2018

Product Environmental Footprint (PEF) Category Rules (PEFCRs)

INTERMEDIATE PAPER PRODUCT

JORI RINGMAN ON BEHALF OF THE TECHNICAL SECRETARIAT FOR THE INTERMEDIATE PAPER PRODUCT

Disclaimer

Abstract

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.

These Product Environmental Footprint Category Rules (PEFCR) shall be used in parallel with the PEF Guide. Where the requirements in these PEFCRs are in line with but at the same time more specific than those of the PEF Guide, such specific requirements shall be fulfilled.

Intermediate paper products require further conversion for their final application. The various paper grades investigated in the PEF screening and supporting studies on intermediate paper have different applications and final functions. In these circumstances, an intermediate material may fulfil a number of different functions depending on the performance required of the final product.

This product category is divided into three sub-categories:

- Graphic papers (including newsprint)
- Packaging papers, and
- Tissue

These PEFCRs are a “module” to be used for the development of a PEF for a final product where the intermediate paper product is one of the components of the product under investigation. The PEFCR of intermediate paper products for various applications will provide the necessary guidance for the PEF studies being undertaken for the final applications to help guarantee that consistent information is used as input into the PEF study of the final application.
All default Environmental Footprint (EF) impact categories and additional environmental information on energy, biodiversity and other parameters (Adsorbable Organic Halogens (AOX) and Chemical Oxygen Demand (COD)) shall be included.

Authors

The Technical Secretariat for the Intermediate Paper Product pilot consisted as per 24 September 2018 of the following organisations with their representatives:

Chair: European Commission, Joint Research Centre (Erwin M. Schau, Rana Pant), until January 2018
Co-chair: Confederation of European Paper Industries, CEPI (Jori Ringman), Chair: from January 2018
Co-chair: WWF International (Emmanuelle Neyroumande), until July 2016

- APP (Liz Wilks)
- CEPI ContainerBoard (Gilles Barreyre)
- CEPI Eurokraft (Elin Floresjö)
- China Quality Certification Centre Guangzhou Branch (Hou Jian)
- Chlorine Free Products Association (Archie J. Beaton)
- Copacel (Bénédicte Oudart)
- De Beaufort-Langeveld (Angeline de Beaufort-Langeveld)
- DS Smith (John Swift)
- FEFCO (Krassimira Kazashka-Hristozova)
- Ferrero (Eva Piermario)
- Forest Stewardship Council (John Hontelez)
- Inmetro (Armando Caldeira-Pires)
- Industrial Minerals Association (IMA) - Europe (Roger Doome, Aurela Shtiza)
- Innovhub-SSI (Graziano Elegir)
- Innventia (Malin Kronqvist, Tatjana Karpenja)
- International EPD System/EPD International AB (Kristian Jelse)
- International Paper (Marie Claude Ritt)
- Lucart (Sabrina Cosci)
- Lyreco (Nasser Kahil)
- Metsä Group (Eija Saski, Senja Kuokkanen)
- Norwegian University of Science and Technology (NTNU) (Ottar Michelsen)
- PEFC International (Xavier Noyon, Michael Berger)
- Reno De Medici (Lucia Rigamonti (Politecnico di Milano), Thomas Bock, Mino Leo Marucci)
- S.A. Industrias Celulosa Aragonesa (Saúl de Llobet)
- SCA (Ellen Riise, Pernilla Cederstrand)
- Sequana (Olivier Guichardon)
- SIG International Services GmbH (Christian Bauer)
- Smurfit Kappa (Sylviane Armagnacq, Outi Marin)
- Sofidel (Riccardo Balducci, Marco Simoncini)
- Solinnen (Philippe Osset, Jad Zoghaïb)
- Steinbeis Papier GmbH (Volker Gehr, Andreas Steenbock)
- Stora Enso (Tuovi Valtonen, Tiina Keskisaari)
- Sustainable Value Consultancy (Krishna B.M. Manda)
- Swedish Forest Industries Federation (Ingrid Haglind)
- Technische Universität Berlin (Annekatrin Lehmann)
- Tetra Pak (David Cockburn)
- UPM (Gabriele Wende, Jarkko Hukkanen)

The product category for which the PEFCR is valid:

Intermediate Paper Products

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Acronyms

AF	Allocation Factor
AOX	Adsorbable Organic Halogens
AR	Allocation Ratio
B2B	Business to Business
B2C	Business to Consumer
BoC	Bill of Components
BoM	Bill of Materials
CEPI	Confederation of European Paper Industries
CF	Characterisation Factor
CFF	Circular Footprint Formula
CFF-M	Circular Footprint Formula – Modular form
CMWG	Cattle Model Working Group
COD	Chemical Oxygen Demand
CPA	Classification of Products by Activity
DC	Distribution Centre
DMI	Dry Matter Intake
DNM	Data Needs Matrix
DQR	Data Quality Rating
EA	Economic Allocation
EC	European Commission
EF	Environmental Footprint
EI	Environmental Impact
EoL	End-of-Life

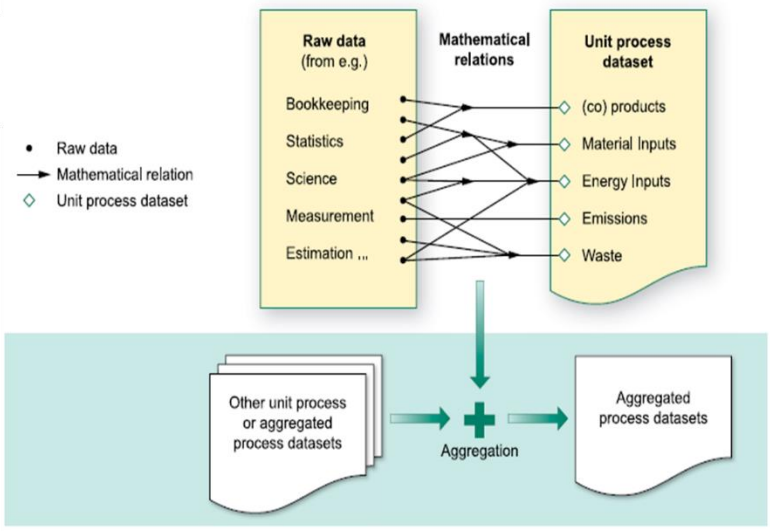
FU	Functional Unit
GE	Gross Energy Intake
GO	Guarantee of Origin (certificates for renewable energy)
GoOs	Guarentees of Origin sold
G_R	Geographical Representativeness
GHG	Greenhouse Gas
GWP	Global Warming Potential
HD	Helpdesk
IC	Integrated Circuit
ILCD	International Reference Life Cycle Data System
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
JRC	Joint Research Centre
LCDN	Life Cycle Data Network
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
LT	Lifetime
MG	Machine Glazed
NACE	Statistical classification of economic activities in the European Community
NDA	Non-Disclosure Agreement
NGO	Non-Governmental Organisation
NMVOC	Non-Methane Volatile Compounds
P	Precision

PCR	Product Category Rules
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
PET	PolyEthylene Terephthalate
RF	Reference Flow
RP	Representative Product
SB	System Boundary
SC	Steering Committee
SMRS	Sustainability Measurement & Reporting System
SS	Supporting study
TAB	Technical Advisory Board
Te_R	Technological Representativeness
Ti_R	Time Representativeness
TS	Technical Secretariat
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[1] and then combined to derive the environmental footprint associated with that process (See Figure 1). Examples of activity data include

[1] Based on Greenhouse Gas protocol scope 3 definition from the Corporate Accounting and Reporting Standard (World Resources Institute, 2011).

	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.
Aggregated dataset	This term is defined as a life cycle inventory of multiple unit processes (e.g. material or energy production) or life cycle stages (cradle to gate), but for which the inputs and outputs are provided only at the aggregated level. Aggregated datasets are also called "LCI results", “cumulative inventory” or “system processes” datasets. The aggregated dataset can have been aggregated horizontally and/or vertically. Depending on the specific situation and modelling choices a "unit process" dataset can also be aggregated. (See Figure 1[2]) *Figure 1: Definition of a unit process dataset and an aggregated process dataset* 
Application specific	It refers to the generic aspect of the specific application in which a material is used. For example, the average recycling rate of PET (Polyethylene terephthalate) in bottles.
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

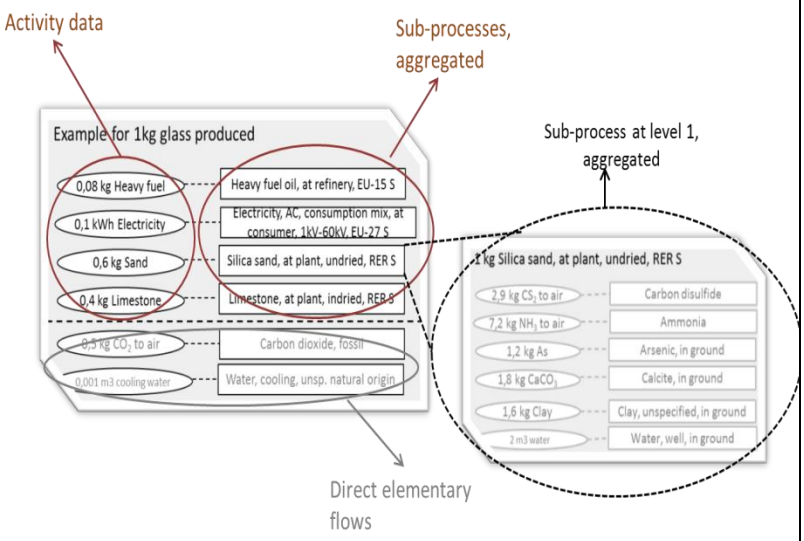
[2] Source: UNEP/SETAC “Global Guidance Principles for LCA Databases"

	used, if appropriate, in the context of communicating environmental performance of a product belonging to the same category.
Bill of materials	A bill of materials or product structure (sometimes bill of material, BoM or associated list) is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts and the quantities of each needed to manufacture an end product.
Business to Business (B2B)	Describes transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer.
Business to Consumers (B2C)	Describes transactions between business and consumers, such as between retailers and consumers. According to ISO 14025:2006, a consumer is defined as "an individual member of the general public purchasing or using goods, property or services for private purposes".
Commissioner of the EF study	Organisation (or group of organisations) that finances the EF study in accordance with the PEF Guide, PEFCR Guidance and the relevant PEFCR, if available (definition adapted from ISO 14071:2014, point 3.4).
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.
Comparative assertion	An environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function (adapted from ISO 14025:2006).
Comparison	A comparison, not including a comparative assertion, (graphic or otherwise) of two or more products based on the results of a PEF study and supporting PEFCRs or the comparison of one or more products against the benchmark, based on the results of a PEF study and supporting PEFCRs.
Data Quality Rating (DQR)	Semi-quantitative assessment of the quality criteria of a dataset based on technological representativeness, geographical representativeness, time-related representativeness, and precision. The data quality shall be considered as the quality of the dataset as documented.
Declared Unit	The declared unit is used instead of a functional unit when the precise function of the product at the building level is not stated

	or known, or when the LCA does not cover a full life cycle.
Direct elementary flows (also named elementary flows)	All output emissions and input resource use that arise directly in the context of a process. Examples are emissions from a chemical process, or fugitive emissions from a boiler directly onsite. (See Figure 2)
Disaggregation	The process that breaks down an aggregated dataset into smaller unit process datasets (horizontal or vertical). Disaggregation can help make data more specific. The process of disaggregation should never compromise or threaten to compromise the quality and consistency of the original aggregated dataset.
EF communication vehicles	It includes all the possible ways that can be used to communicate the results of the EF study to the stakeholders. The list of EF communication vehicles includes, but is not limited to, labels, environmental product declarations, green claims, websites, infographics, etc.
EF report	Document that summarises the results of the EF study. For the EF report the template provided as an annex to the PECFR Guidance shall be used. In case the commissioner of the EF study decides to communicate the results of the EF study (independently from the communication vehicle used), the EF report shall be made available for free via the commissioner's website. The EF report shall not contain any information that is considered as confidential by the commissioner, however confidential information shall be provided to the verifier(s).
EF study	Term used to identify the totality of actions needed to calculate the EF results. It includes the modelisation, the data collection, and the analysis of the results.
Electricity tracking[3]	Electricity tracking is the process of assigning electricity generation attributes to electricity consumption.
Elementary flow	Material or energy entering the system being studied that has been drawn from the environment without previous human transformation, or material or energy leaving the system being studied that is released into the environment without subsequent human transformation.
Environmental aspect	Element of an organisation's activities or products or services that interacts or can interact with the environment (ISO 14001:2015).

