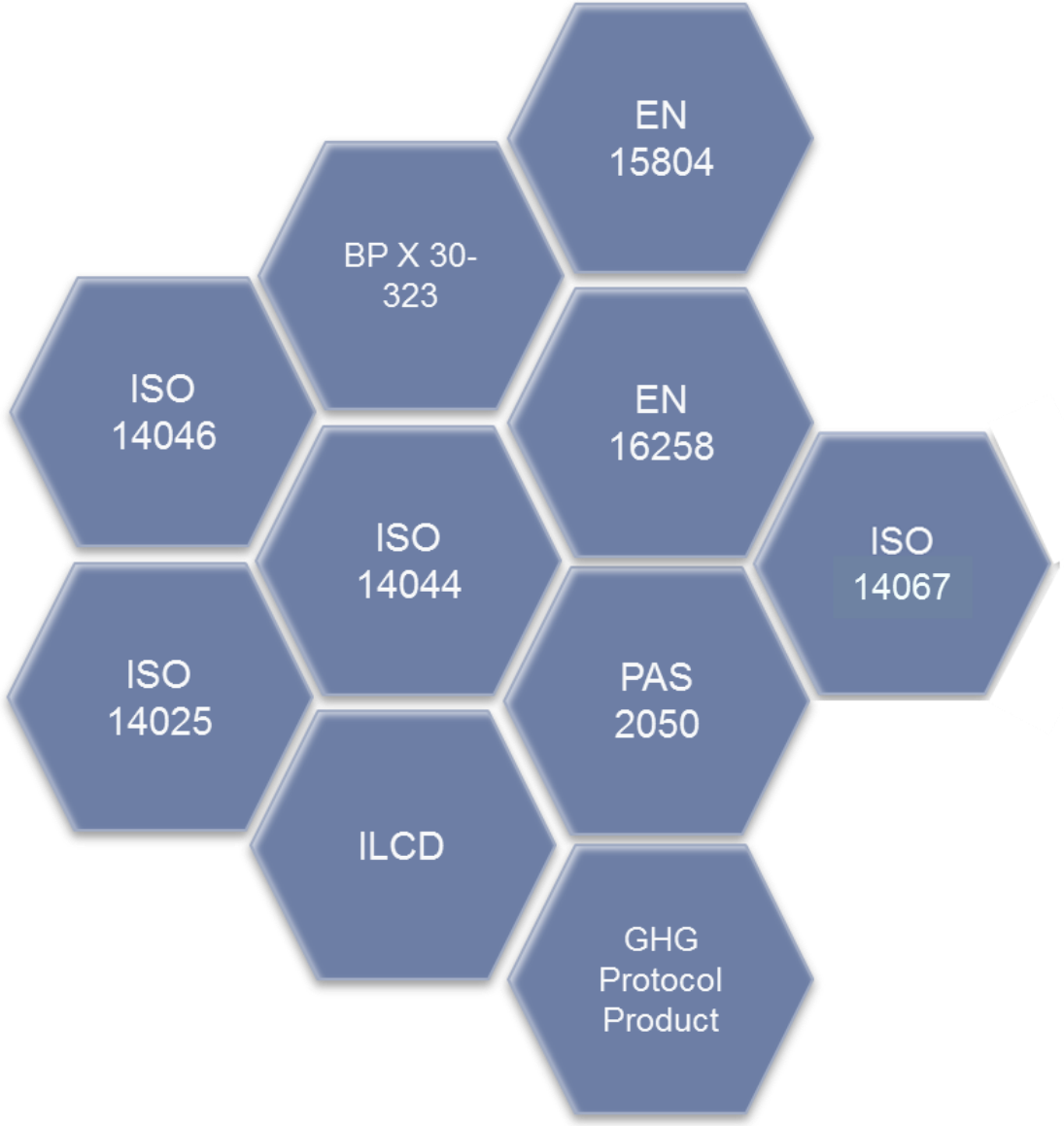
16 impact categories

Impacts of the same category are summed up along the life cycle

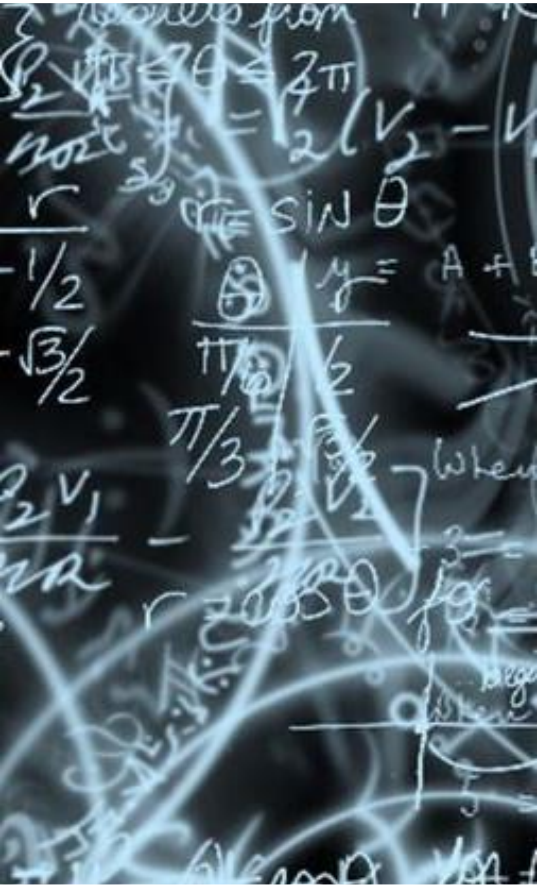
Impacts categories are combined

- Any product (or organisation) on EU market
- Life cycle based, comprehensive impact coverage
- Pilot Phase (2013-2018):
  - 280 organisations involved (industry associations, large OEM's)
  - ~3.000 stakeholders involved
- Transition Phase (ongoing)

Incorporation/consideration of existing standards



Features of the EF Initiative



- A single set of rules valid for the European market (PEFCR)
- Definition of a representative product/organization
- Benchmarks
- Materiality Approach (focus where it counts)

Integration of existing knowledge (LCA studies, corporate GHG reporting, GRI, EMS) with new requirements (method, data; and specific for product groups or sectors)

Acronyms

B2B	Business-to-Business
B2C	Business-to-Consumer
CFF	Circular Footprint Formula
DQR	Data Quality Rating
EF	Environmental Footprint
EoL	End of Life (of a product)
EPD	Environmental Product Declaration
ILCD	International Reference Life Cycle Data System
LCA	Life Cycle Assessment
LCIA	Life Cycle Impact Assessment
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
RP	Representative Product

What is a PEFCR

Product Environmental Footprint Category Rule (PEFCR):

Consistent and specific set of rules to calculate the relevant environmental information of products belonging to the product category in scope – e.g., dairy products, metal sheets, uninterruptable power supply.

Pilot phase: 21 PEFCRs/OEFSRs

Finalised PEFCRs in April 2018

- Rechargeable batteries
- Decorative paints
- IT equipment (HDD systems)
- Leather
- Thermal insulation (housing)
- Beer
- Dairy products
- Feed for food prod. animals
- Pet food
- Pasta
- Wine
- Packed water

Finalised PEFCRs in November 2018

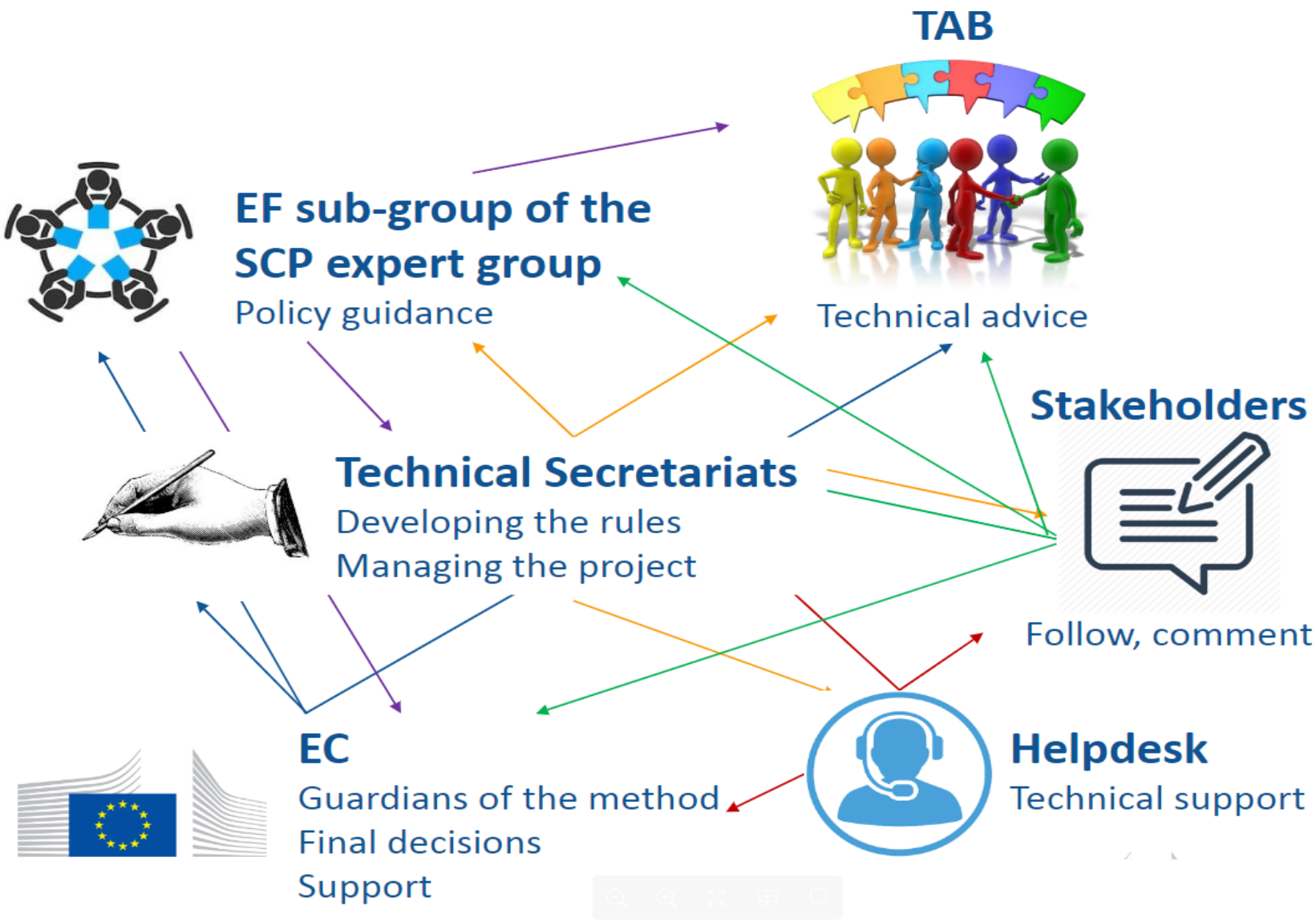
- Hot & cold water pipe systems
- Liquid household detergents
- Uninterruptable power supply
- Photovoltaic electricity generation
- Intermediate paper product
- Metal sheets
- T-shirt

Finalised OEFSRs

- Retail
- Copper production

http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm

Actors


TAB
EF sub-group of the
SCP expert group
Policy guidance
Technical advice
Stakeholders
Technical Secretariats
Developing the rules
Managing the project
Follow, comment
EC
Guardians of the method
Final decisions
Support
Helpdesk
Technical support

PEFCRs currently being developed

(Transition phase)

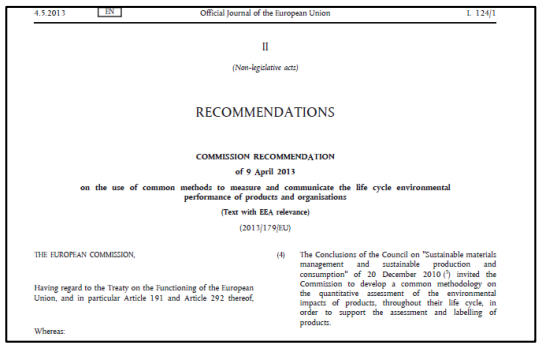
	**Apparel** (including accessories, dresses, hosiery, underwear, leggings/ tights, baselayer, jacket, jersey, pants, shirts, skirt, socks, sweater and cardigans, swimwear, t-shirt, boots, cleats, court, dress shoes/ heel, other athletic shoes, sandals and sneakers)	Sustainable Apparel Coalition pef@apparelcoalition.org
	**Cut flowers and potted plants**	Coöperatie Royal FloraHolland U.A. alberthaasnoot@royalfloraholland.com
	**Flexible** packaging (low, medium and high functionality flexible packaging)	Amcor Group GmbH isabelle.jenny@amcor.com
	**Synthetic turf**	EMEA Synthetic Turf Council (ESTC) stefan@estc.info
	**Marine fish** (wild caught marine fish and marine fish from marine open net pen aquaculture)	Norwegian Seafood Federation (NSF) henrik.stenwig@sjomatnorge.no

Relevant documents

Pilot phase

Transition phase

2013 → **2018** → **2019-2022**



4.5.2013 EN Official Journal of the European Union L 124/1

II

(Non-legislative acts)

RECOMMENDATIONS

COMMISSION RECOMMENDATION
of 9 April 2013
on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations
(Text with EEA relevance)
(2013/179/EU)

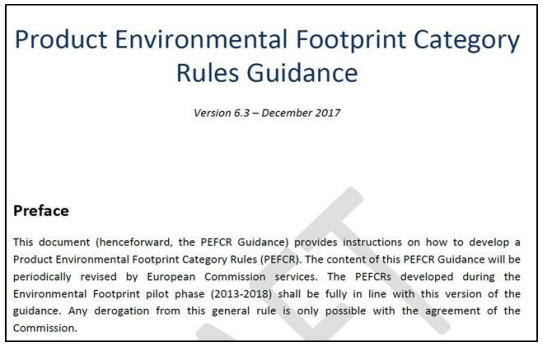
THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 191 and Article 292 thereof,

Whereas:

(4) The Conclusions of the Council on "Sustainable materials management and sustainable production and consumption" of 20 December 2010 (7) invited the Commission to develop a common methodology on the quantitative assessment of the environmental impacts of products, throughout their life cycle, in order to support the assessment and labelling of products.

Rec 179/2013



Product Environmental Footprint Category Rules Guidance

Version 6.3 – December 2017

Preface

This document (henceforward, the PEFCR Guidance) provides instructions on how to develop a Product Environmental Footprint Category Rules (PEFCR). The content of this PEFCR Guidance will be periodically revised by European Commission services. The PEFCRs developed during the Environmental Footprint pilot phase (2013-2018) shall be fully in line with this version of the guidance. Any derogation from this general rule is only possible with the agreement of the Commission.

PEFCR Guidance 6.3

JRC TECHNICAL REPORTS

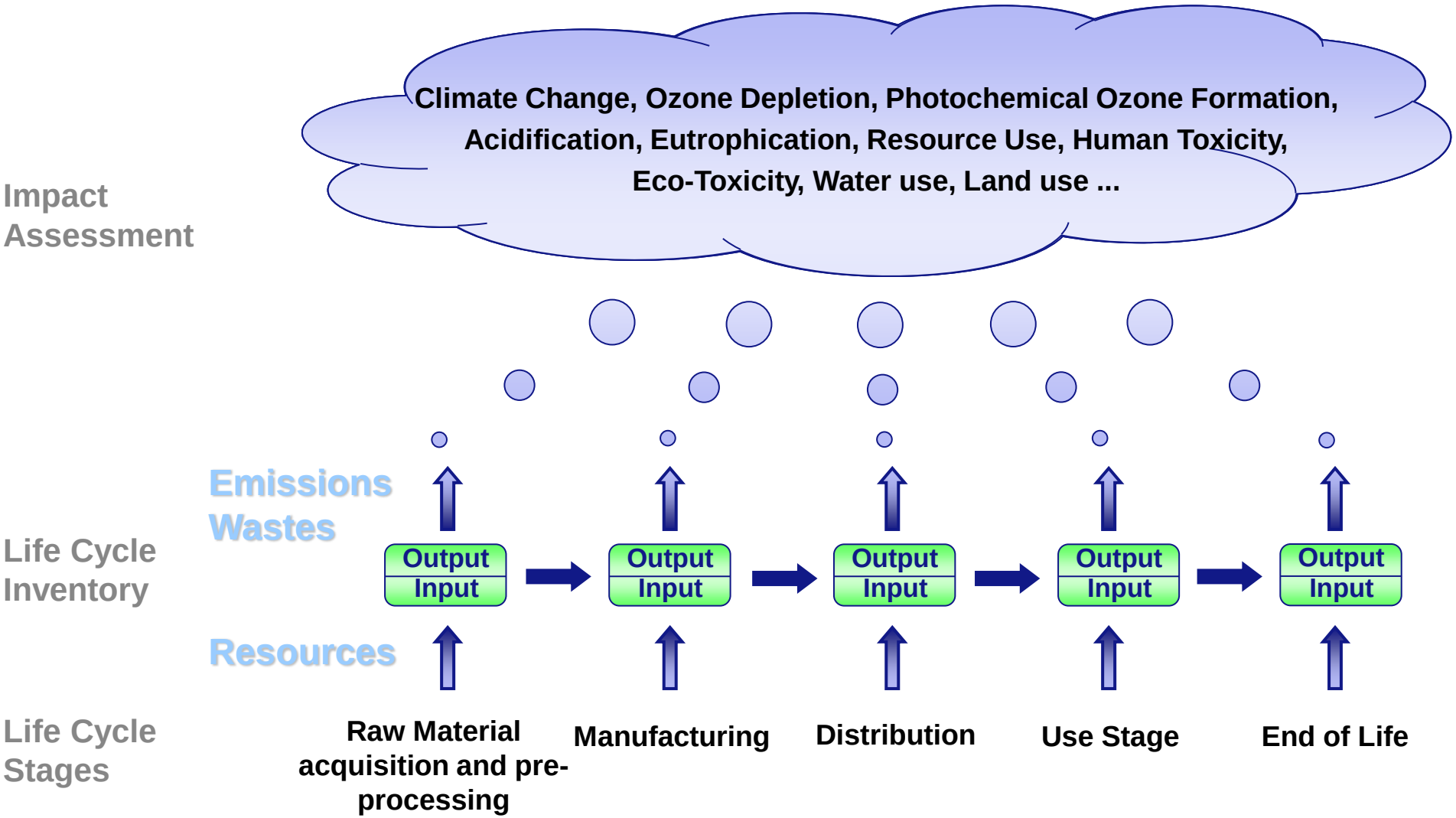
Suggestions for updating the Product Environmental Footprint (PEF) method

Zampori L. Pant R

2019

JRC Technical Report

...'based on a life cycle approach'...
Life Cycle Assessment –



Life Cycle Assessment

From Code of Practice to EF

Scientific bodies as pre-standard driver: **1980&90s**

Industry Associations

1997: LCA standard under ISO → Increased use in practice

2000s: Labelling / EPDs based on standardised LCA

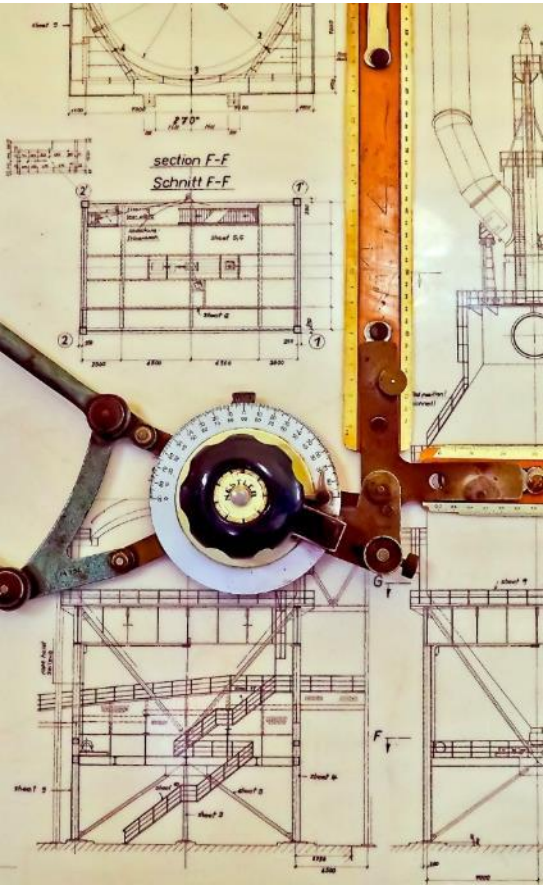
→ Increased B2B and some B2C communications

IPP, EPLCA, ELCD, ILCD, SCP/SIP, Circular Economy PEF

2005+: Policy takes up LCA, uses insights for EU policies

LCA-based public policies: **2021+**

Principles



To produce reliable, reproducible, and verifiable EF studies, a core suite of analytical principles shall be adhered to:

(1) Relevance

(2) Completeness

(3) Consistency

(4) Accuracy

(5) Transparency

Applications

In-house applications

- optimisation of processes along the life cycle of a product,
- support to environmental management,
- identification of environmental hotspots,
- support for product design minimising environmental impacts along the life cycle,
- environmental performance improvement and tracking.