[3] http://www.e-track-project.org/

External communication	Communication to any interested party other than the commissioner or the practitioner of the study.
Foreground elementary flows	Direct elementary flows (emissions and resources) for which access to primary data (or company-specific information) is available.
Functional Unit	The functional unit represents the quantified performance of a product system for use as a reference unit for the LCA study. It is the unit of scale or reference on which the LCA results are based, and relates to the given function of the product.
Independent external expert	Competent person, not employed in a full-time or part-time role by the commissioner of the EF study or the practitioner of the EF study, and not involved in defining the scope or conducting the EF study (adapted from ISO 14071:2014, point 3.2).
Input flows	Product, material or energy flow that enters a unit process. Products and materials include raw materials, intermediate products and co-products (ISO 14040:2006).
Intermediate product	An intermediate product is a product that requires further processing before it is saleable to the final consumer.
Lead verifier	Verifier taking part in a verification team with additional responsibilities compared to the other verifiers in the team.
Life Cycle Inventory (LCI)	The combined set of exchanges of elementary, waste and product flows in a LCI dataset.
Life Cycle Inventory (LCI) dataset	A document or file with life cycle information of a specified product or other reference (e.g., site, process), covering descriptive metadata and quantitative life cycle inventory. A LCI dataset could be a unit process dataset, partially aggregated or an aggregated dataset.
Material-specific	It refers to a generic aspect of a material. For example, the recycling rate of PET.
Output flows	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).
Partially disaggregated dataset	A dataset with a LCI that contains elementary flows and activity data, and that only in combination with its complementing underlying datasets yield a complete aggregated LCI data set. We refer to a partially disaggregated dataset at level 1 in case the LCI contains elementary flows and activity data, while all complementing underlaying dataset are in their aggregated form (see an example in Figure 2).

	Figure 2: An example of a partially aggregated dataset, at level 1  The activity data and direct elementary flows are to the left, and the complementing sub-processes in their aggregated form are to the right. The grey text indicates elementary flows
PEFCR Supporting study	The PEF study done on the basis of a draft PEFCR. It is used to confirm the decisions taken in the draft PEFCR before the final PEFCR is released.
PEF Profile	The quantified results of a PEF study. It includes the quantification of the impacts for the various impact categories and the additional environmental information considered necessary to be reported.
PEF screening	A preliminary study carried out on the representative product(s) and intended to identify the most relevant life cycle stages, processes, elementary flows, impact categories and data quality needs to derive the preliminary indication about the definition of the benchmark for the product category/sub-categories in scope, and any other major requirement to be part of the final PEFCR.
Population	Any finite or infinite aggregation of individuals, not necessarily animate, subject to a statistical study.
Practitioner of the EF study	Individual, organisation or group of organisations that carries out the EF study in accordance with the PEF Guide, PEFCR Guidance and the relevant PEFCR, if available. The practitioner of the EF study can belong to the same organisation as the commissioner of

	the EF study (adapted from ISO 14071:2014, point 3.6).
Primary data[4]	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 a synonym of "company-specific data" or "supply chain-specific data".
Product category	Group of products (or services) that can fulfil equivalent functions (ISO 14025:2006).
Product Category Rules (PCR)	Set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories (ISO 14025:2006).
Product Environmental Footprint Category Rules (PEFCRs)	Product category-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 help to shift the focus of the PEF study towards those aspects and parameters that matter the most, hence contribute to increased relevance, reproducibility and consistency of the results by reducing costs versus a study based on the comprehensive requirements of the PEF Guide.
Refurbishment	It is the process of restoring components to a functional and/or satisfactory state to the original specification (providing the same function), using methods such as resurfacing, repainting, etc. Refurbished products may have been tested and verified to function properly.
Representative product (model)	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

[4] Based on Greenhouse Gas protocol scope 3 definition from the Corporate Accounting and Reporting Standard (World Resources Institute, 20011).

	average EU sales-weighted characteristics of all technologies around. A PEFCR may include more than one representative product if appropriate.
Representative sample	A representative sample with respect to one or more variables is a sample in which the distribution of these variables is exactly the same (or similar) as in the population from which the sample is a subset.
Sample	A sample is a subset containing the characteristics of a larger population. Samples are used in statistical testing when population sizes are too large for the test to include all possible members or observations. A sample should represent the whole population and not reflect bias towards a specific attribute.
Secondary data[5]	It refers to data not from a 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.
Site-specific data	It refers to directly measured or collected data from one facility (production site). It is synonymous with “primary data”.
Sub-population	In this document this term indicates any finite or infinite aggregation of individuals, not necessarily animate, subject to a statistical study that constitutes a homogenous sub-set of the whole population. Sometimes the word "stratum" can be used as well.
Sub-processes	Those processes used to represent the activities of the level 1 processes (=building blocks). Sub-processes can be presented in their (partially) aggregated form (see Figure 2).
Sub-sample	In this document this term indicates a sample of a sub-population.
Supply chain	It refers to all of the upstream and downstream activities associated with the operations of the company applying the

[5] Based on Greenhouse Gas protocol scope 3 definition from the Corporate Accounting and Reporting Standard (World Resources Institute, 2011)

	PEFCR, including the use of sold products by consumers and the end-of-life treatment of sold products after consumer use.
Supplychain specific	It refers to a specific aspect of the specific supply chain of a company. For example, the recycled content value of an aluminium can produced by a specific company.
Type III environmental declaration	An environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information (ISO 14025:2006). The predetermined parameters are based on the ISO 14040 series of standards, which is made up of ISO 14040 and ISO 14044.
Unit process dataset	Smallest element considered in the life cycle inventory analysis for which input and output data are quantified (ISO 14040:2006). In Life Cycle Analysis (LCA) practice, both physically not further separable processes (such as unit operations in production plants, then called “unit process single operation”) and also whole production sites are covered under "unit process", then called “unit process, black box” (International Reference Life Cycle Data System ILCD Handbook).
Validation statement	Conclusive document aggregating the conclusions from the *verifiers* or the verification team regarding the EF study. This document is mandatory and shall be electronically or physically signed by the *verifier or in case of* a verification panel, by the lead verifier. The minimum content of the validation statement is provided in this document.
Verification report	Documentation of the verification process and findings, including detailed comments from the *Verifier(s)*, as well as the corresponding responses. This document is mandatory, but can be confidential. However, it shall be signed, electronically or physically, by the *verifier or in case of a* verification panel, by the lead verifier.
Verification team	Team of verifiers that will perform the verification of the EF study, EF report and EF communication vehicles.
Verifier	Independent external expert performing a verification of the EF study and eventually taking part in a verification team.

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 life cycle management and participation in voluntary or mandatory programmes.

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.

For all requirements not specified in this PEFCR, the applicant shall refer to the documents this PEFCR is in conformance with (see chapter 2.7).

These PEFCRs, as they are for an intermediate product, are principally intended for use in compiling a PEF when paper is one of the components of the product under investigation. Intermediate paper products as such require further conversion for their final application and the results are to be used in the final product calculation. The PEFCRs of intermediate paper products for various applications will provide the necessary guidance for the PEF studies being undertaken for the final applications, to help guarantee that consistent information is used as input.

CEPI participated in the development of these PEFCRs with the aim of ensuring a consistent approach to the data provided for paper products in the development of a PEF.

These PEFCRs have been developed as part of the Environmental Footprint pilot phase running from 2013 to 2018. They have been aligned with existing PCR (Schau and Jelse, 2014).

Terminology: shall, should and may

This PEFCR uses precise terminology to indicate the requirements, 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

2.1 Technical secretariat

The organisations in the Technical Secretariat (TS) at the time of final vote are listed below.

Name of the organisation	*Type of organisation*	*Name of the members*	*Participation since*
APP		Liz Wilks	
CEPI - Confederation of European Paper Industries	trade/industrial/sectoral association at EU level	Jori Ringman	14 Jan 2014
CEPI ContainerBoard	trade/industrial/sectoral association at EU level	Gilles Barreyre	
CEPI Eurokraft		Elin Floresjö	
China Quality Certification Centre Guangzhou Branch		Hou Jian	14 Jan 2014
Chlorine Free Products Association	non-governmental organisation (NGO)	Archie Beaton	
Cohn & Wolfe		Sabina Lindstedt	
Copacel	trade/industrial/sectoral association at national or regional level	Bénédicte Oudart	14 Jan 2014
De Beaufort-Langeveld	consultancy	Angeline de Beaufort-Langeveld	
DS Smith	consultancy	John Swift	14 Jan 2014
Essity (formerly SCA)	large company	Pernilla Cederstrand, Ellen Riese	14 Jan 2014
European Commission, Joint Research Centre	public administration	Erwin M. Schau, Rana Pant	14 Jan 2014 until Jan 2018
FEFCO		Krassimira Kazashka	
Ferrero group	large company	Eva Piermario	14 Jan 2014
Forest Stewardship Council	non-governmental organisation (NGO)	John Hontelez	14 Jan 2014
Industrial Minerals Association (IMA) – Europe	trade/industrial/sectoral association at EU level	Roger Doome, Aurela Shtiza	14 Jan 2014
Innovhub-SSI	research/academia	Graziano Elegir	14 Jan 2014
International EPD System/EPD International AB	other EU stakeholder organisation	Kristian Jelse	14 Jan 2014
International Paper	large company	Marie Claude Ritt	14 Jan 2014
Lucart		Sabrina Cosci	14 Jan 2014
Lyreco	large company/distribution	Nasser Kahil	19 May 2015
Metsä Group	large company	Eija Saski	14 Jan 2014
Norwegian University of Science and Technology (NTNU)		Ottar Michelsen	14 Jan 2014
PEFC International		Xavier Noyon	
Reno De Medici		Lucia Rigamonti	14 Jan 2014
RISE (formerly Innventia)	research/academia	Tatjana Karpenja, Malin Johansson	14 Jan 2014
S.A. Industrias Celulosa Aragonesa	large company	Saúl de Llobet	14 Feb 2018
Sequana	large company	Olivier Guichardon	14 Jan 2014
SGS		Jean-Baptiste Molet, Pierre Boccon-Gibod, Juliane Franze	
SIG International Services GmbH		Christian Bauer	14 Jan 2014
Smurfit Kappa	large company	Sylviane Armacnacq, Outi Marin	14 Jan 2014
SOFEA		Anita Singh	
Sofidel	large company	Riccardo Balducci, Marco Simoncini	14 Jan 2014
Solinnen	small company	Philippe Osset	14 Jan 2014

Stora Enso	large company	Tiina Keskisaari	14 Jan 2014
Swedish Forest Industries Federation	trade/industrial/sectoral association	Ingrid Haglind	14 Jan 2014
Technische Universität Berlin		Annkatrin Lehmann	14 Jan 2014
Tetra Pak	large company	David Cockburn	14 Jan 2014
UFIPA		Christophe Girardier	14 Jan 2014
UPM	large company	Gabriele Wende, Jarkko Hukkanen	14 Jan 2014
Utrecht University		B.M. Krishna Manda	14 Jan 2014

2.2 Consultations and stakeholders

Three stakeholder consultations have been held during the pilot phase of intermediate paper products.

2.2.1 First stakeholder consultation

The first stakeholder consultation took place during 3 – 30 March 2014, with a stakeholder meeting in Brussels on 14 March 2014. Five written documents were received from APP, CEPI, Group Hygiene, GT8 Edition and WWF.