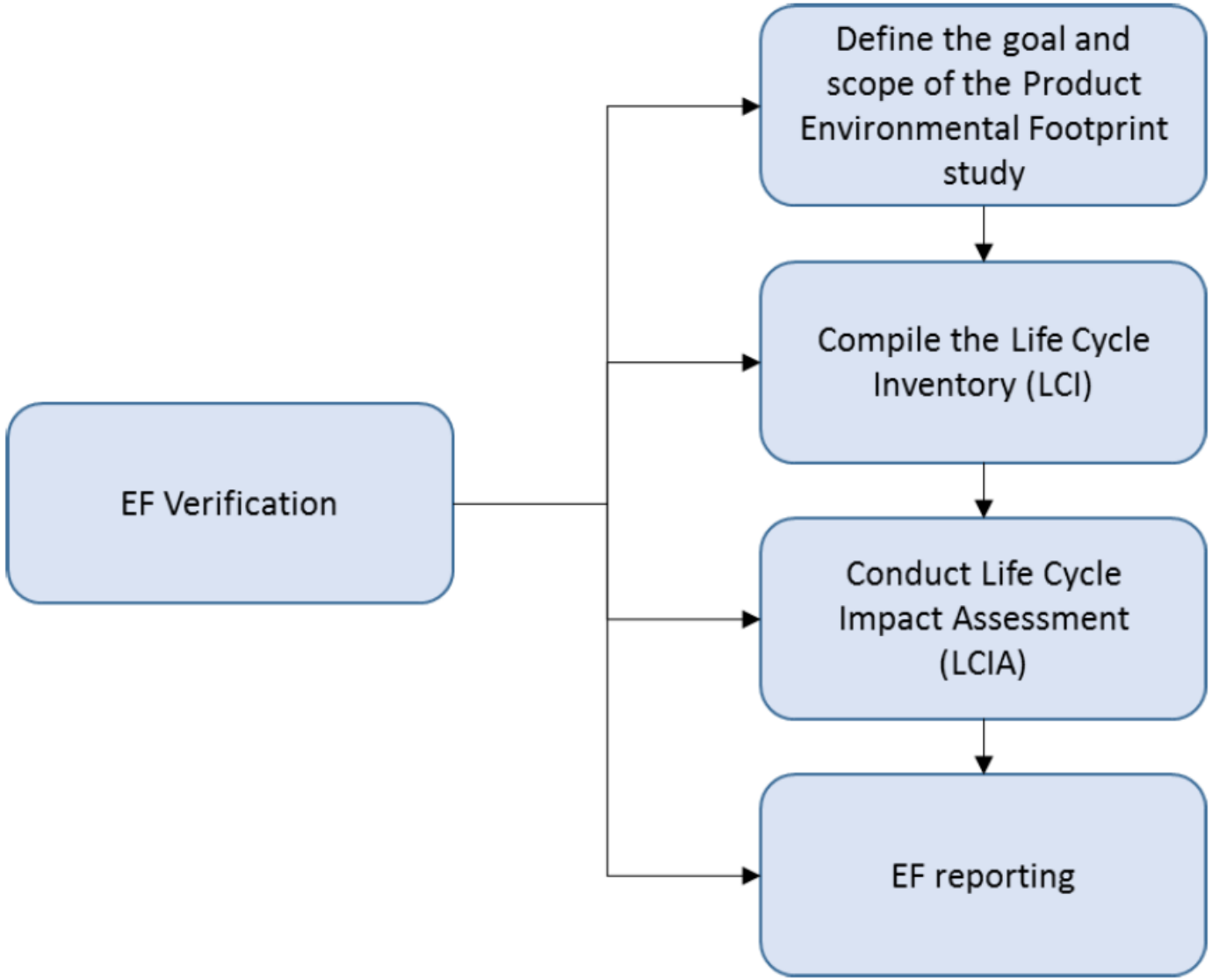
External applications (B2B, B2C)

- responding to customers and consumers demands,
- marketing,
- co-operation along supply chains to optimise the product life cycle,
- participation in 3rd party schemes related to environmental claims or giving visibility to products that communicate their life cycle environmental performance.

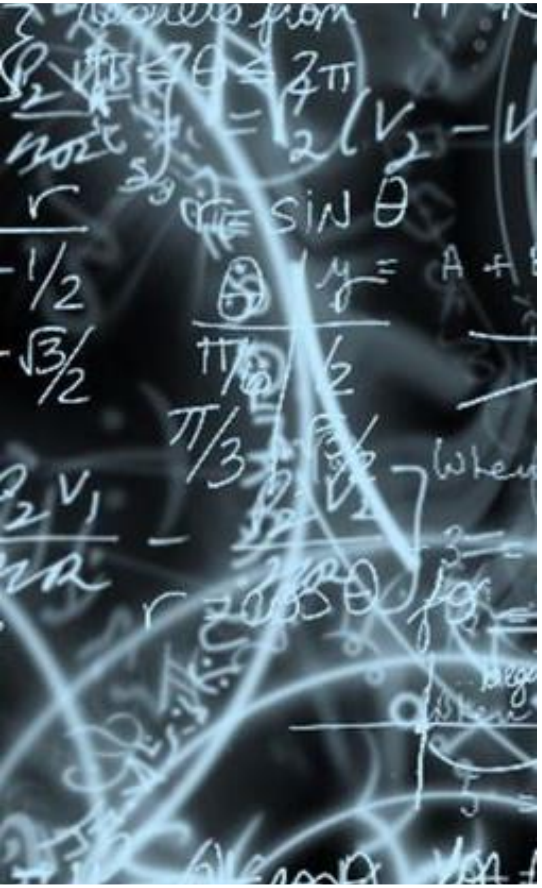
Additional applications if in compliance with a PEFCR/OEFSR

- Comparisons and comparative assertions (i.e., claims of overall superiority or equivalence of the environmental performance of one product compared to another)
- Comparison and comparative assertions against the benchmark followed by a grading of other products/organisations according to their performance versus the benchmark
- Identification of significant environmental impacts common to a product group/sector
- Reputational schemes giving visibility to products/organisations that calculate their life cycle environmental performance
- Green procurement (public and corporate)

Phases of an EF study



Outcomes of an EF study (1)

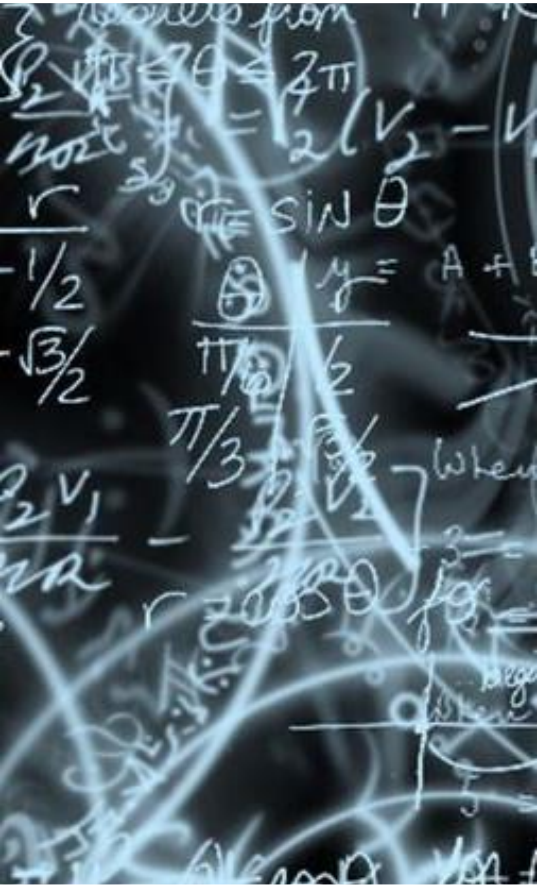


Environmental profile

Hotspot results

Additional information

Outcomes of a PEF study (2)

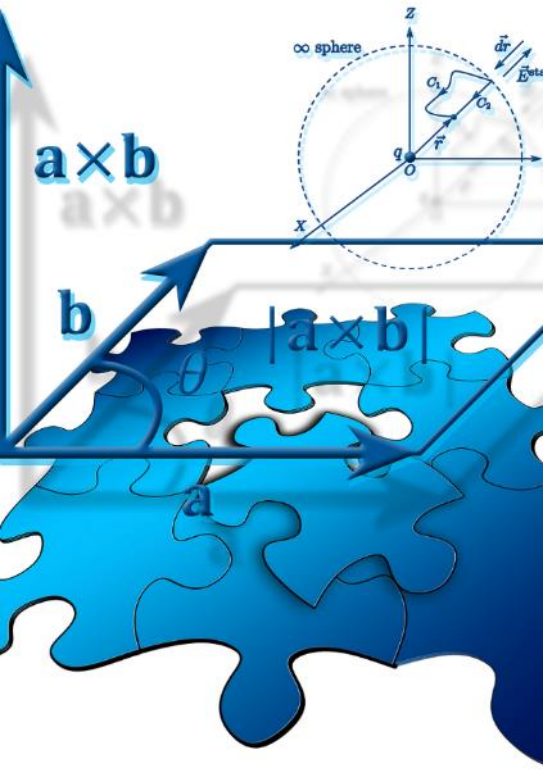


The environmental performance of the product, using all the EF impact categories and models.

Results of a PEF study shall be calculated and reported in the EF report as

- characterised,
- normalised, and
- weighted results for each EF impact category; and
- as a single overall score

Scope



The scope of the EF study describes in detail the system to be evaluated and the technical specifications.

The scope definition shall be in line with the defined goals of the study and shall include (see subsequent sections for a more detailed description):

- **Functional unit and reference flow**
- **System boundary**
- **EF impact categories**
- **Additional information to be included**
- **Assumptions/Limitations**

Functional Unit and Reference Flow

Functional unit:

Quantified performance of a product system for use as a reference unit

Reference flow:

The amount of product needed to provide the defined function

Functional Unit

A product without a function is useless

Function

What?

Unit & magnitude

How much?

Duration

How long?

Level of quality

How well?

Functional Unit – Example *Paint*

- Function (“What”): Protection and decoration
- Unit and Magnitude (“How much”): 1 square meter
- Duration (“How long”): 50 years
- Quality (“How well”): min. 98% opacity

- *Reference flow: Needed mass in kg of paint*

Functional Unit - Example *Pet Food*

What: To serve metabolizable energy (of prepared pet food to a cat or dog)

How much: Daily ration, recommended rate for average cat or dog (where average refers to the pet weight: 4 kg for a cat and 15 kg for a dog)

How well: To meet the daily caloric and nutritional requirements of the animal

How long: 1 day

Reference flow: Amount of product needed to fulfil the defined function, and shall be measured in grams (g)

Function, Functional Unit & Reference Flow

Define reference flow for each product to enable a comparison…

Environmental Impacts Covered

Normalisation
results divided by normalisation factors defined based on yearly emissions of an average global citizen

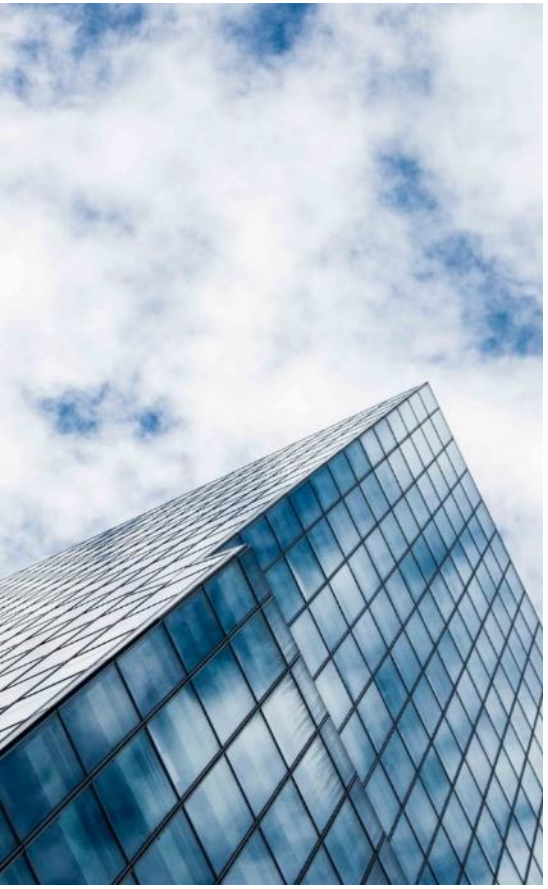
Weighting
normalized results multiplied by weighting factors (expert panels, planetary boundaries, reliability of indicator)

Single score

\+

Additional environmental information

Modelling Requirements

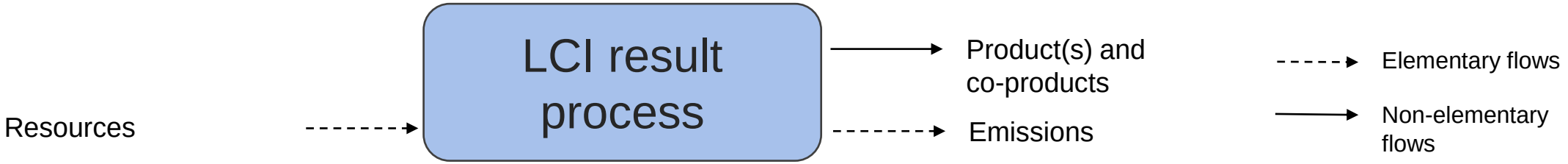


» PEF Method gives detailed guidance on how to model specific life cycle stages, processes and other aspects.

- Agricultural production;
- Electricity use;
- Transport and logistics;
- Capital goods (infrastructure and equipment);
- Storage at distribution center or retail;
- Sampling procedure;
- Use stage;
- End of life modelling
- Extended product lifetime;
- Packaging;
- Greenhouse gas emissions and removals;
- Offsetting;
- Handling multi-functional processes;
- Data collection requirements and quality requirements;
- Cut-off

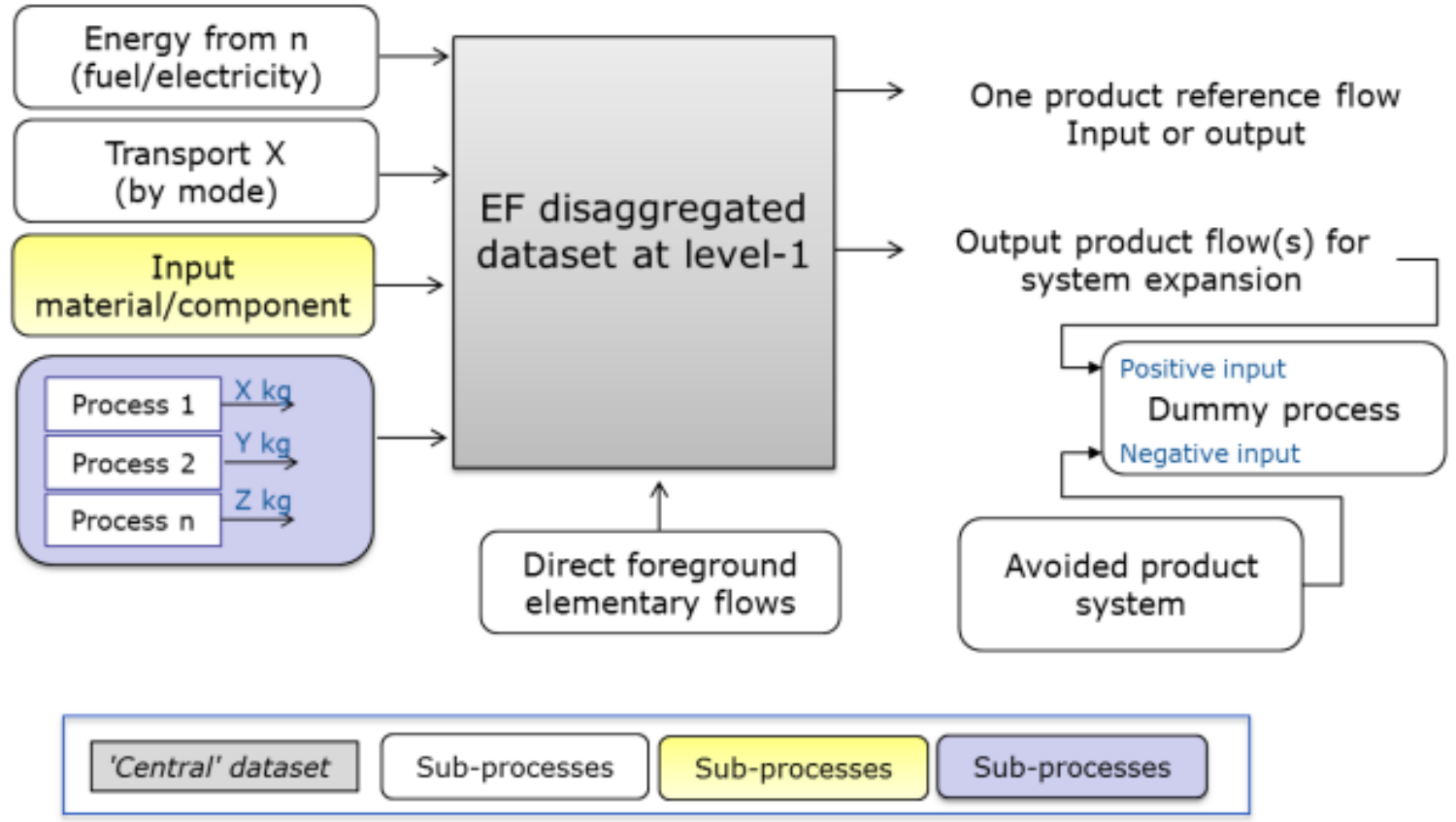
Datasets

- An EF compliant dataset can be available in aggregated form and partially aggregated form at level-1:
  - **Aggregated dataset** (LCI result): Complete or partial life cycle of a product system that next to the elementary flows lists in the input/output list exclusively the product(s) of the process as reference flow(s), but no other goods or services or wastes.



  - **Partially aggregated dataset**: A dataset with a LCI that contains elementary flows and activity data, and that only in combination with its complementing supporting datasets yield a complete aggregated LCI data set.
  - **Partially aggregated dataset at level-1**: A partially aggregated dataset at level-1 contains elementary flows and activity data of one level down in the supply chain, while all complementing supporting datasets are in their aggregated form (*see next slide*).

Partially aggregated dataset at level-1



For more details check the latest version of the PEF/OEF method available at http://eplca.jrc.ec.europa.eu/EnviromentalFootprint.html

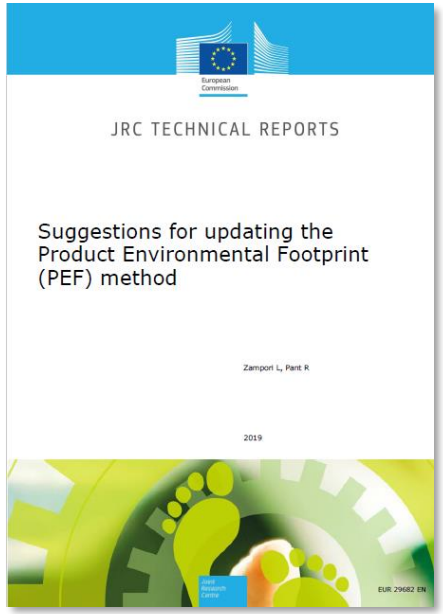
EF compliance

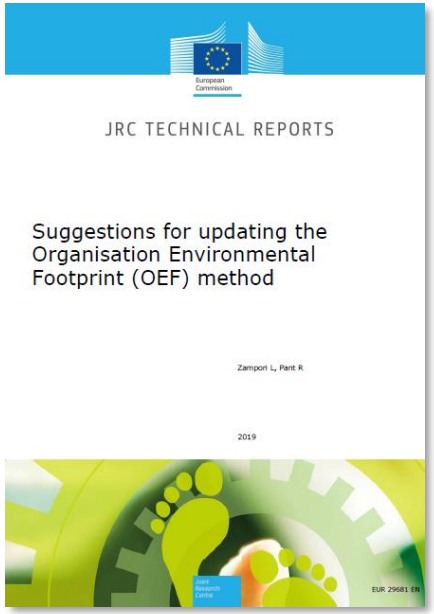
1) Modelling compliance (capital goods, CFF, etc.)
2) Meta data compliance (e.g. DQR, extent of documentation, etc.)
3) Nomenclature, elementary flows, and LCIA methods
   Dictionary to develop EF compliant dataset (=flow list, properties, impact factors, …)

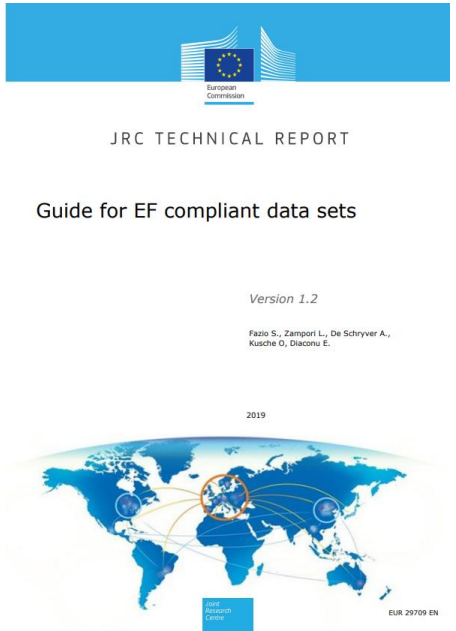
EF Methods
https://eplca.jrc.ec.europa.eu/permalink/PEF_method.pdf