Participants of first stakeholder meeting:

- Rana Pant, Joint Research Centre (JRC), European Commission (Chairman)
- Erwin M. Schau, JRC, European Commission (Co-Chairman)
- Bengt Davidsson, CEPI (Vice-Chair)
- Michele Galatola, DG Environment, European Commission
- Jiannis Kougoulis, DG Environment, European Commission
- Angeline De Beaufort-Langeveld, independent consultant
- Aurela Shtiza, IMA-Europe
- Benedicte Oudart, COPACEL
- Eija Saski, Metsä Group
- Ellen Riise, SCA
- Emmanuelle Neyroumande, WWF International
- Fabienne Godin, FPS Health and Environment, Belgium
- Gabriele Wende, UPM
- Gilles Barreyre, CEPI Containerboard
- Ingrid Haglind, Swedish Forest Industries Federation
- Jad Zoghaïb, Solinnen
- Johan Vlieger, PEFC International
- John Swift, DS Smith
- Laget Staf, Eurometaux/Umicore
- Mark Macaré, FINAT
- Nikolay Minkov, Technische Universität Berlin
- Reynaud Laetitia, INTERGRAF
- Riccardo Balducci, Sofidel
- Sylviane Armagnacq, Smurfit Kappa
- Thomas Bock, Reno de Medici
- Volker Gehr, Steinbeis Papier GmbH
- Terry Coleman, ERM

Meeting documents are available at:
https://webgate.ec.europa.eu/fpfis/wikis/display/EUENVFP/PEFCR+Pilot%3A+Intermediate+paper+product

2.2.2 Second stakeholder consultation

The second stakeholder consultation took place in a virtual form during 9 April – 9 May 2015. Written comments were received from the following 18 organisations:

- BillerudKorsnäs
- CEPI Eurokraft
- European Tissue Symposium
- FSC
- German Environment Agency
- International Paper
- John Swift
- Lucart Group
- Metsä Group
- SCA
- Smurfit Kappa
- Sofidel
- Stora Enso
- Swedish Forest Industries Federation
- Thinkstep AG
- Technische Universität Berlin
- UPM
- WWF International

Stakeholder consultation documents are available at:
https://webgate.ec.europa.eu/fpfis/wikis/display/EUENVFP/PEFCR+Pilot:+Intermediate+paper+product

2.2.3 Third stakeholder consultation

The third stakeholder consultation took place in a virtual form during 30 May – 27 June 2016. Written comments were received from the following 15 organisations:

- ASPAPEL
- Association of Polish Papermakers
- Belgium - Federal Public Service - Health, Food chain safety and Environment
- CEPI Eurokraft
- EC, DG ENV
- Indonesian Pulp & Paper Association (APKI)
- International Paper
- Maki Consulting GmbH
- Metsä Group
- Politecnico di Milano
- Stora Enso
- Swedish Forest Industries Federation
- Technische Universität Berlin
- Thinkstep AG

- WWF International

Stakeholder consultation documents are available at:
https://webgate.ec.europa.eu/fpfis/wikis/display/EUENVFP/PEFCR+Pilot:+Intermediate+paper+product

2.3 Review panel and review requirements of the PEFCR

The review panel are the following:

Name of the member	*Affiliation*	*Role*
Ugo Pretato	Studio Fieschi&Soci, Italy	LCA expert (Chair)
Tiina Pajula	VTT, Finland	Industry expert
Frank Wellenreuther	IFEU, Germany	NGO representative

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 6.3 [indicate the version the PEFCR is in conformance with], and, where appropriate, in accordance with the requirements provided in the most recently 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 Life Cycle Impact Assessment (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 [indicate the version the PEFCR is in conformance with] 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 3 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 4 May 2013.

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

We hereby confirm that, following the PEFCR examination, we have not established any relevant deviations by the above-referenced PEFCR document with respect to the requirements identified in the review scope.

We confirm we have been independent in our roles as reviewers, we have not been involved in the preparation of the PEFCR or related supporting studies and we have no conflicts of interest regarding this review.

The PEFCR validity is set until 31-12-2020.

We appreciate the efforts undertaken by the Technical Secretariat in developing this PEFCR and the effective collaboration during the review.

2.5 Geographic validity

This PEFCR is valid for products in scope sold/consumed in the European Union and the European Free Trade Association, 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 version in English supersedes translated versions in case of conflicts.

2.7 Conformance with 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. Available at: http://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR_guidance_v6.3.pdf

3. Scope of the PEFCR

This section includes a description of the scope of the PEFCR and lists the number of sub-categories included in the scope of the PEFCR for an intermediate paper product.

3.1 Product classification

The Classification of Products by Activity (CPA) codes for the products included in this PEFCR are:

C.17.12 paper and paperboard, with the following products:

17.12.1 Newsprint, handmade paper and other uncoated paper or paperboard for graphic purposes
17.12.2 Toilet or facial tissue stock, towel or napkin stock, cellulose wadding and webs of cellulose fibres
17.12.3 Containerboard
17.12.4 Uncoated paper
17.12.5 Uncoated paperboard (other than that used for writing, printing or other graphic purposes)
17.12.7 Processed paper and paperboard

These PEFCRs cover all products under the CPA codes listed above, except the following products:

17.12.12 Handmade paper and paperboard
17.12.43 Filter paper and paperboard; felt paper
17.12.44 Cigarette paper not cut to size or in the form of booklets or tubes
17.12.77 Paper, paperboard, cellulose wadding and webs of cellulose fibres, coated, impregnated, covered, surface coloured or printed, in rolls or sheets

3.2 Representative product(s)

These PEFCRs are for the product category **intermediate paper products**. The intermediate products are not subjects of benchmarks within the PEF.

Intermediate paper product is a manufactured product (material) that is used as an input for producing paper products for different end-use applications. Intermediate paper products are used in communication (newsprint and other graphic papers), packaging, sanitary and hygienic (tissue), and speciality end-use applications. The term "intermediate" is used to differentiate between "paper materials" and "paper product"; where the latter one refers to final products such as envelopes, corrugated packaging or kitchen towel. Such final products are not included in this product category.

This product category is divided into three sub-categories:

- Graphic papers (including newsprint)
- Packaging papers, and
- Tissue

There are three representative products in this product category, one for each sub-category. The representative products are all virtual (“average”) products and their make-up is based on the **share of the European market** of the constituent grades; see Table 1.

Table 1: The representative products for the three sub-groups graphic papers, packaging papers and tissue

Representative product	Consumption share
Total Graphic papers	**100%**
Newsprint	22%
Other graphic papers	
Uncoated mechanical	15%
Coated mechanical	20%
Uncoated woodfree	22%
Coated woodfree	21%
Total Packaging papers	**100%**
Case materials	68%
Carton board	20%
Wrappings	7%
Other paper and board for packaging (not included)	5%
Total Tissue	**100%**
Paper for toilet tissue	59%
Paper for towels (wet-strength)	27%
Paper for napkins (wet-strength)	8%
Paper for hankies (wet-strength)	6%

Source: Own calculations based on CEPI data; Schau and Davidsson eds. (2014)

The descriptions of these sub-categories based on the descriptions in the CEPI Annual Statistics 2017 (CEPI, 2018) are as follows:

3.2.1 Graphic papers

Newsprint: paper mainly used for printing newspapers. It is made largely from mechanical pulp and/or paper for recycling, with or without a small amount of filler. Weights usually range from 40 to 52 g/m2 but can be as high as 65 g/m2. Newsprint is machine-finished or slightly calendered, white or slightly coloured and is used in reels for letterpress, offset or flexo-printing.

Uncoated mechanical: paper suitable for printing or other graphic purposes where less than 90% of the fibre furnishes consists of chemical pulp fibres. This grade is also known as groundwood or wood containing paper and magazine paper, such as heavily filled super-calendered paper for consumer magazines printed by the rotogravure and offset methods.

Uncoated woodfree: paper suitable for printing or other graphic purposes, where at least 90% of the fibre furnishes consists of chemical pulp fibres. Uncoated woodfree paper can be made from a variety of furnishes, with variable levels of mineral filler and a range of finishing processes such as sizing, calendering, machine glazing and watermarking. This grade includes most office papers, such as business forms, copier, computer, stationery and book papers. Pigmented and size press “coated” papers (coating less than 5g per side) are covered by this heading.

Coated papers: all paper suitable for printing or other graphic purposes and coated on one or both sides with minerals such as china clay (kaolin), calcium carbonate, etc. Coating may be done by a variety of methods, both on-machine and off-machine, and may be supplemented by super-calendaring. Coated mechanical papers are made of fibres produced mainly (90%) from a mechanical pulping process and are

also known as coated groundwood. Coated woodfree papers are made of fibres produced mainly (90 from a chemical pulping process and are also known as coated free sheet).

Paper for recycling (i.e. recovered paper) is increasingly used in other graphic paper grades than newsprint.

3.2.2 Packaging papers

Case materials: papers and boards mainly used in the manufacture of corrugated board. They are made from any combination of virgin and recovered fibres and can be bleached, unbleached or mottled, and are generally uncoated. Fluting is the middle ply with outer layers called the liners. Included are kraftliner, testliner, semi-chemical fluting, and paper for recycling-based fluting (Wellenstoff). Main uses include corrugated boxes, transport packaging, storage and product display. Also known as containerboard, corrugated case materials, cardboard, linerboard or corrugating medium.

Cartonboard (can also be written as carton board): may be single or multiply, coated or uncoated. It is made from virgin and/or recovered fibres, and has good folding properties, stiffness and scoring ability. It is mainly used in cartons for consumer products such as frozen food, cosmetics and liquid containers. It is also known as solid board, folding box board, boxboard or carrier board.

Wrappings (up to 150 g/m2): papers whose main use is wrapping or packaging made from any combination of virgin or recovered fibres, bleached or unbleached. They may be subject to various finishing and/or marking processes. Included are sack kraft, machine glazed (MG) paper, other wrapping kraft, sulphite and greaseproof paper.

Other papers mainly for packaging purposes: this category embraces all paper and board mainly for packaging purposes other than those listed above. Most are produced from recovered fibres, e.g. greyboard, destined for conversion, which in some cases may be for end-uses other than packaging including book covers and games. Also known as greyboard or unlined chip.

3.2.3 Tissue

Classified by CEPI as "Sanitary and Household" and described as follows:

This product category covers a wide range of tissue and other hygienic papers for use in households or commercial and industrial premises. Examples are toilet paper and facial tissues, kitchen towels, hand towels and industrial wipes. Some tissue is also used in the manufacture of nappies, sanitary towels, etc. The parent reel stock is made from virgin pulp or recovered fibre or a mixture of these. It is reported in the production statistics at parent reel weight before conversion to finished products. Import and export statistics, however, take into account trade in both parent reels and finished products.

3.3 Functional unit and reference flow

The functional unit is one tonne (1000 kg) of saleable paper grade [graphic, packaging papers or tissue] at the paper mill gate[6] with no duration connected to it. The declared unit is the same as the functional unit and is used for intermediate paper products. The reference flow is the amount of product needed

[6] Converting operation of paper material (from reels or sheets to a semi-finished or finished product) is not included in the scope of the study as it occurs beyond the intermediate product stage.

to fulfil the defined function and shall be measured in one metric tonne (1000 kg). All quantitative input and output data collected in the study shall be calculated in relation to this reference flow.

The mill gate is at the end of the reel winding process of the pigment/mineral coated or uncoated paper reel. If rewinding and reel packaging are part of the intermediate product they shall be included. In the case of high grammage paper the product is manufactured into sheets and not into reels[7].

The paper weight (grammage, i.e. weight per unit of area, [g/m^2]), moisture content[8] [%] and code of the paper grade shall be specified. Additional units of analysis may be used to report the results in parallel with the mandatory functional unit. The alternative units of analysis may be, for example:

- One square metre of product[9]; or
- for tissue: The amount of tissue required to absorb 1g of water (the determination of the amount of water absorbed shall be by using the test method EN ISO 12625-8 or similar).

It should be recognised that declared units of different intermediate paper products shall not be compared, unless additional specifications that ensure comparability are set, e.g. quality aspects.

Table 2: Key aspects used to define the functional unit

What?	Intermediate paper (graphic papers, packaging papers or tissue) grade at the paper mill's gate[10]
How much?	One tonne (1000kg), saleable
How well?	As an intermediate paper product, there is no quality performance connected to it.
How long?	As an intermediate paper product, there is no duration connected to it.

3.4 System boundary

The Product Environmental Footprint analysis of an intermediate paper product shall be "cradle to gate" including all the environmentally relevant upstream and production processes.

The cradle to gate system shall start when resources are extracted from nature – starting with the upstream processes of the inflow of raw materials from collected paper for recycling, wood from forests, water, energy wares, and other materials (such as chemicals), needed for the manufacture of the product – and ends at the mill gate as defined in this chapter.

The following life cycle stages and processes shall be included in the system boundary as in table 3:

[7] High grammage paper means above 500 g/m^2 where some paperboards are manufactured into sheets and not reels because of their high stiffness.

[8] The term “moisture content” is defined in ISO 4046-5, 5.79 and the relevant test method is ISO 287.

[9] Surface may be a more appropriate basis for the functional unit for final products.

[10] Converting operation of paper material (from reels or sheets to a semi-finished or finished product) is not included in the scope of the study as it occurs beyond the intermediate product stage.

Table 3: Life cycle stages

Life cycle stage	Short description of the processes included
Raw material acquisition (upstream processes)	The production of wood, collection of recovered paper, production of energy wares, and other materials needed in the production of pulp and paper; transport of raw materials.
Production of main product (core processes)	Production of pulp, transport of pulp, production of paper and paperboard.

3.4.1 System boundaries – upstream processes

Examples of upstream processes for intermediate paper products can be found below.

The following material inflows to the production system shall be included:

- Paper for recycling:
  - Collection of paper for recycling from households, industry and offices, i.e. pre- and post-consumer waste (ISO 14021:2016, see 4.7 for trimmings), and transport to a sorting facility;
  - Sorting into paper grades (according to EN 643) e.g. at a depot, and transport;
  - In Figure 1, the box paper for recycling is dashed as this process is shared with another life cycle and further consideration (e.g. regarding allocation between different product lives see 5.9 on multi-functionality) is needed for this aspect.

- Wood from forests:
  - i.e. relevant upstream silvicultural, transport or wood processing activities, e.g. seedling production, soil preparation, planting (sowing or natural regeneration), pre-commercial thinning, thinning, fertilisation, felling, transportation;
  - Production of off-site woodchips (e.g. the silviculture activities listed above, transportation to a chipping place and chipping itself.); and/or
  - Production of saw milling residues;
  - Other materials; the production of:
  - Functional chemicals
  - Process chemicals
  - Minerals;
- Water;
- The production of energy wares (fuels, electricity and heat) used in the production
- Transport of raw materials to the pulp and paper production.

3.4.2 System boundaries – core processes

Production of pulp, paper and paperboard:

The facility gate of a pulp mill shall be the pulp warehouse (for market pulp). The facility gate of a paper mill shall be at the end of reel winding process of the coated or uncoated paper reel[11]. Examples of production of paper and paperboard processes to include in the study are:

- Pulping (market pulp and internally produced):
  - Virgin fibre pulp production with relevant process steps depending on type of pulp (kraft pulp, sulphite pulp, mechanical and chemi-mechanical pulp), e.g. de-barking, chipping, cooking/groundwood pulping, refining, delignification, washing, bleaching, drying
  - Recycled fibre pulp production, e.g. re-pulping of collected paper, mechanical removal of impurities, de-inking, bleaching, drying
- Paper and paperboard production:
  - Paper and paperboard production, e.g. stock preparation, refining, and a paper and board machine
  - Additional processes, e.g. coating, sizing, dying and calendaring
  - Finishing processes, e.g. reeling and reel winding
- Supporting activities used in a pulp and paper production, e.g. water and solid waste treatment, electricity and steam generation, chemical recovery
- Transportation:
  - Pulp to paper and paperboard production (if not integrated)
  - Waste generated by the mill

All the processes which are required for the intermediate paper material to obtain functionality specified by the functional unit shall be modelled in the study. Additional processes such as coating, sizing, dying and calendaring, notwithstanding they take place on- or off-paper machine or the paper mill, shall be included.

3.4.3 System boundaries – downstream processes

Downstream processes are excluded: this document provides category rules for an intermediate paper product.

3.4.4 System boundaries – boundaries to nature

Boundaries to nature shall be defined as flows of resources[12] from nature into the system. Emissions to air, water and soil cross the system boundary when they are emitted from or leaving the product system. Resources and emissions are elementary flows entering the system being studied that have been drawn from the environment without previous human transformation, or material or energy leaving the system being studied that are released into the environment without subsequent human transformation.

[11] If rewinding and reel packaging are part of the intermediate product they shall be included.

[12] "Resources" refer to resources from air (e.g. "Oxygen"), water (e.g. "Groundwater), biosphere and ground (e.g. "Hard coal"; 32.7 MJ/kg net calorific value).

3.4.5 Cut-off rule

Criteria for the exclusion of inputs and outputs are intended to support an efficient calculation procedure. The following procedure shall be followed for the exclusion of inputs and outputs:

- All inputs and outputs to a process shall be included in the calculation, for which data are available.
- In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1% of the total absolutely dry mass input of that unit process. The effect of the total omitted inputs and outputs shall be a maximum of 1% of each environmental impact category.
- Human toxicity-Cancer effect, Human toxicity-non Cancer effect and Freshwater Ecotoxicity shall not be taken into account when selecting processes that can be excluded based on the cut-off rule.

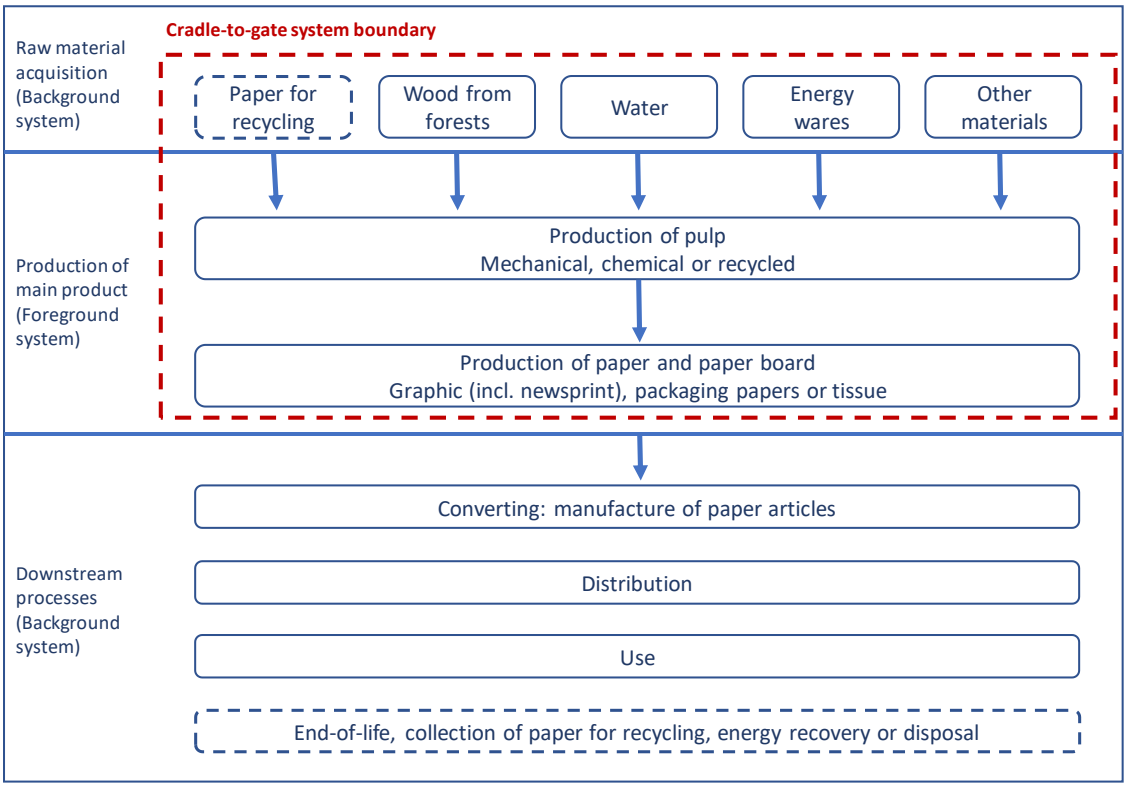
According to this PEFCR, the following processes may be excluded based on the cut-off rule:

If the total mass of chemicals not listed as mandatory input is below 1% of the paper weight, they can be cut off and omitted from the study.

Packaging materials and cores (pallet, paper and board, LDPE (Low Density Poly Ethylene) for wrapping, steel wire, cores and core plugs) can be excluded.

3.4.6 System diagram

Figure 3: System boundary diagram with cradle-to gate system boundary (simplified)



Each PEF study done in accordance with this PEFCR shall provide in the PEF study a diagram indicating the organisational boundary, to highlight those activities under the control of the organisation and those falling into Situation 1, 2 or 3 of the data need matrix. Situations 1, 2 and 3 describe the position of the PEF applicant to primary data and have been explained in chapter 5.4. See also 3.4.1 and 3.4.2 for more details for upstream and core processes respectively.

3.5 Environmental footprint 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 4: List of impact categories to be used to calculate the PEF-profile

Impact category	Indicator	Unit	Recommended default LCIA method
Climate change - Climate change-biogenic - Climate change – land use and land transformation	Radiative forcing as Global Warming Potential (GWP100)	kg $CO_{2\ eq}$	Baseline model of 100 years of the IPCC (based on IPCC 2013)
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)
Land use	• Soil quality index[13] • Biotic production • Erosion resistance • Mechanical filtration • Groundwater replenishment	• Dimensionless (pt) • kg biotic production[14] • kg soil • m^3 water • m3 groundwater	• Soil quality index based on LANCA (EC-JRC)[15] • 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.

[13] This index is the result of the aggregation, performed by Joint Research Centre (JRC), of the four indicators provided by LANCA model as indicators for land use.

[14] This refers to occupation. In case of transformation the LANCA indicators are without the year (a).

[15] Forthcoming document on the update of the recommended Impact Assessment methods and factors for the EF.

Impact category	Indicator	Unit	Recommended default LCIA method
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 of 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 full list of normalisation factors and weighting factors are available in Annex 1 – List of EF normalisation factors and weighting factors.

The full list of characterisation factors (EC-JRC, 2017a) is available at this link: http://eplca.jrc.ec.europa.eu/LCDN/developer.xhtm

All default impact categories shall be used for intermediate products and are therefore required for PEF studies following this PEFCR. However, it is relevant to note that robustness of impact categories (see table on previous page) and normalisation factors (Annex A, PEF Guidance 6.3) can be low, which must be taken into account when evaluating the results. Based on that, impact categories have been listed in the following table 5.

Table 5: Evaluation of quality of impact categories

Impact category	Impact assessment method – Robustness	Normalisation - Robustness
Climate change	I	I
Particulate matter	I	I/II
Ozone depletion	I	II
Photochemical ozone formation, human health	II	I/II
Acidification	II	I/II
Eutrophication, terrestrial	II	I/II
Eutrophication, marine	II	II/III
Eutrophication, freshwater	II	III
Ionising radiation, human health	II	III
Water use	III	II
Resource use, minerals and metals	III	II
Resource use, fossils	III	II
Land use	III	II
Ecotoxicity, freshwater	III/interim	III
Human toxicity, cancer	III/interim	III
Human toxicity, non-cancer	III/interim	III

The results for water might be overestimated and shall therefore be interpreted with caution. Some of the EF datasets tendered during the pilot phase and used in this pilot phase and used in the PEFCR include inconsistencies in the regionalisation 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 remains valid and usable. The affected EF datasets will be corrected by mid-2019. At that timeit will be possible to review this PEFCR accordingly, if seen necessary.

The PEFCR Guidance 6.3 introduces an aggregated PEF index to model land use impact, using the LANCA method (LANCA® Method, Fraunhofer Institute for Building Physics) as its background. The aggregated index (creating a single value based on four different characterisation factors from the method) has limited capability of capturing the specific nature of forest management in semi-natural forests and plantations. Therefore, the land use impact result in the current PEFCR calculations needs to be treated with caution. The LANCA method itself is better able to capture the long-term positive and negative impacts of commercial forestry in forest land use, however it needs to be re-evaluated against the forest management models. No other land use impact method has been introduced in the meanwhile therefore the PEFCR follows the aggregated land use index, with a specific calculation principle for applicants of this PEFCR as explained in section 4.

The aim of the Intermediate Paper Product PEF Pilot is to enhance methods that promote improvements in all life cycle impact areas. Therefore, this pilot recommends refining the evaluation of forestry and permanent crops in LCA to allow for the representation of maintained and/or improved land management during the transition period until 2021.