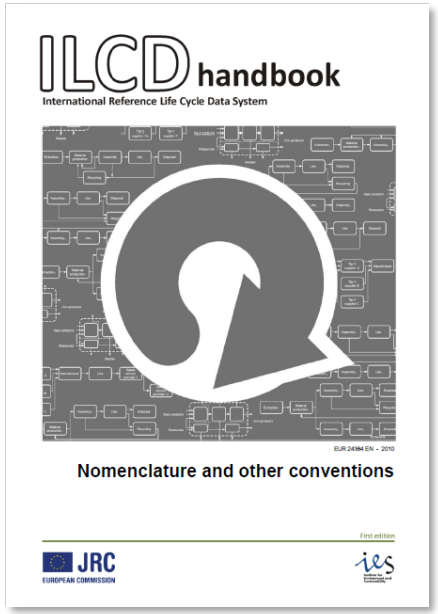
Guide on EF data:
https://eplca.jrc.ec.europa.eu/permalink/Guide_EF_DATA.pdf

EF reference package (EF 2.0 or 3.0)
http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml

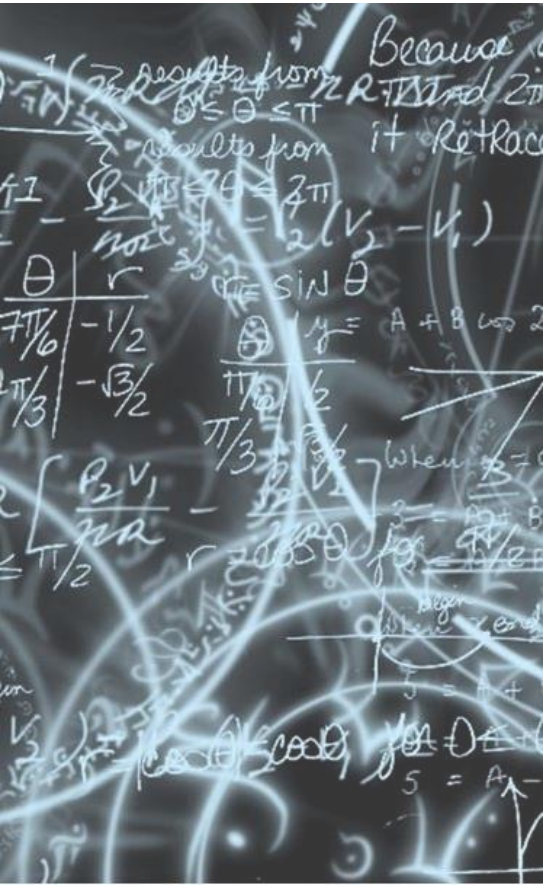








Two types of datasets



Company-specific datasets

- Directly obtained at/for a specific facility or set of facilities
- Data shall include all known inputs and outputs of the processes.
- The data may be collected, measured or calculated using company-specific activity data and related emission factors.
- All inputs and outputs need to be scaled to the reference flow of the process and shall be specific to the product in scope of the study.
- All new datasets created when conducting a EF study shall be EF-compliant.

» Secondary datasets

- Generic data from industry (association) reports, industry studies, government statistics, patents, literature or scientific papers, etc.
- All secondary datasets shall fulfil the minimum data quality requirements (DQR). Data sources shall be clearly documented and reported in the EF report.

Note: For PEFCRs/OEFSRS in the transition phase and PEF/OEF studies that implement these, up to 10% "ILCD entry-level" datasets are allowed,

Data needs matrix (DNM)

- Data needs matrix (DNM) indicates for which processes in scope company-specific or secondary data shall or may be used – depending on the level of influence the company has on the process
- Three cases are distinguished:
  1) **Situation 1**: the process is run by the company performing the EF study
  2) **Situation 2**: the process is not run by the company performing the EF study, but the company has access to (company-)specific information
  3) **Situation 3**: the process is not run by the company performing the EF study, and the company does not have access to (company-)specific information

Note that level-1 partially aggregated datasets are used exclusively for Situation 2, Option 2.

		Data requirements
Situation 1: process run by the company	**Option 1**	Provide company-specific data (both activity data and direct emissions) and create a company-specific dataset (DQR≤1.5). Calculate DQR of the dataset following the rules at section 4.6.5.2.
Situation 2: process not run by the company but with access to company-specific information	**Option 1**	Provide company-specific data and create a company-specific dataset (DQR≤1.5). Calculate DQR of the dataset following the rules at section 4.6.5.2.
	Option 2	Use an EF-compliant secondary dataset and apply company-specific activity data for transport (distance), and substitute the sub-processes used for electricity mix and transport with supply-chain specific EF compliant datasets (DQR≤3.0). Recalculate DQR of the dataset used (see section 4.6.5.6).
Situation 3: process not run by the company and without access to company-specific information	**Option 1**	Use an EF-compliant secondary data set in aggregated form (DQR≤3.0). Recalculate DQR of the dataset if the process is most relevant (see section 4.6.5.7)

Data quality

- Data quality is an important aspect to evaluate the validity of EF studies
- To assess data quality of processes, different data quality criteria are defined:

Minimum requirements	• Completeness • Methodological appropriateness and consistency[69]
Data quality criteria (scored)	• Technological representativeness[70] (TeR) • Geographical representativeness[71] (GeR) • Time-related representativeness[72] (TiR) • Precision[73] (P)
Documentation	• Compliant with the ILCD format
Nomenclature	• Compliant with the ILCD nomenclature structure (use of EF reference elementary flows for IT compatible inventories; see detailed requirements at section 4.3)
Review	• Review by "Qualified reviewer" • Separate review report

Used to calculate the data quality rating (DQR)

Data quality rating (DQR)

- Based on the rating, the DQR for each new EF dataset shall be calculated and reported with this formula:

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

- The formula is applicable to company-specific datasets, secondary datasets and EF studies
- Overall data quality rating – correspondence with numeric DQR value:

Overall data quality rating (DQR)	**Overall data quality level**
DQR ≤ 1.5	"Excellent quality"
1.5 < DQR ≤ 2.0	"Very good quality"
2.0 < DQR ≤ 3.0	"Good quality"
3 < DQR ≤ 4.0	"Fair quality"
DQR >4	"Poor quality"

Appropriate Data

Approximation – Calculation – Measurement

idea/concept

rational, fast

decision/proof

reliable, evidential

Upstream/ Background data

Supplier data

Asso-ciation data

Company data

Down-stream data

Data Collection Support (Input Data)

Company Name	Example Company
Product	Brand name
Unit Process Names	Technology Name
Process Location – City	Example Site
Process Location – Country	DE
Area covered by production facilities [m2]	

period: 2020

Inputs

Raw Materials / Pre-Cursors

Input Name	Further Characterization	Function	Water Content [%]	Comment	Unit	Annual Consumption	Data quality assessment - value has been	Supply Transport Distances [km] Truck	Train	Ship	Pipeline	Origin
Raw Material 1	More detailed information if useful (e.g. in case heterogenous precursors, solutions, etc) Please give percentages	*Reactant*			*kg*		*Measured*					
Raw Material 2		*Reactant*			*kg*		*Measured*					
Raw Material 3		*Reactant*			*kg*		*Measured*					
Raw Material 4		*Reactant*			*kg*		*Measured*					
Raw Material 5		*Reactant*			*kg*		*Measured*					

Water Use

Auxiliaries

Electricity

Input Name	Further Characterization	Source	Comment 1	Comment 2	Unit	Annual Consumption	Data quality assessment - value has been
Electricity from country-specific grid mix					*kWh*		*Measured*
Electricity from CHP		*Natural Gas*			*kWh*		*Measured*
Electricity from company specific source or mix	If mixed electricity sources, please give composition in %	*Hydropower*			*kWh*		*Measured*

Steam and Thermal Energy

Example (not a PEF Requirement)

Data Collection Support (Output Data)

Outputs

Product(s)

Product Name	Further Characterization	Economic Value [€/kg] OR price ratios	Net Calorific Value [MJ/kg]	Water Content [%]	Unit	Annual Production	Data quality assessment - value has been
0	Considered as main	0	0,00		kg		Measured
0	sold externally or internally	0	0,00		kg		Measured
0	sold externally or internally	0	0,00		kg		Measured
0	sold externally or internally	0	0,00		kg		Measured
0	sold externally or internally	0	0,00		kg		Measured

Waste for recovery

Waste for incineration

Waste Category	Further Characterization	Comment 1	Comment 2	Comment 3	Unit	Annual Production	Data quality assessment - value has been
Hazardous Waste for Incineration					kg		Measured
Non-Hazardous Waste for Incineration					kg		Measured

Waste for landfill

Water Output

Emissions to Water

Emissions to Air

Output Name	Characterization of emission flow	Comment 1	Comment 2	Unit	Annual Production	Data quality assessment - value has been
1,1,2,2-Tetrachloroethane	Direct process off gas emitted to air - no emissions from any fuel consumption mentioned above included			kg		Measured
	Direct process off gas emitted to air - no emissions			kg		Measured
	Direct process off gas emitted to air - no emissions			kg		Measured

Example (not a PEF Requirement)

Data Collection Support (QA Checks)

Company	Example Company
Product	Brand name
Process	Technology Name
Site	Example Site
Data collection year	2020

Mass Balance [kg]				Calculated from Stoichiometry
Input		**Output**		
Raw materials and Pre-Cursor (dry)	#DIV/0!	Product(s) dry	#DIV/0!	
		Production Waste	#DIV/0!	
		Unreacted Raw Material Side reaction outputs Unrecorded Production waste (in WW)	#DIV/0!	0,00
		Recorded waste in waste water	#DIV/0!	
		Air Emissions from reaction	#DIV/0!	
		Water formed in reaction	0,00	#DIV/0!
Sum	#DIV/0!	**Sum**	#DIV/0!	
Input / Output ratio		**#DIV/0!**		

Water Balance [kg]			
Input		**Output**	
Cooling Water	#DIV/0!	Waste Water to WWTP	#DIV/0!
Process Water	#DIV/0!	Water untreated	#DIV/0!
Water for Steam production	#DIV/0!	Water relooped	#DIV/0!
Water incl. in Raw Materials	#DIV/0!	Water incl. in Products	#DIV/0!
		Water Vapour (measured)	#DIV/0!
		Water Vapour (calculated)	#DIV/0!
Total Water Input	#DIV/0!	**Total Water Output**	#DIV/0!
Input / Output ratio		**#DIV/0!**	

Total Input	#DIV/0!	**Total Output**	#DIV/0!
Input / Output ratio		**#DIV/0!**	

Energy demand [MJ]		
Input		**Output**
Electricity (direct)	#DIV/0!	
Electricity (indirect from pressure air)	#DIV/0!	
Thermal Energy (from steam and fuels	#DIV/0!	
Total Input	#DIV/0!	

- Early Quality assurance recommended
- Possibly iteration needed

Example (not a PEF Requirement)

Prominent Issues in Data Collection

- Mass balance (major elements, water), or energy balance not closed
- (Primary) source of electricity and thermal energy unclear
- Amount and disposition of wastewater / used process water unclear
- Only regulated air emissions known
- Treatment of raw-gases unclear
- Source of scrap/secondary input unclear (and if pre- or postconsumer)
- Disposition of scrap/secondary material output unclear
- Share of bio-based carbon in input and output unclear
- Assignment of data to specific products partly unclear

Helpful Aspects in Data Collection

- Get management/C-Level support
- Inform core stakeholders in your company (R+D, Production, Procurement, EHS, Marketing)
- Structure the core process steps
- Design own or adapt existing data collection sheets
- If possible, use data collection templates from your association, consultant, software supplier,…..
- Pre-fill data collection sheets as much as possible (use your systems like ERP, PLM, BoM, CAD,…)
- Check your company’s (emission) reporting schemes
- Do internal QA and 4-eye checks before using the information gathered (…before verifiers reject the data)

Where to find EF Compliant Datasets

» The EF tendered datasets are available via the registered nodes of the data developers

! Be sure to use EF 2.0 datasets for PEF/OEF studies under the 21 pilot-phase PEFCRs/OEFSRs, and EF 3.0 datasets for PEF/OEF studies on the new PEFCRs/OEFSRs from the transition phase

Provider/ owner	Link to Node	Database name *
Quantis	https://lcdn.quantis-software.com/PEF/	Agrifood and “Other” Processes
CEPE	http://lcdn-cepe.org	Chemicals for Paint
Sphera (thinkstep)	http://lcdn.thinkstep.com/Node/	Energy, Transport, End-of-Life, Incineration, Packaging, Metals and minerals, Plastics (non-packaging), Electrical and Electronics, extra proxy data
FEFAC	http://lcdn.blonkconsultants.nl/Node/	Feed
ecoinvent	http://ecoinvent.lca-data.com/	Chemicals
FEVE	http://soda.rdc.yp5.be/	Container glass
JRC	https://eplca.jrc.ec.europa.eu/EF-node/	Representative products and organisations incl. Background Data and Data developed outside the specific data calls

** EF 2.0 data, partly 3.0; other databases under development/update; check EF website at JRC*

Data User Rights

- Datasets are owned by data providers
- Usage free of charge for PEF/OEF studies under official PEFCRs/OEFSRs in the EF framework financed by the European Commission
- PEFCRs/OEFSRs from the pilot phase: EF 2.0 package datasets to be used
- PEFCRs/OEFSRs from the transition phase: EF 3.0 package datasets to be used
- For any other purposes, including for PEF/OEF studies without PEFCR/OEFSR, the dataset use rights need to be purchased/obtained from the data providers

EF impact assessment

- Results shall be calculated and reported in the EF report as **characterised**, **normalised** and **weighted** results for each EF impact category **and as a single overall score** based on the weighting factors given
- Results shall be reported for (i) the total life cycle, and (ii) the total life cycle excluding the use stage.
- Substantial amount of information and documentation available in the EF Reference Package. Most relevant for the Impact Assessment:
  - Characterization factors
  - Normalisation factors
  - Weighting factors

Interpretation of EF results - Hotspots

Item	At what level does relevance need to be identified?	Threshold
Most relevant impact categories	Normalised and weighted results	Impact categories contributing cumulatively at least 80% of the total environmental impact
Most relevant life cycle stages	For each most relevant impact category	All life cycle stages contributing cumulatively more than 80% to that impact category
Most relevant processes	For each most relevant impact category	All processes contributing cumulatively (along the entire life cycle) more than 80% to that impact category, considering absolute values.
Most relevant elementary flows	For each most relevant process and most relevant impact categories	All elementary flows contributing cumulatively at least to 80% to the total impact for each most relevant process. If partially aggregated data are available: for each most relevant process, all direct elementary flows contributing cumulatively at least to 80% to that impact category (caused by the direct elementary flows only)

EF Reporting

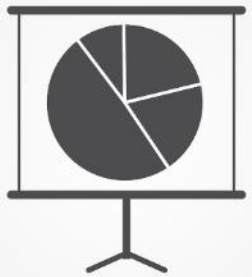
What did you hear/see in the last hour?

Let’s put an EF report together…

What needs to be reported?

Let’s start a list

Reporting structure



- Summary
- Main report
  - General information,
  - Goal of the study,
  - Scope of the study,
  - Life cycle inventory analysis,
  - Life cycle impact assessment results,
  - Interpreting EF results.
- Validation statement
- Annexes
- *Possibly: Confidential report (for verification/validation only)*

A PEF report template is available in Annex E (of the PEF Method). The template **shall** be used.

Verification & Validation

Mandatory whenever the EF study, or part of the information therein, is used for any type of external communication.

Verification:
EF verifier checks whether the EF study has been carried out in compliance with the most updated version of the EF method.

Validation:
EF verifier confirms that the information and data included in the EF study/report and the communication vehicles are reliable, credible and correct.

Verification & Validation (2)

The verification and validation of the EF report shall ensure that:

- the EF report is complete, consistent, and compliant with the EF report template provided in the most recent version of the EF method;
- the information and data included are consistent, reliable and traceable;
- the mandatory information and sections are included and appropriately filled in;
- all the technical information that could be used for communication purposes, independently from the communication vehicle to be used, are included in the report.

Note: *Confidential information shall be subject to validation, whilst they may be excluded from the EF report.*

Minimum requirements for verifiers

- *Self declaration*
- *Min. 6 points*
- *Min. 1 point for each mandatory criterion*
- *Detailed definitions of criteria see PEF Method*

			Score (points)				
	Topic	**Criteria**	**0**	**1**	**2**	**3**	**4**
Mandatory criteria	Verification and validation practice	Years of experience (1)	<2	2 ≤ x < 4	4 ≤ x < 8	8≤ x < 14	≥14
		Number of verifications (2)	≤5	5 < x ≤ 10	11 ≤ x ≤ 20	21 ≤ x ≤ 30	>30
	LCA method-logy and practice	Years of experience (3)	<2	2 ≤ x < 4	4 ≤ x < 8	8≤ x < 14	≥14
		Number of LCA studies or reviews (4)	≤5	5 < x ≤ 10	11 ≤ x ≤ 20	21 ≤ x ≤ 30	>30
	Know-ledge of the specific sector	Years of experience (5)	<1	1 ≤ x < 3	3 ≤ x < 6	6≤ x < 10	≥10
Additional criteria	Review, verifica-tion/ validation practice	Optional scores relating to verification/ validation	— 2 points: Accreditation as third party verifier for EMAS — 1 point: Accreditation as third party reviewer for at least one EPD Scheme, ISO 14001, or other EMS				

Verification / validation

Combination of

» Documental review
  - EF report
  - technical content of any communication vehicle and
  - the data used in the calculations

» Model review

Note:

The verification of the company-specific data shall always be organised through a visit of the production site(s) the data refer to.

The verification may take place at the end of the EF study or in parallel (concurrent) to the study.

Examples

Example Wine – Representative products

Still wine:

- Wine-making: 63.55% red conventional, 4.45% red organic, 29.9% white conventional and 2.1% white organic.
- Ageing in oak barrels (for at least 12 months): 15% of still red glass-bottled wine and 3% of still white glass-bottled wine.
- Primary packaging: 79% of glass bottle (with different types of stoppers), 16% of Bag in Box, 4% of PET bottle and 1% of beverage carton.
- Types of stoppers used for glass bottles: 67% cork closure, 17% synthetic stoppers (made of a mix of materials) and 16% screw caps (made of aluminium).
- Production: 75% in the EU, 25% abroad.

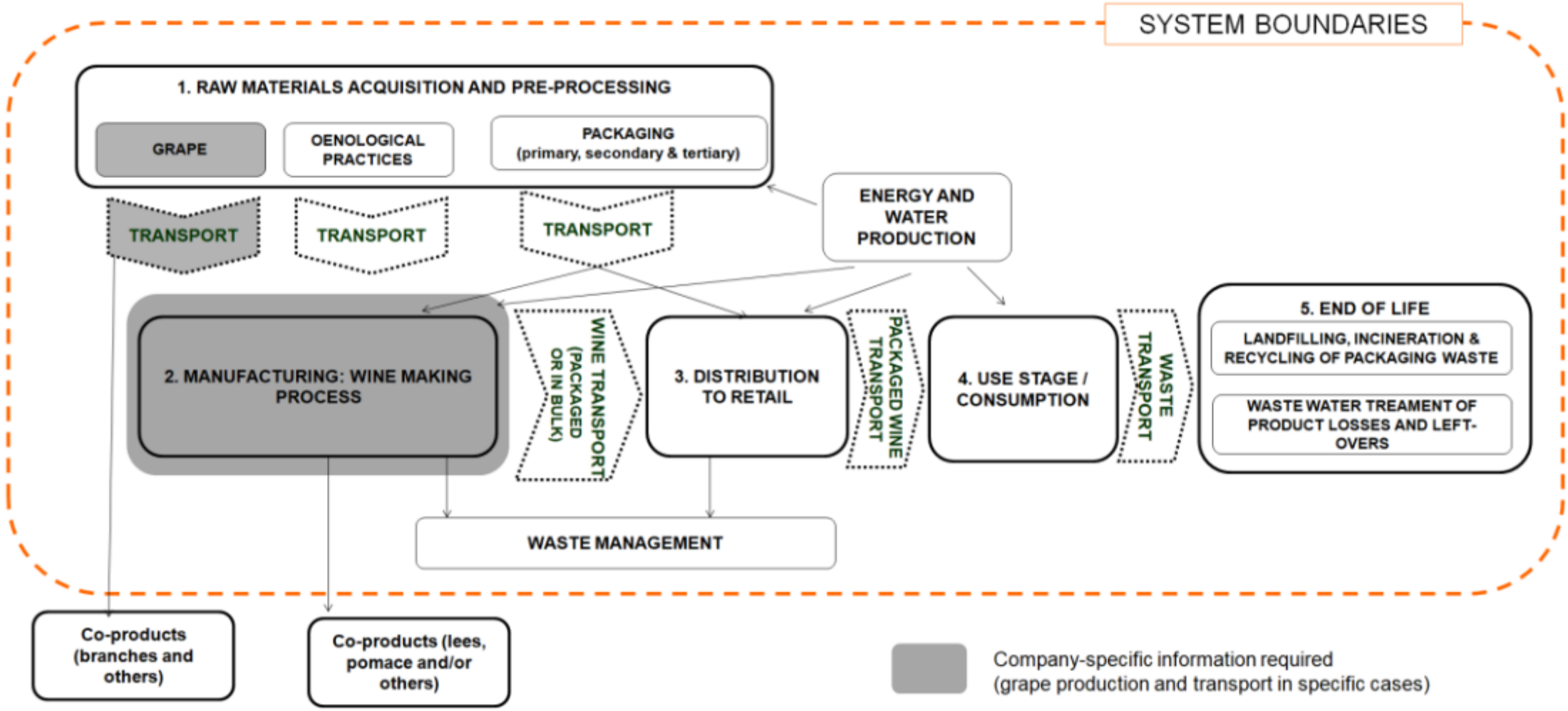
Sparkling wine:

- Wine-making: 93.45% conventional and 6.55% organic.
- Primary packaging: glass bottle and mushroom-shaped sparkling wine closure.
- Production: 97% in the EU, 3% abroad.