3.6 Limitations

Comparisons, assertions and benchmarking

Given the supplier/customer relationship for intermediate paper products, a requirement for direct comparability of such products would be most unusual. If such a comparison were to be requested, the following requirements for the grades of an/the intermediate paper product to be compared would be seen as the minimum:

- the function of the final product in which the grades are used shall be identical to the compared product
- the end-of-life scenario of the final product in which the grades are used shall be identical to the compared product
- the grades themselves shall have equivalent technical characteristics which will be relevant to the functionality of the final product and these characteristics shall be specified in detail
- to enable this detailed specification, the grade of the intermediate product shall be stated using the three levels of the CPA code, completed by the exact grade of the category of paper. For example, the grade of a containerboard may be defined and characterised through the “European list of corrugated base papers”, (CEPI ContainerBoard 5th Edition, September 2015)

Process and functional chemicals

Emissions from the use of process or functional chemicals in pulp and paper production are omitted from the mandatory data on flows to be collected at pulp and paper mills. The emissions from these chemicals are not commonly measured as they are not usually considered as material for the mill's environmental performance, as stated, for example, in BREFs (Best available techniques REFerence) or in legal permits for pulp and paper mills.

NOTE: The use of chemicals by the pulp and paper industry is constantly monitored for cost, quality and risks with well established procedures in all mills. To improve these factors, the various chemicals used are often subject to change. The amount of work to identify these substances for the purpose of life cycle inventories and as input to life cycle impact assessments does not currently seem to be justified as it would not lead to any useful information.

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

The most relevant impact categories have been selected based on the final remodelling results (October 2018) and represent the highest impact categories modelled for average products for graphic, packaging and tissue papers.

- Most relevant impact categories: all impact categories that cumulatively contribute to at least 80% of the total environmental impact (excluding toxicity related impact categories and land use impact category) starting from the largest to the smallest contribution.
- Most relevant processes: those that collectively contribute by at least 80% to any of the most relevant impact categories identified.

The most relevant impact categories and processes for the paper sub-categories in the scope of the Intermediate Paper Product PEFCR have been introduced in Table 6, below.

Table 6: Most relevant impact categories and processes

Impact category and *life cycle stage*	**Processes**		
	Tissue	**Graphic**	**Packaging**
Climate change	Electricity grid mix	Electricity grid mix	Electricity grid mix
	Thermal energy from fossil fuels	Thermal energy from fossil fuels	Thermal energy from fossil fuels
Abiotic resource depletion – fossil fuels	Electricity grid mix	Electricity grid mix	Electricity grid mix
	Thermal energy from fossil fuels	Thermal energy from fossil fuels	Thermal energy from fossil fuels
Particulate matter	Pulp production	Pulp production	Electricity grid mix
	Electricity grid mix	Electricity grid mix	Thermal energy from fossil fuels
	Transoceanic ship transport	Thermal energy from fossil fuels	Starch production*
		PCC*** production*	AKD** sizer production*
			Sulphate pulp production
Acidification	Thermal energy from fossil fuels	Thermal energy from fossil fuels	Thermal energy from fossil fuels
	Pulp production	Pulp production	Pulp production
	Electricity grid mix	Electricity grid mix	Electricity grid mix
		PCC*** production*	Starch production*
			AKD** sizer production*

*Processes related to the life cyclee stage “raw material acquisition”. The major part of impacts is coming from the life cycle stage “Production of main product”. See also Table 7.
** Alkyl ketene dimers (AKDs) are a family of organic compounds. The main application of alkylated ketene dimers is in the sizing of paper and cardboard, as well as in the hydrophobation of cellulose fibres.
*** Precipitated calcium carbonate PCC is used as filler, and its properties as porosity, ensure levels of whiteness and opacity significantly higher than those obtained with the use of other non-synthetic fillers.

Land use impacts: With the current available method (the aggregated index based on the LANCA® Method) the land use impact category appears as the third most relevant impact category in the calculations for the average products. The land use impact of the production of wood fibre-based products is a material element in an LCA study and part of the Intermediate Paper Product PEFCR (see paragraph 3.5).

Results from the land use impact category are to be interpreted with caution as they may overestimate impacts. This is mainly due to the way the sub-indicators were aggregated, which included a rescaling process to avoid negative numbers, and to how the reference status was defined. Additionally, secondary datasets on forestry currently do not properly capture sustainable forest management practices. As a consequence, results do not accurately reflect different forest management practices in semi-natural forests.

Alongside this land use result, information on sustainable forest management may be included following the guidance for additional environmental information on certified forest management (see section 7.4.2, paragraph on biodiversity and land use).

NOTES:

1) **Climate change:** As climate change is listed as a relevant impact category the total climate change shall be reported as the sum of the three sub-indicators. The sub-indicators 'Climate change - biogenic' and 'Climate change - land use and land transformation' shall be reported separately for those sub-indicators contributing more than 5% each to the total score.
2) **Biodiversity:** Biodiversity is also highly relevant*, although not an LCA impact category*, and shall be reported as additional environmental information.

However, as an intermediate product, all impact categories shall be included in the PEF study.

Intermediate paper consists only of two life cycle stages: Raw material acquisition, and Production of main product. The most relevant impact categories are split as follows between two life cycle stages as in Table 7.

Table 7: Most important impact categories in life cycle stages

Impact category	**Life cycle stage: Raw material acquisition**	**Life cycle stage: Production of main product**
Abiotic resource depletion	<10%	>90%
Climate change	<10 %	>90 %
Respiratory inorganics	<10 %	>90 %
Acidification	<10 %	>90 %

5. Life cycle inventory

All newly created processes shall be EF compliant. Sampling is not allowed.

5.1 Lists of mandatory company-specific data

There are four data points for which it is mandatory to use company-specific data (e.g. primary data). Not using primary data for these processes means that the study is not compliant with this PEFCR. These four data points are:

- Amount of wood and/or recycled fibres used for 1 tonne of virgin pulp
- Transport of raw materials
- Use of electricity, with split on generated electricity on-site and electricity from general grid mix
- Use of thermal energy
- Use of chemicals
- Use of water
- Emissions to air and water
- Wastes

There are two approaches to company-specific mandatory data depending on the integration level of the company:

- Separated processes A and B in which pulping and papermaking are separate processes. Used especially for virgin paper production.
- Integrated process C in which pulping and papermaking are combined processes and it is not possible to separate data flows. Used especially for recycled paper production.

Table 8: Example of list or mandatory company-specific data for all processes A, B and C

Process name	*Unit of measurement (output)*	*Default*				*UUID*	*Default DQR*				*Most relevant process [Y/N]*
		R_1	*Amount per FU*	*Dataset*	*Dataset source*		*P*	*Ti_R*	*G_R*	*Te_R*	

Data collection requirements for mandatory processes A – Pulping, market pulp and internally produced

Virgin fibre pulp production with relevant process steps depending on the type of pulp.

Information about the wood species percentage used for the making of market pulp shall be collected and the water content of the wood shall be included by the suppliers as separate data. The wood characteristics data given for different types of wood in Annex 4-I shall be used for possible conversions. Data for each pulp type used, a set of data shall be included, including de-inked recycled pulp.

The full list of mandatory company-specific data for process A – Pulping has been introduced in Annex 4-III.

Data collection requirements for mandatory process B – Papermaking

The full list of mandatory company-specific data for process B – Paper making has been introduced in Annex 4-III.

Data collection requirements for mandatory process C – Integrated process

The full list of mandatory company-specific data for process C – Integrated process has been introduced in Annex 4-III.

Requirements for direct elementary flow data collection

The requirements for the direct elementary flow data collection for all three processes have been described in national regulations. The national regulation in frequency of measurement and default measurement method shall be used.

5.2 Data gaps

The following data gaps have been identified:

A. Particulate matter (dust)– size (PM10 and PM2.5) – Currently the pulp and paper industry is usually not measuring the size of the dust from the foreground system, only dust as a total.

B. Carbon flows on the forest level.

C. Chemicals with partially unknown composition.

In order to fill these data gaps the following solutions should be used:

A. For particulate matter, the following hierarchy apply:

- As a first option, using own measurement of PM2.5 in the flue gas
- The second option is to use own measurement of PM10 in the flue gas
- The third option is to use the default approach chosen in the screening study. (This assumed the following size distribution of particles: PM2.5 (22.2%), PM10 (12.3%), >PM10 (65.4%) due to missing data/measurements on particle sizes).

It is recommended that further analysis be undertaken to obtain the specific size distribution for particle emissions from each site so that this impact category can be reported more accurately.

B. For carbon flows on the forest level:
Missing biogenic carbon flows at the forest level thus not taken into account in the carbon balance, shall be listed. Those that are missing from the current method on climate change (see 5.9) are below ground biomass carbon flows. They differ depending on the forest management type and the soil and climate conditions. If there is local data available on those carbon flows they may be used and reported as additional environmental information. The choice of methodology should then be justified and thoroughly described.

C. Modelling of chemicals with partially unknown composition:

- If only one chemical substance in a mixture is known, the mixture shall be modelled with a concentration of 100% of this known chemical substance.
- If more than one chemical substance is known but the substances together do not add up to 100%, the mixture shall be modelled reporting the partial composition to 100% (e.g. if three substances are known to be 20, 30 and 40% of the total and 10% is missing, the known substances shall be recalculated to 22,2%, 33,3% and 44,4% respectively).

5.3 Data quality requirements (DQR)

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 four criteria:

$$DQR = \frac{TeR+GR+TiR+P}{4} \quad \text{[Equation B.1]}$$

Where Te_R is the Technological Representativeness, GR is the Geographical Representativeness, Ti_R 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 the 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.

5.3.1 Company-specific datasets

The score of criterion P cannot be higher than 3 while the score for Ti_R, Te_R and G_R 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 follows:

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 in descending oreder from the most contributing to the least contributing one.

2. Calculate the DQR criteria Te_R, Ti_R, G_R 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 11.

   2.a) Each most relevant elementary flow consists of the amount and elementary flow naming (e.g. 40g of carbon dioxide). For each most relevant elementary flow, evaluate the 4 DQR parameters named Te_R-EF, Ti_R-EF, G_R-EF, PEF in Table B. 5. For example, the following shall be evaluated: 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-AD, PAD) and (ii) Te_R, Ti_R and G_R shall be evaluated at the level of the secondary dataset used (named Te_R-SD , Ti_R-SD and G_R-SD). As Ti_R is evaluated twice, the mathematical average of Ti_R-AD and Ti_R-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 percentage (weighted using 13 EF impact categories, with the exclusion of the three 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 use the total DQR of the newly developed dataset using equation B.2, where $\overline{Te_R}, \overline{G_R}, \overline{Ti_R}, \bar{P}$ are the weighted average calculated as specified in point 4.

$$DQR = \frac{\overline{Te_R}+\overline{G_R}+\overline{Ti_R}+\bar{P}}{4} \qquad \text{[Equation B.2]}$$

NOTE: In case the newly developed dataset has most relevant processes filled in by non-EF compliant datasets (and thus without DQR), these datasets cannot be included in steps 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 percentage. Continue with steps 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 $\overline{Te_R}, \overline{G_R}, \overline{Ti_R}, \bar{P}$ and the total DQR shall be multiplied with 1.375.

Table 9: Assessing the value of the DQR criteria for datasets with company-specific information

	PEF and PAD	**$Ti_{R\text{-}EF}$ and $Ti_{R\text{-}AD}$**	**$Ti_{R\text{-}SD}$**	**$Te_{R\text{-}EF}$ and $Te_{R\text{-}SD}$**	**$G_{R\text{-}EF}$ and $G_{R\text{-}SD}$**
1	*Measured/calculated and 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 two annual administration periods with respect to the EF report publication date*	*The EF report publication date happens not later than two years beyond the time validity of the dataset*	*The elementary flows and the secondary dataset are 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*

5.4 Data Needs Matrix (DNM)

All processes required to model the product and outside the list of mandatory company-specific data (listed in section 5.1) shall be evaluated using the Data Needs Matrix (see table 10). 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:

Situation 1: the process is run by the company applying the PEFCR (e.g. papermaking process).

Situation 2: the process is not run by the company applying the PEFCR but the company has access to (company-)specific information (e.g. market pulp, in most cases).

Situation 3: the process is not run by the company applying the PEFCR and this company does not have access to (company-)specific information (could, for example, be the case for market from some papermaking companies).