Example Wine (2)

What?	Moderate consumption of alcoholic beverage.
How much?	0.75 litres of wine
How well?	This aspect could not be incorporated so far. This limitation is recognized and requires further developments in order to improve fair comparisons.
How long?	Not applicable as how long refers to the duration/life time of the product and shall be quantified if shelf-life is indicated on the packaging. As wine has a very long shelf life being exempted by Regulation 1168/2011 from a mandatory indication of an expiry date, and the duration of the service provided is very variable.

Example Wine (3)



Example Wine (4)

Required company-specific data

Example grape production:

- production yield (kg of grape per ha),
- amount of products applied in the vineyard (plants and soil) (kg and m3 for liquids)
- amount of water used (m3),
- amount and type of energy used (kWh and m3 for fuels),
- amount and type of tying materials used (kg), and
- vineyard surface (ha).

In addition, the applicant will calculate the nitrogen and phosphate emissions derived from the application of fertilizers (see section 6.2) as well as the carbon dioxide emissions from lime, urea and urea-compounds application.

See excel file named "Wine_PEFCR_v6.3-Life cycle inventory.xlsx" available at http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR.htm for the list of all processes to be expected in situation 1.

Mandatory company-specific data, excerpt

Requirements for data collection purposes			Requirements for modelling purposes								Remarks
Activity data to be collected	*Specific requirements (e.g. frequency, measurement standard, etc)*	*Unit of measure*	*Default dataset to be used*	*Dataset source (i.e. node)*	*UUID*	*TiR*	*TeR*	*GR*	*P*	*DQR*	
Inputs:											
Electricity use	Actual measurement	kWh	Country- specific Electricity grid mix 1kV-60kV	http://lcdn.thinkstep.com/Node/	{34960d4d-af62-43a0-aa76-adc5fcf57246}	1.5	1	1	2	1.4	
Container glass	Measurement	kg	Container glass, virgin. Virgin container glass (all sizes) to be used for glass bottles and food jars| Production mix.	http://lcdn.thinkstep.com/Node/	5ccf94ab-173c-4688-bcc8-d434166be45e	2	2	2	2	2	
Cork stopper	Measurement	kg	Natural cork stopper, wine	http://lcdn.thinkstep.com/Node/	{af4888dd-dbc7-4572-84e9-62388d10b0d6}	1	1	1	2	1.3	

Default values provided

Example transportation

For grapes:

25 km by truck (>32 t, EURO 4; UUID 938d5ba6-17e4-4f0d-bef0-481608681f57), 64% utilisation ratio

For packaging materials from manufacturing plants to filler plants (beside glass):

230 km by truck (>32 t, EURO 4; UUID 938d5ba6-17e4-4f0d-bef0-481608681f57), 64% 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).

More default values and rules to ensure a level playing field

Vinification

- Ageing (if applied): Production, transportation and waste management of barrels.
  If barrels are used in several production cycles, only part of these processes will be allocated to the product assessed taking into account the ratio between ageing time and the total service life of the barrel.
- Packing of wine (filling operations).
- Cleaning operations.
- Management of the waste produced.

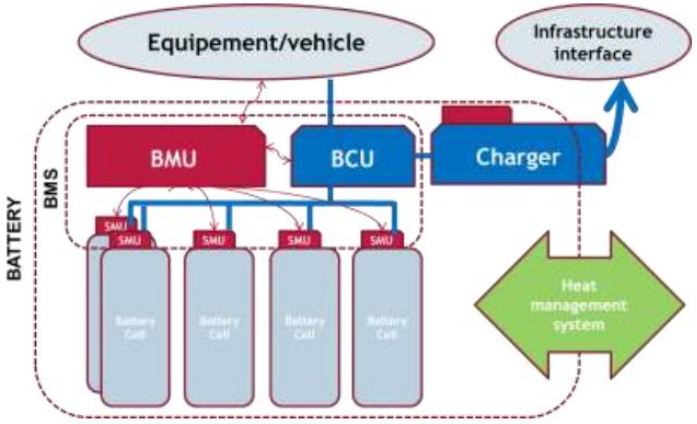
Distribution

Use stage (cooling)

Management of the waste produced.

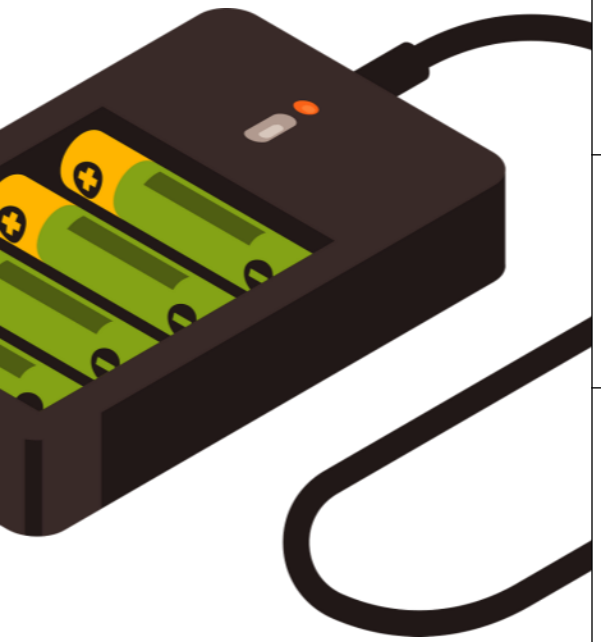
‘End-of-life’

Example Rechargeable battery PEFCR



Elements	CPT Li-ion	ICT Li-ion	ICT Ni-MH	e-mobility Li-ion
Specify if it is a real or a virtual product	Virtual	virtual	virtual	virtual
Description of the product	CPT- Li-ion battery Chemistry composition based on market share	ICT- Li-ion battery Chemistry composition based on market share	ICT- Ni-MH battery Chemistry composition based on market share	e-mobility- Li-ion battery Chemistry composition based on market share
Quantity of functional units based on battery industry standard /IEC 61951-2/ /IEC 61960/	14,4 kWh	11,2 kWh	0,704 kWh	8000 kWh

Functional Unit



What?	**Electrical energy**
How much?	**1 kWh of the total energy delivered over service life** (quantity of Wh, obtained from the number of cycles multiplied by the amount of delivered energy over each cycle).
How well?	**Maximum specific energy** (measured in Wh/kg). Specific product standards and technical properties of the high specific energy rechargeable batteries PEF shall be declared in the PEF documentation
How long?	The amount of cumulative energy delivered over service life of the high specific energy rechargeable batteries (quantity of Wh, obtained from the number of cycles multiplied by the amount of delivered energy over each cycle). The time required to deliver this total energy is not a significant parameter of the service.

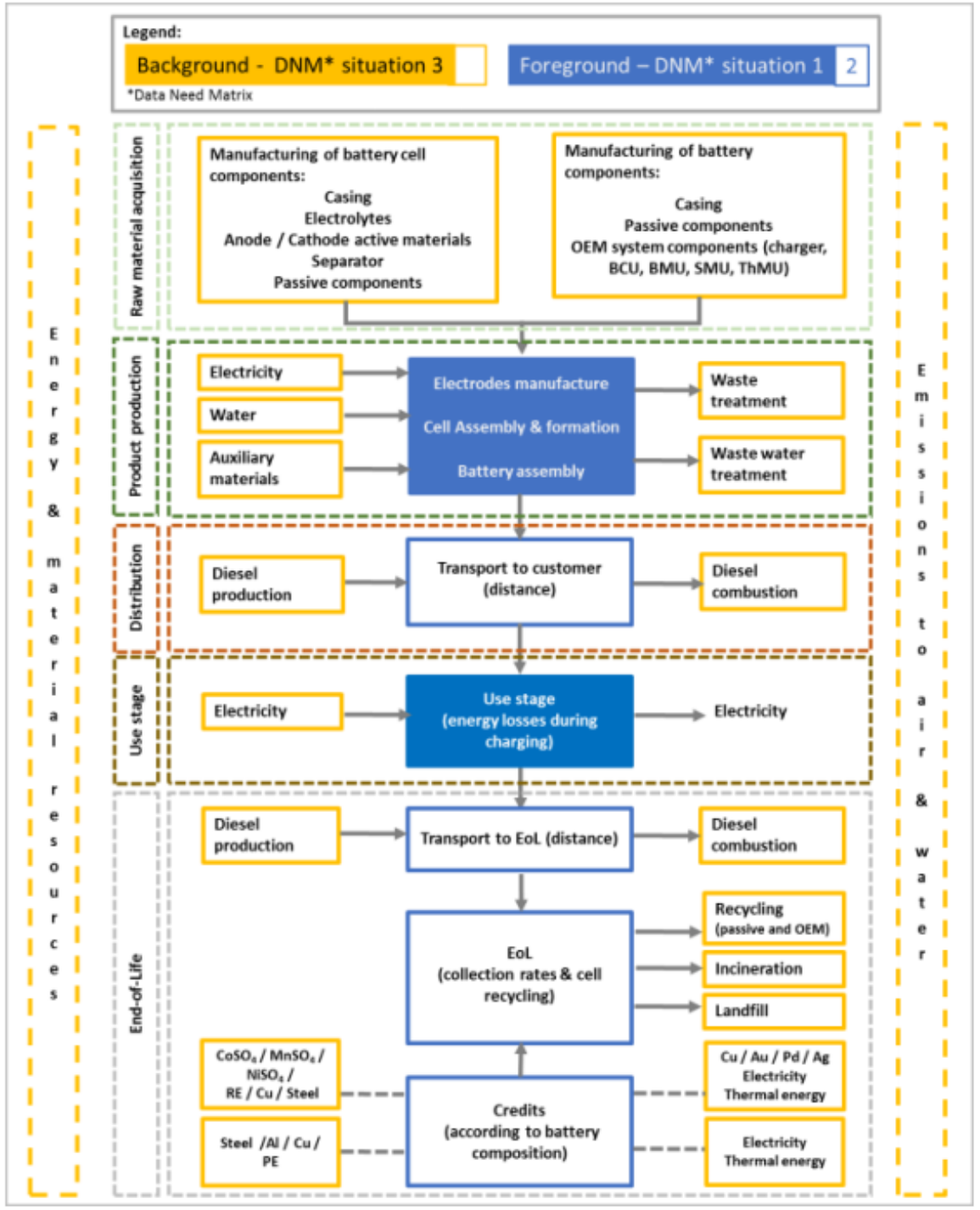
Example battery reference flow

Abv.	Parameter	Battery A	Battery B	Unit
Qua	Quantity functional unit	14,4	29,6	kWh over service life / per battery
AS	Application service	29,6	29,6	[kWh] total energy required per application
Nb batt	Number batteries	2,06	1	[-] number of batteries to fulfil the total energy required by the application