Table 10: Data Needs Matrix (DNM)[16]

		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)	
	Option 2		Use default secondary dataset in PEFCR, in aggregated form (DQR ≤3,0) - If secondary datase in PEFCR: DQR parameters from PEFCR - If secondary dataset not in PEFCR: DQR parameters from metadata of dataset
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)	
	Option 2	Use company-specific activity data for transport (distance), and substitue the sub-processes used for electricity mix and transport with supply-chain specific PEF compliant datasatets (DQR ≤3,0). - If secondary dataset in PEFCR: DQR parameters from PEFCR. - If secondary dataset not in PEFCR: re-evaluate context-specific DQR parameters.	
	Option 3		Use company-specific 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). - If secondary dataset in PEFCR: DQR parameters from DQR - If secondary dataset not in PEFCR: DQR parameters from metadata of dataset
Situation 3: process not run buy the company applying the PEFCR and without access to (company-)specific information	Option 1	Use default secondary dataset, in aggregated form (DQR ≤3,0) - If secondary dataset in PEFCR: DQR parameters from PEFCR. - If secondary dataset not in PEFCR: re-evaluate context-specific DQR parameters.	
	Option 2		Use default secondary dataset in PEFCR, in aggregated form (DQR ≤4,0) - If secondary dataset in PEFCR: DQR parameters from DQR - If secondary dataset not in PEFCR: DQR parameters from metadata of dataset

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

5.4.1 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 processes, 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 5.3.1.

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.

5.4.2 Processes in situation 2

When a process is not run by the company applying the PEFCR, but there is access to company-specific data, 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 (option 1);
- The company has some supplier-specific information and wants to make some minor 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).

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 5.3.1.

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 Universally Unique Identifier (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 TeR and TiR, using Table(s) 10 and 11. The criteria GR shall be lowered by 30%[17] 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 11: Assessing the value of DQR criteria when secondary datasets are used

	Ti_R	Te_R	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 the scope of the dataset	The process modelled in the EF study takes place in the country the dataset is valid for
2	The EF no later than two years beyond the time validity of the dataset	The technologies used in the EF study is included in the mix of technologies in the 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 no later than four years beyond the time validity of the datase	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 no later than six 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 is later than six months 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

5.4.3 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).

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

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 , Table(s) 10 and 11, provided.

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.

5.5 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
- Use an EF compliant dataset available in a free or commercial source.
- Use another EF compliant dataset considered to be a good proxy. In such case this information shall be included in the "limitation" section of the PEF report.
- Use an ILCD entry level compliant dataset. In such cases, this information shall be included in the "data gap" section of the PEF report.

5.6 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 Te_R, Ti_R, G_R 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 three toxicity-related ones). The calculation rules explained in chapter 5.4 shall be used.

5.7 Allocation rules

This chapter gives guidance on how to allocate between different co-products, where sub-division of the process is not possible. Where one of the co-products is electricity, 5.8 applies. If one of the co-products is heat, direct substitution with the company's own heat mix shall be used, with the related credit.

All relevant inputs and outputs from pulp- and paper mills, including by-products and residues that are subject to material- or energy recycling, need to be inventoried properly and shall be listed in the PEF report.

Table 12: Allocation rules

Process	**Allocation rule**	**Modelling instructions**
Upstream processes (if applicable, e.g. saw mill and forest operation)	Physical allocation	The dry mass of the different product outputs shall be used
Virgin pulping	Physical allocation	The dry mass of the different product outputs, e.g. tall oil, turpentine, shall be used
Recovered paper pulping	CFF formula applies	See section 5.10
Paper making	If possible, subdivision If not possible, direct substitution	See section 5.8

5.8 Electricity and heat 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). Examples of electricity and heat modelling are given at the end of this section.

The following electricity mix shall be used in hierarchical order:

I. A 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 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 a non-EU country. The residual grid mix characterises

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 a 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 characterised 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 registers, systems, or mechanisms).
3. Be as close as possible to the period to which the contractual instrument is applied.

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 5.7. 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 combine 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/ordomestic 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 (Nitrogen Oxides) removal and de-dusting.

Allocation rules:

Table 13: Allocation rules for electricity

Process	**Physical relationship**	**Modelling instructions**
Pulping	Mass	Mass shall be used to calculate the ratios of production between EU countries/regions when a product is produced in different locations.
Papermaking	Mass	Mass shall be used to calculate the ratios of production between EU countries/regions when a product is produced in different locations.

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 under the following conditions:

- 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.

- 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.
- 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.
- Sub-division 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 exports 30% of the electricity produced, emissions related to 70% of produced electricity should be accounted for in the PEF study.
- If not possible, direct substitution shall be used. The country-specific residual consumption electricity mix shall be used as a substitution[18].
- Sub-division is considered to be impossible when upstream impacts or direct emissions are closely related to the product itself.

Where sub-division is not possible, it must be justified and documented.

A similar rule applies to **heat production**:

If heat is produced in excess of the amount consumed within the defined system boundary and is provided to, for example, other heat consumers, this system can be seen as a multifunctionality

[18] For some countries, this case is a best case rather than a worst case

situation; as such, the system will provide two functions (e.g. product + heat). For this situation, companies performing a PEF study shall follow the following hierarchy:

- If possible, apply sub-division
- If not possible, direct substitution shall be used. The mill's own heat mix shall be used as a substitute, with the related credit.

Where sub-division is not possible, it must be justified and documented.

Examples of electricity modelling

A company sells 100% of its on-site produced electricity to the electricity grid (100 MWh) and buys from the electricity grid, through a supplier, the electricity it needs (50 MWh). This is a possible situation for companies that generate on-site electricity in Spain (at least).

In this example, on-site electricity production mix is:

- 80% combined cycle high efficiency cogeneration (natural gas)- 80 MWh
- 10% biogas- 10 MWh
- 10% biomass- 10 MWh

As a result, the company generates both renewables (20 GoO) and high-efficiency co-generation Guarantees of Origin (80 GoO) that can be sold to a third party or redeemed.

Case 1: Guarantees of Origin are sold to a third party

In this case:

- Electricity consumption (50 MWh): hierarchical order should be applied to choose the electricity mix:
    a) Supplier-specific electricity product
    b) Supplier-specific total electricity mix
    c) Country-specific residual grid mix

Electricity sold (100 MWh): Consider the system as a multifunctional situation (product + electricity) where all on-site produced electricity with related Guarantees of Origin sold (GoOs) is sold out.

Case 2: Guarantees of Origin are redeemed (example 1)

In this case, 20 renewable GoOs and 30 high efficiency co-generation GoOs are redeemed covering 100% of electricity consumption. Additionally, 50 high efficiency co-generation GoOs are sold to a third party. Consider the system as a multifunctional situation:

- Electricity consumption (50 MWh): Apply sub-division. Own electricity mix should be modelled. According to this example the following electricity production mix should be considered:

- 20% biogas engines- 10 MWh
- 20% biomass boilers- 10 MWh
- 60% combined cycle high efficiency co-generation (natural gas)- 30 MWh

- Electricity sold (50 MWh): Apply sub-division. Consider that the company sells 50 MWh (instead of 100 MWh), produced with combined cycle high efficiency co-generation (natural gas).

Case 3: Guarantees of Origin are redeemed (example 2)

In this case, 20 renewable GoOs are redeemed (covers 40% of electricity consumption) and 80 high efficiency co-generation GoOs are sold to a third party. Consider the system as a multifunctional situation:

- Electricity consumption (50 MWh): Combination of on-site electricity and grid electricity. For the on-site electricity apply subdivision. For the grid electricity apply the hierarchical order detailed above (case 1).
  - 20% biogas- 10 MWh
  - 20% biomass- 10 MWh
  - 60% electricity from the grid through a supplier- 30 MWh
- Electricity sold (80 MWh): Apply sub-division. Consider that the company sells 80 MWh (instead of 100 MWh) produced with combined cycle high efficiency co-generation (natural gas).

5.9 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/carbonisation 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[19] shall be modelled under sub-category 3 (including 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

[19] 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.

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.

For intermediate products only:

The biogenic carbon content at the factory gate (physical content and allocated content) shall be reported as 'additional technical information'.

3. Climate 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 land use change and land use. This sub-category includes biogenic carbon exchanges from deforestation, road construction or other soil activities (including 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 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 PAS 2050-1:2012 (BSI 2012) for horticultural products. PAS 2050:2011 (BSI 2011): Large emissions of Greenhouse Gasses (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 recognised 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) (Intergovernmental Panel on Climate Change). 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.

   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
- 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 origin 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 origin 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 origin 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.

The sum of the three sub-categories shall be reported. In addition, the sub-categories 'Climate change-biogenic' and 'Climate change-land use and land transformation' shall be reported separately.

The secondary datasets do not currently properly capture the impact of sustainable forest management practices. Therefore the results from any land use change category must be regarded with caution as they most likely result from worst case scenario impact, and are not representative.

Soil carbon storage shall be modelled, calculated and reported as additional environmental information: *No*.

5.10 Modelling of wastes and recycled content

As these PEFCRs are for intermediate products, the end-of-life-stage is not included in the system boundary. However, the output *paper for recycling* is used as an input in the production of pulp (recycled) when applying the Circular Footprint Formula (details are given in paragraph 6.1.1)

The from products used during the manufacturing, distribution, retail, the use stage or after use shall be included in the overall modelling of the life cycle of the product. Overall, this should be modelled and reported at the life cycle stage where the waste occurs. This section 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 a product 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.

For hotspot analysis A needs to be set to 1.

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

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

R_2: 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: 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 declared 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 declared unit) arising from the recycling process at EoL, including collection, sorting and transportation process.

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

E^*_v: specific emissions and resources consumed (per declared 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 declared 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 declared 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.

6. Life cycle stages

To be able to differentiate products and production sites and see development in the product environmental footprints, the majority of the processes in Intermediate paper product category rules have been defined to require company-specific datasets. In the following the key life cycle stages and data to be used have been explained.

6.1 Raw material acquisition and pre-processing

The main raw material acquisition process is related to forestry. Table 14 defines the approach to the modelling of harvesting and wood chips. The data on chemicals shall be used according to the mandatory company-specific datasets (section 5.4 and Appendix 5) and following the EF datasets introduced in the list of datasets for remodeling (Appendix 6).

Transport upstream and before the mill gate, and, if relevant, storage scenarios to be included in the study shall be specified together with the underlying assumptions.

The modelling of transport of input materials (e.g. wood, pulp, paper for recycling, chemical products) should be done using primary activity data (distance, weight and transport mode).

Table 14: Raw material acquisition and processing, transport

Process name	*Unit of measurement (output)*	*Default*				*UUID*	*Default DQR*	*Most relevant process [Y/N]*			
		R_1	*Amount per FU*	*Dataset*	*Dataset source*		*P*	*Ti R*	*G R*	*Te R*	
Softwood harvesting	*kg/tonne*	*0*	*Indicated in company-specific mandatory data*	*Ecoinvent EU-28+3 Company specific country of origin list*	http://ecoinvent.lca-data.com	0c4ebc79-741a-4643-9bac-d6d6a13c54d4	*2*	*2*	*2*	*2*	*Y*
Hardwood harvesting	*kg/tonne*	*0*	*Indicated in company-specific mandatory data*	*Ecoinvent EU-28+3 Company specific country of origin list*	http://ecoinvent.lca-data.com	683eafd2-7295-4dc6-867c-3bccb7cb4043	*2*	*2*	*2*	*2*	*Y*
Wood chips, softwood	*kg/tonne*	*0*	*Indicated in company-specific mandatory data*	*Ecoinvent EU-28+3 Company specific country of origin list*	http://ecoinvent.lca-data.com	e3b9fc32-da89-4e4d-ab33-a2265f49a8ad	*2*	*2*	*2*	*2*	*Y*
Wood chips, hardwood	*kg/tonne*	*0*	*Indicated in company-specific mandatory data*	*Ecoinvent EU-28+3 Company specific country of origin list*	http://ecoinvent.lca-data.com	dfdcb4ed-4df4-4789-bb6e-4363461d0268	*2*	*2*	*2*	*2*	*Y*
Articulated lorry transport, Euro 3	*kg/tonne*	*0*	*Indicated in company-specific mandatory data*	*Ecoinvent EU-28+3*	http://ecoinvent.lca-data.com	e505ea63-d833-47db-985f-b35ffe5e5c50	*2*	*2*	*2*	*2*	*Y*
Freight train,	*kg/tonne*	*0*	*Indicated in company-specific mandatory data*	*Ecoinvent EU-28+4*	http://ecoinvent.lca-data.com	da248653-790b-44bf-9e43-d4ae66cafbe1	*2*	*2*	*2*	*2*	*Y*
Transoceanic ship	*kg/tonne*	*0*	*Indicated in company-specific mandatory data*	*Ecoinvent EU-28+5*	http://ecoinvent.lca-data.com	6ca61112-1d5b-473c-abfa-4accc66a8a63	*2*	*2*	*2*	*2*	*Y*

6.2 Modelling recycled content

The following formula is used to model the recycled content:

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

In which:

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

E_V = specific emissions and resources consumed (per functional unit) arising from the acquisition and pre-processing of virgin paper (e.g. relevant upstream silvicultural, transport or wood processing activities, pulping without intermediate paper production (see Figure 2). If this information is not available see Annex 4 – Background data.

$E_{recycled}$ = specific emissions and resources consumed (per functional unit) arising from the recycling process of the recycled (or reused) paper, e.g. collection, sorting, transportation, deinking, pulping without intermediate paper production (see Figure 2).

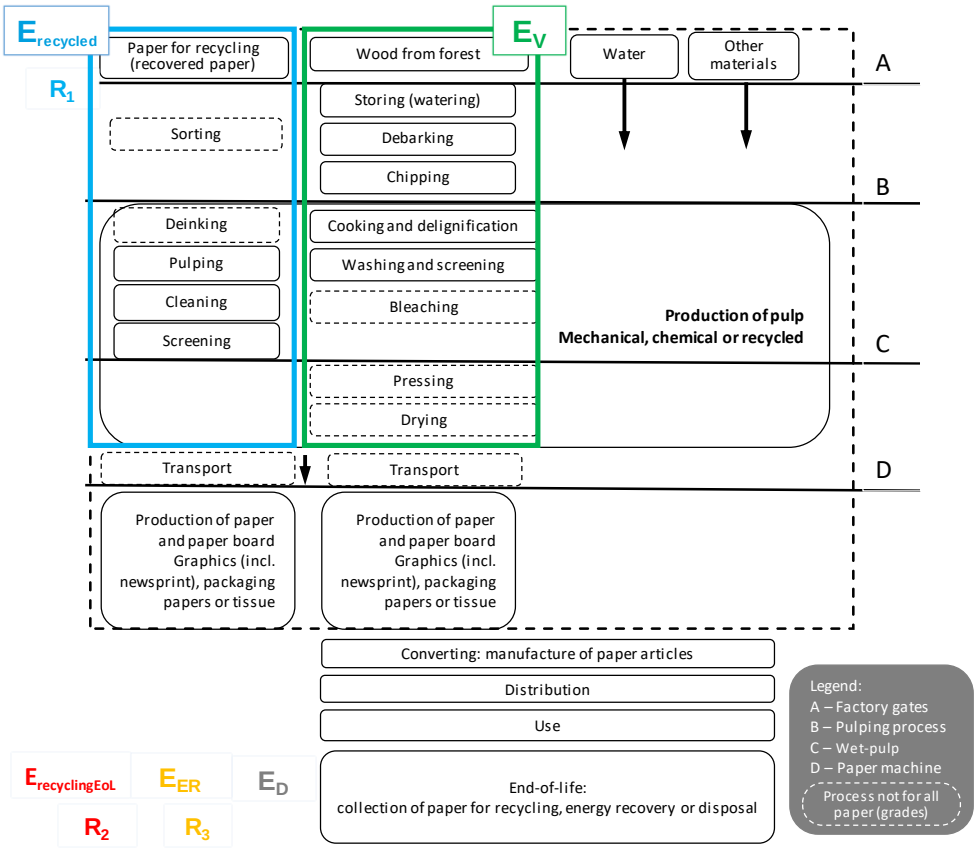
R_1 [dimensionless] = "recycled (or reused) content of the intermediate paper product", is the proportion of material (dry weight) in the intermediate product that has been recycled from a previous system (0=<R1<=1).

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

Qp: quality of the primary material, i.e. the quality of the virgin pulp.

Figure 4 shows how to draw the system boundaries for E_v, and $E_{recycled}$ for integrated and non-integrated mills.

Figure 4: System boundaries for for E_V, and $E_{recycled}$ for integrated and non-integrated mills



Company-specific recycled content values R1 shall be used for papermaking processes for graphic, packaging and tissue paper. $E_{recycled}$ shall be company-specific for intermediate paper products containing recycled fibres , i.e company specific values shall be used for re-pulping/de-inking processes. In case of missing data, EF datasets shall be used (EF datasets for pulp are being made available during 2019).

Converting trimmings

The use of trimmings in pulp and paper mills is a common practice. Data concerning the quantity of used trimmings shall be collected and divided into two main categories: trimmings produced by the reporting company and trimmings purchased from other companies.

The internally produced trimmings are not considered as recycled content and shall not be included in R1. They shall be sub-categorised by the manufacturing pulp or paper mill. The quantity of each sub-category shall be considered made up by the fibrous material mix used by the related pulp and paper mill and modelled according to the market pulps or paper for recycling used in the making.

If the trimmings are externally purchased, the related quantity shall be considered as pre-consumer paper for recycling (ref. ISO 14021:2016) and modelled accordingly as recycled content.

The transportation phase related to both trimmings categories shall be considered in the PEF calculations.

Allocation of burdens and credits

Parameter A is used to allocate burdens and credits between a supplier and the user of the recycled materials. This means that the higher the value on A, the more influence the recycling processes will have on the result. With a low value on A, there will be a benefit when high levels of paper are recovered.

The PEF profile shall be calculated and reported using A equal to 1.

Under additional technical information the results shall be reported for different applications with the following A values in table 15 below.

Table 15: A values

Application	***A value to be used***
Paper MATERIAL (undefined)	0.2
Graphic paper	0.5
Packaging - corrugated - pads/box/inserts	0.2
Packaging - paper sack	0.2
Packaging - paper bag	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
Tissue paper	0.5

The quality ratio: Qsin/Qp

One quality ratio is used in the Circular Footprint Formula for intermediate paper products, to take into account the quality of the ingoing recycled materials. This is set to 1 for intermediate paper products, as the quality of the pulp (fibres) at point of substitution (line D) is of the quality needed for the paper production (i.e. Ev=E*v). Qsin/Qp equal 1 shall be used when the recycling process considers fibre losses.

6.3 Manufacturing (production of pulp and intermediate paper)

The key processes within manufacture of pulp and paper are production of energy (electricity, heat and steam), production of pulp and production of paper. The processes may be integrated depending on the design and product being produced. The mandatory datasets in chapter 5.4 and Annex 4-III cover these processes and required data and its quality. The EF datasets to be used by IPP PEF applicant have been introduced the EF compliant datsets. The modeling for virgin pulp grades has been introduced in table 16.

Table 16: Pulp grades

Process name	Unit of measurement (output)	Default				UUID	Default DQR				Most relevant process [Y/N]
		R_1	Amount per FU	Dataset	Dataset source		P	Ti_R	G_R	Te_R	
Thermomechanical pulp	kg/tonne	0	Indicated in company-specific mandatory data	Ecoinvent EU-28+3 Company specific country of origin list	http://ecoinvent.lca-data.com	d3b333de-d6ad-498e-835e-1d9b7bb6cef1	2	2	2	2	Y
Sulphate pulp production	kg/tonne	0	Indicated in company-specific mandatory data	Ecoinvent RER Company specific country of origin list	http://ecoinvent.lca-data.com	914e32ca-076b-4df2-8128-e517bc3a8b38	2	2	2	2	Y
Unbleached kraft pulp, hardwood	kg/tonne	0	Indicated in company-specific mandatory data	Ecoinvent EU-28+3 Company specific country of origin list	http://ecoinvent.lca-data.com	9fcfa6ad-8752-46b7-84ae-46cb0ebcac39	2	2	2	2	Y
Chemi-thermomechanical pulp	kg/tonne	0	Indicated in company-specific mandatory data	Ecoinvent EU-28+3 Company specific country of origin list	http://ecoinvent.lca-data.com	8e79ed21-a4ea-4503-b87a-7ce602933901	2	2	2	2	Y
Unbleached kraft pulp, softwood	kg/tonne	0	Indicated in company-specific mandatory data	Ecoinvent EU-28+3 Company specific country of origin list	http://ecoinvent.lca-data.com	c0b0db5b-8e01-4aa5-890a-ec01730dc32e	2	2	2	2	Y

6.4 Distribution stage and end of life

As this is a PEFCR for intermediate paper products, the distribution stage and end-of-life stage are not included.

7. PEF results

7.1 Benchmark values

The various paper grades investigated in the PEF screening and supporting studies on intermediate paper have different applications and final functions. In these circumstances, an intermediate material may fulfil a number of different functions depending on the performance required of the final product.

In the screening study one tonne of material is defined as the declared unit for three sub-categories of the product category, which is a mix of different grades of papers of the respective sub-category (graphic papers, packaging papers, tissue).

Each sub-category is an average of intermediate paper with different functionalities, so that each sub-category does not have a specific functionality.

Customers for intermediate paper products are professional users and communication on intermediates is on a business-to-business basis only. Professional customers do not require a simplified comparison with a representative product as may be provided to the consumer of the finished product.

Customers for intermediate paper products will be provided with the full results of all impact categories that will allow them to further aggregate the environmental footprint of the paper with the other materials and articles they use to calculate the environmental footprint of the final product.

The screening study contains the average data for each impact category for each sub-category of intermediate paper product. For each sub-category the values quoted are the average of a number of different paper types which have different characteristics and functions. For instance, for packaging the data are a compilation of papers for corrugated, cartons, sacks and beverage cartons and even within these paper types the paper itself can have different functions. Thus the average values are not directly comparable to values obtained for the product environmental footprint of a specific intermediate paper product. Therefore these data for representative products may be seen as “reference values” and their main use is for assessing whether the results of product environmental footprint studies for intermediate paper products are credible and reasonable.

Chapter 3.2 of this PEFCRs document includes the following statement:

“These PEFCRs are for the product category intermediate paper product. The intermediate products are not subjects of benchmarks within the PEF."

Given the supplier/customer relationship for intermediate paper products described above, a requirement for the direct comparability of such products would be most unusual. If, however, such a comparison were to be requested, the following requirements for the grades of intermediate paper product to be compared would be seen as the minimum:

- the function of the final product in which the grades are used shall be identical
- the end of life scenario of the final product in which the grades are used shall be identical
- the grades themselves shall have equivalent technical characteristics which will be relevant to the functionality of the final product and these characteristics shall be specified in detail

- to enable this detailed specification, the grade of the intermediate product shall be stated using the three levels of the CPA code, completed by the exact grade of the category of paper. For example, the grade of a containerboard may be defined and characterised in the “European list of corrugated base papers”, (CEPI ContainerBoard 5th Edition, September 2015).

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

The following additional technical information shall be reported:

- The biogenic carbon content at the factory gate (physical content and allocated content). If derived from native forest, it shall be reported that the corresponding carbon emissions shall be modelled with the elementary flow '(land use change)’.
- The recycled content (R1).
- Results with application-specific A-values, if relevant (see chapter 6.2).

7.4 Additional environmental information

Biodiversity is considered as relevant for this PEFCR.

7.4.1 General rules

Sustainable production of bio-based materials shall be considered at all relevant stages of the life cycles of the PEFCRs. In the case of an intermediate paper product, this applies to sustainable forest management. The key impact category related to sustainable forest management which is missing from the PEFCR is biodiversity and shall be separately reported as additional information in the PEF report.

Additional environmental information shall be reported separately from the lifecycle-based Product Environmental Footprint (PEF) results, with all methods and assumptions clearly documented.

7.4.2 Additional rules

The following additional environmental information shall be included in the study:

On energy

- Total energy consumption by primary energy source, separately accounting for renewable energy use.

Renewable energy is not defined in the PEF Guide and the following definition and supporting information, based on relevant International Standards, are considered appropriate and are offered as a common approach to the concept:

"Renewable energy" is understood to be energy derived from sources that are non-exhaustible or capable of continuous replenishment. Renewable energy sources include, but are not limited to, solar and wind energy. They also include biomass and geothermal sources that are classed as renewable materials. Claims of renewability for energy sources associated with movements of water or use of biomass shall only be made if they are from sources that are managed in accordance with the principles of sustainable development.