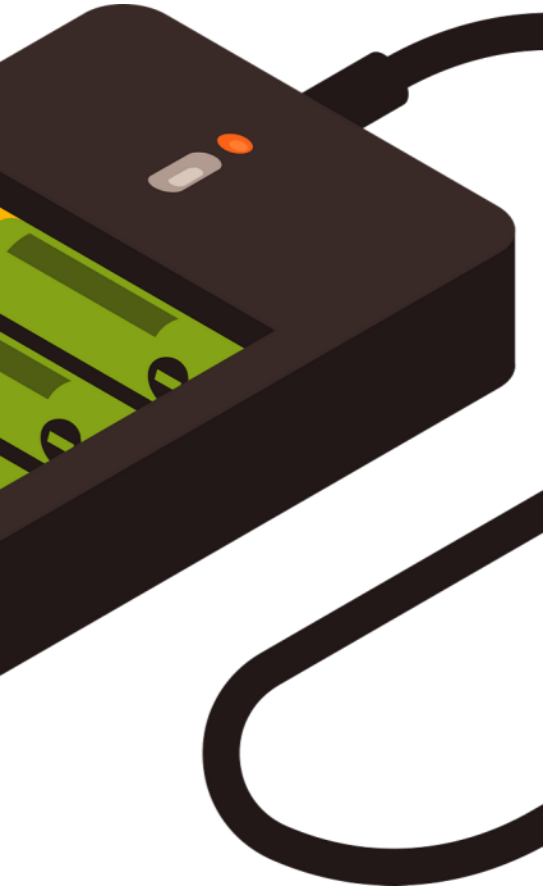
System boundary and data needs

What needs to be considered?

What kind of data is required?



Most relevant life cycle stages



CPT - Li-ion battery

Impact category	Raw Material acquisition	Production of the main product	Product distribution	Use stage	End-of-Life
Climate Change (fossil) [kg CO2 eq.]	82%	8%	0%	7%	3%
Resource use, energy carriers [MJ]	77%	11%	0%	9%	3%
Resource use, mineral and metals [kg Sb eq.]	87%	0%	0%	0%	13%
Respiratory inorganics [kg PM2.5 eq.]	79%	4%	0%	3%	15%

ICT - Li-ion battery

Impact category	Raw Material acquisition	Production of the main product	Product distribution	Use stage	End-of-Life
Climate Change (fossil) [kg CO2 eq.]	65%	15%	0%	11%	9%
Resource use, energy carriers [MJ]	60%	18%	0%	12%	10%
Resource use, mineral and metals [kg Sb eq.]	81%	1%	0%	0%	18%
Respiratory inorganics [kg PM2.5 eq.]	69%	5%	0%	3%	23%

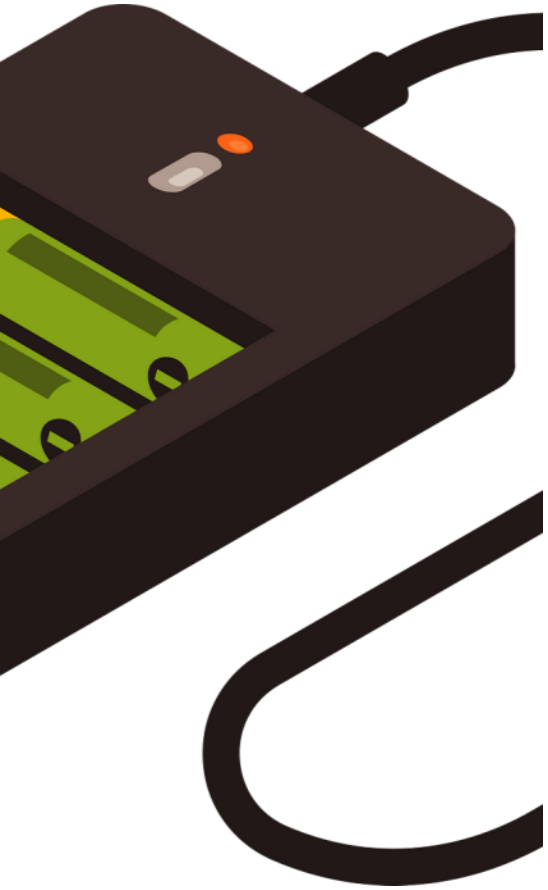
ICT - NiMH battery

Impact category	Raw Material acquisition	Production of the main product	Product distribution	Use stage	End-of-Life
Acidification terrestrial & freshwater [Mole of H+ eq.]	68%	2%	0%	1%	28%
Climate Change (fossil) [kg CO2 eq.]	63%	3%	0%	12%	22%
Resource use, energy carriers [MJ]	59%	4%	0%	15%	21%
Resource use, mineral and metals [kg Sb eq.]	67%	2%	0%	0%	31%
Respiratory inorganics [kg PM2.5 eq.]	70%	2%	0%	2%	27%

e-mobility Li-ion battery

Impact category	Raw Material acquisition	Production of the main product	Product distribution	Use stage	End-of-Life
Climate Change (fossil) [kg CO2 eq.]	45%	26%	0%	17%	12%
Resource use, energy carriers [MJ]	43%	29%	0%	18%	10%
Resource use, mineral and metals [kg Sb eq.]	65%	1%	0%	0%	34%
Respiratory inorganics [kg PM2.5 eq.]	66%	13%	0%	6%	41%

Data ready to be used (extract)



Material/ Process	PEFCR Geographical reference	PEFCR Dataset name ()	Unit (output)	Default amount per FU				EF compliant dataset used	EF Geographical reference	Proxy (yes/ no)	Comment	Data set source	UUID	Default DQR (estimated)				
				Power tool	ICT		e-mobility							P	TiR	GR	TeR	DQR average
				LI-ion (power)	LI-ion (energy)	NI MH	LI-ion (Large/ EV)											
Active components per cell																		
Anode																		
Aluminium foil	EU-27	Aluminium foil	kg/kg battery	0	0	0.005	0	Aluminium foil	EU-28+EFTA	no		PEF DB	{49a32f83-b59d-4f7b-b0f6-2efe9f9997aa}	2	1	4	4	3
Cobalt hydroxide	GLO	Cobalt hydroxide	kg/kg battery	0	0	0.029	0	Cobalt	GLO	yes	worst case proxy (overestimate)	PEF DB	{c76002c7-dfef-4d17-a100-fecd7910cfad}	2	1	3	2	2
Copper foil	CN	Copper Foil (11 µm) for 1 m2	kg/kg battery	0.199	0.073	0	0.074	Copper sheet	EU-28+EFTA	yes	foil and CN process needed	PEF DB	{cb8a2255-c375-4d5d-9402-d62ca38787d7}	2	1	4	4	3
Graphite powder	CN	Graphite powder (estimate)	kg/kg battery	0.085	0.182	0	0.126	Carbon black, general purposes production	RER	yes	best case proxy (underestimate) / CN process needed	PEF DB	{fde4abff-7cd7-4535-b472-481321d7d936}	2	1	4	4	3
Manganese	ZA	Manganese	kg/kg battery	0	0	0.016	0	Manganese	GLO	no		PEF DB	{38085a7e-98a3-4b5d-9381-8cefce00cc27}	2	1	3	2	2
Nickel hydroxide	DE	Nickel hydroxide	kg/kg battery	0	0	0.153	0	Nickel	GLO	yes	worst case proxy (overestimate)	PEF DB	{bb78c02b-70da-4e9e-a5a3-c5c45a5dcdb0}	2	1	3	2	2
Plastic compound	DE	Polyvinylidene fluoride (emulsion polymerization) (PVDF)	kg/kg battery	0.002	0.045	0	0.002	Polyvinylidene fluoride (PVDF)	GLO	no		PEF DB	{8fd31112-01c1-46d3-8c8d-29e2bdfa6e38}	2	1	3	2	2
	DE	Styrene-Butadiene Rubber (SBR) Mix	kg/kg battery	0.002	0.045	0	0.002	Styrene-butadiene rubber (SBR)	GLO	no		PEF DB	{5312a57a-4dc4-4ee7-9c77-72afdd38f1ea}	2	1	3	2	2
Rare earth	CN	Rare earth elements - extraction (Sichuan)	kg/kg battery	0	0	0.094	0	Rare earth concentrate	CN	no		PEF DB	{4d5a1b20-880a-4e48-8206-972f35bf27c1}	2	1	1	2	2
Steel sheet part	EU-27	Steel sheet part	kg/kg battery	0	0	0.081	0	Steel cold rolled coil / Steel cast part alloyed	EU-28+EFTA	no		PEF DB	{3e5ff637-ffc2-4920-9051-11055b1d2d18}	2	1	4	4	3
Cathode																		
Cathode material (sulphates)	CN	Electricity grid mix	MJ/kg battery	n.a.	n.a.	n.a.	n.a.	Electricity grid mix	CN	no		PEF DB	{8233263a-bf2e-416e-97a4-7f632248075a}	2	1	1	1	1
	DE	Manganese sulphate (estimation)	kg/kg battery	0.128	0.364	0	0.237	Manganese sulphate production	GLO	no		PEF DB	{b848a196-e27e-4e8e-953e-7de7cbc54c57}	2	1	3	2	2
	DE	Nickel Sulfate from electrolytnickel	kg/kg battery					Nickel sulphate production	RER	no		PEF DB	{3b369ae8-1f45-47ed-8dcf-af5f71593067}	2	1	4	4	3
	EU-27	Sodium hydroxide (caustic soda) mix (100%)	kg/kg battery					Sodium hydroxide production	RER	no		PEF DB	{2ba49ead-4683-4671-bded-d52b80215e9e}	2	1	4	4	3

Link Collection

- Further reading about the EF transition phase
- EF Wiki
- Training calendar , also to download slides and recordings of all webinars and trainings
- PEF method
- OEF method
- Description of governance bodies
- Existing PEFCRs/OEFSRs, e-learning tools, and technical reports
- Rules for EF compliant data sets

- Email address technical helpdesk: EF_Helpdesk@sphera.com
- Email address EF Team at DG ENV: env-environmental-footprint@ec.europa.eu

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Questions & Answers

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