The above is taken from 7.15.1 of EN ISO 14021:2001+A1.

"Renewable material" is defined in EN 16575:2014 as "material that is composed of biomass and that can be continually replenished".

To comply with these rules, claims of renewability for energy sources associated with biomass shall only be made if they are from sources that are managed in accordance with the principles of sustainable development. As a proxy the routes proposed on biodiversity below shall be used to assess accordance with the principles of sustainable development.

Note 1: Directive 2009/28/EC on the promotion of the use of energy from renewable sources includes in Article 2 definitions for "energy from renewable sources" and "biomass".

Note 2: For background processes, the way in which renewable energy is defined may follow the method used (e.g. Cumulative Energy Demand in Ecoinvent) of the datasets used, but shall then be reported separately.

On biodiversity and land use

Intermediate paper is made with both virgin and recycled fibres. While the usage of recycled fibres has no direct impact on biodiversity, there is a need to address this impact for consumption or production of virgin fibre. Within the EU single market, the EU Timber Regulation (EC nr 995/2010) applies to all timber and timber derivative products placed on the market.

There is currently no life cycle impact assessment methodology for biodiversity impacts of forest management to produce virgin fibre for intermediate paper products. Nevertheless, biodiversity impacts are an essential element of a PEF for intermediate paper products and shall be reported as described below.

Sustainable forest management practices have been developed to protect and maintain the ecosystem services in managed forests and plantations. The voluntary sustainable forest management certification schemes have been designed to address relevant practices that help protect ecosystem services such as biodiversity or those that are impacted by land use and their implementation has been verified through

an accredited, independent third party. These practices set a proxy for mitigating land use impacts and protecting biodiversity.

There are two routes for addressing biodiversity, the first of which is a proxy based on forest management systems and the second through more direct assessment. The applicants of an Intermediate Paper Product PEF using this version (October 2018), may use the forest management system route to communicate about sustainable land use in forests in their PEF results (see section 4).

Table 17: Two routes for addressing biodiversity and land use

Biodiversity and land use - Route 1	**Biodiversity - Route 2**
1. This option consists of reporting potentially two aspects: 1.1 Report the percentage of fibre content in the product that is third party, chain of custody certified under a forest management certification scheme that includes performance-based measurement criteria for maintaining or enhancing biodiversity and ecosystem services. 1.2 If appropriate, report also the remaining percentage of fibre that is third party verified as not coming from controversial sources, defined as follows: - illegally-harvested wood - wood harvested in violation of traditional and civil rights - wood harvested in forests with high environmental, biodiversity or landscape value is threatened by management activities - wood harvested in forests being converted to plantations or non-forest use - wood from forests in which genetically-modified trees are planted	Alternatively and specifically in the absence of forest management certification: Report the percentage of fibre content in the product that comes from forests that have been managed to maintain or enhance conditions for biodiversity, as demonstrated by regular monitoring and reporting of biodiversity levels and gains or losses.

In order to be fully transparent, report the percentage of virgin fibre content in the product which does not have a biodiversity verification mechanism, as described by either route 1 or 2 above. Percentages should add up to 100% of the total virgin fibre amount.

When communicating the percentage of certified fibre content (according to route 1, paragraph 1.1) it shall be clearly stated that this percentage figure cannot be used for any claim regarding the final converted paper product. For that purpose the actual certified fibre share of the supplied paper shall be used, in accordance with the respective chain of custody standard.

On other parameters (AOX and COD)

The PEF Guide requires that all known elementary flows are reported. Some parameters consisting of more than one elementary flow are not covered in default EF impact categories. The analytical measures adsorbable organic halogen compounds (AOX) and chemical oxygen demand (COD) are widely available in the pulp- and paper producing industry. COD emissions shall be reported. AOX emissions shall be

reported where bleaching processes are involved. The unit of measurement is kg/tonne for both COD and AOX.

On future Aspects

The following aspects are for future consideration in these PEFCRs, as there is currently no agreed methodology and data set. If a third party certification scheme exists, that includes performance-based measurement criteria related to these aspects, or if there is local data available, those may already be used. The choice of methodology should then be justified and thoroughly described.

On water

With regard to water, ecosystem services loss and minimum flow requirements of drainage basins, and freshwater biodiversity may be considered. Data for these aspects is not currently widespread but this could be reported once data is available.

Indirect Land Use Change

With regard to indirect land use change the following statement from EN 16760 "Bio-based products — Life Cycle Assessment" is considered to represent the current position:

Indirect land use change considers potential land transformations which are not caused directly by the operator but may be seen as a response from other operators. There is currently no agreed scientific method to characterise indirect land use change in coherence with the modelling principles of LCA. The consideration of potential effects of land transformation in the context of addressing GHG emissions may only be treated as qualitative information and be addressed during the interpretation phase.

This position may be reviewed in the light of future developments.

- The following further chapters of EN 16760 may also be of use in deriving principles or requirements to incorporate into the PEFCRs:
- 5.4.2 Land use,
- 5.6.2 Modelling forestry systems
- 6.2.2 Land use, including 6.2.2.2 Land use related to Natural Environment / Ecosystem Quality.

The background information concerning the rationale for the selection of the additional environmental information is provided in Annex 4-II to the PEFCRs.

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 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/reports 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 Integrated Circuits (IC) 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[20];
- all the newly created datasets shall be checked regarding 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 situations 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

[20] Available at: http://eplca.jrc.ec.europa.eu/LCDN/developer.xhtml

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 Circular Footprint Formulas (CFF) parameters. For example, if there are five processes and each one of them includes five activity data, five secondary datasets and 10 CFF parameters, then the verifier(s) has to check at least four out of five processes (70%) and, for each process, (s)he shall check at least four activity data (70% of the total amount of activity data), four secondary datasets (70% of the total amount of secondary datasets), and seven CFF parameters (70% of the total amount of CFF parameters), i.e. 70% of each set of data that could be subject to a 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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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	Normalisation factor	Normalisation factor per person	Impact assessment 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	
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

WITHOUT TOX CATEGORIES	**Final weighting factors** C scaled to 100
Climate change	**22.19**
Ozone depletion	**6.75**
Particulate matter	**9.54**
Ionizing radiation, human health	**5.37**
Photochemical ozone formation, human health	**5.1**
Acidification	**6.64**
Eutrophication, terrestrial	**3.91**
Eutrophication, freshwater	**2.95**
Eutrophication, marine	**3.12**
Land use	**8.42**
Water use	**9.03**
Resource use, minerals and metals	**8.08**
Resource use, fossils	**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 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 criterion and total) of the study			

ANNEX 3 - Critical review report of the PEFCR

Product Environmental Footprint Category Rules (PEFCR)
for "Intermediate Paper Product"

CRITICAL REVIEW REPORT

Review Panel

Name of the member	***Affiliation***	***Role***
Ugo Pretato	Studio Fieschi & soci Srl	Chair of the review panel
Tiina Pajula	VTT	Member of the review panel
Frank Wellenreuther	IFEU	Member of the review panel

Review Scope

The task of the review panel was to assess the compliance of the PEFCR document against the following requirements:

- The PEFCR has been developed in accordance with the requirement provided in the PEFCR Guidance 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 and the most recent approved version of the PEF Guide,
- The benchmark(s) is(are) correctly defined, where applicable
- 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.

Review Process

The review has been performed in two distinct rounds.

The first round was carried out in March 2017 on a previous version of the PEFCR document and against the requirements of the PEFCR guidance version 5.2. The panel made several comments, most of which were satisfactorily solved by the Technical Secretariat in an updated PEFCR version.

The second round was performed between August and October 2018 on a revised PEFCR version. This version applies the requirements of the PEFCR guidance 6.3 and the results of the remodelling carried out on the representative products during 2017 and 2018. The panel made other comments, which were addressed by the Technical Secretariat in the Final PEFCR version.

The full list of comments made in the two review rounds and the related responses and corrective actions from the Technical Secretariat are documented in the enclosed spreadsheet "PEFCR Paper_Critical Review Comments_1st and 2nd Round_Final".

The responses are overall satisfactory, however the reviewers recommend further improvements in the presentation of the life cycle inventory templates (Annex 4-III to the PEFCR) in order to increase transparency and completeness in data collection (see comment 27 in the attached spreadsheet).

Review Statement

We hereby confirm that, following the PEFCR examination, we have not established any relevant deviations by the above-referenced PEFCR document with respect to the requirements identified in the review scope.

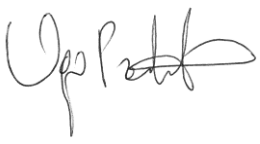
We confirm we have been independent in our roles as reviewers, we have not been involved in the preparation of the PEFCR or related supporting studies and we have no conflicts of interest regarding this review.

The PEFCR validity is set until 31-12-2020.

We appreciate the efforts undertaken by the Technical Secretariat in developing this PEFCR and the effective collaboration during the review.

Yours sincerely,

12 October 2018

Ugo Pretato	Tiina Pajula	Frank Wellenreuther
		

ANNEX 4 - Other Annexes

Annex 4-I – Background information on bark content and density of wood

Data on wood consumption can be given by the suppliers to the pulp and paper producers in different forms. The variables can be as follows:

- amount given as mass (kg) or volume (m3)

- amount with (over) or without (under) bark

Actual data for wood conversion should be used. If the data is not available, the following coefficients shall be used for conversion.

Table A4-1: Average conversion factors for round wood assortments from over bark to under bark. Multiplying the log volume or weight with (over) bark by the factor gives log volume or weight without (under) bark.

Round wood assortment	**Factor**
Pine logs	0.880
Spruce logs	0.898
Birch logs	0.885
Pine pulpwood	0.863
Spruce pulpwood	0.864
Birch pulpwood	0.862
All assortments, average	0.875

Data source: Finnish Statistical Yearbook of Forestry 2014:,
http://www.metla.fi/metinfo/tilasto/julkaisut/vsk/2013/vsk13_symbolit_kartat.pdf

Table A4-2: Dry-fresh density values for the most important tree species. The dry-fresh density of wood is the absolute dry mass of wood per the corresponding fresh volume.

Tree species	**Dry-fresh density**	
	kg/m3	*Data sources*
Pine	420	1
Spruce	380	1
Birch	498	1
Aspen	400	1
Alder	420	1
Oak	600	2
Beech	600	3
Poplar	455	4

Data sources:

1) Finnish Statistical Yearbook of Forestry 2014, http://www.metla.fi/metinfo/tilasto/julkaisut/vsk/2013/vsk13_symbolit_kartat.pdf

2) Tapion taskukirja, Metsätalouden kehittämiskeskus Tapio 2008

3) Alakangas, Eija. Properties of fuels used in Finland. Espoo 2000. Technical Research Centre of Finland, VTT Research Notes 2045. 172 p. app.17 p.

4) http://www.wood-database.com/lumber-identification/hardwoods/poplar/

Annex 4-II – Background information on additional technical and environmental information

Biogenic carbon in recycled paper

In the screening study, the emissions (and uptake of biogenic carbon in the wood used for virgin paper production) are allocated to recycled paper with the default PEF recycling formula applied cradle to gate and the physical biogenic carbon content provided according to the BoM.

The PEF recycling End of Life EoL formula, when used cradle to gate (with a credit for saving disposal upstream) has the effect, if recycled material input is used, that removals and emissions of biogenic carbon flows are imbalanced. This is due to the fact that for recycled materials the removal is steered by the part-virgin material that is brought into the formula with the 50/50 effect. While the result was close for graphic (1247 kg CO2 content vs 1237) and tissue (1530 kg CO2 content vs 1509 for Toipa and 1601 kg CO2 content vs 1509 for WS) with a lower recycled content (graphic 27% and tissue 25% recycled pulp content), it was far away for packaging paper (1642 kg CO2 content vs 930) with a high recycled content (78%).

This means that when the results are interpreted attention must be paid to these imbalances that will vary depending on the recycled content.

Therefore, the physical property biogenic carbon content at the factory gate (expressed as kg CO2) of paper shall always be reported as meta data.

Annex 4-III – Mandatory company-specific datasets

Table A4- 1: Pulping

Requirements for data collection purposes			Requirements for modelling purposes								
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**	**Default Data quality parameters**					**Remarks**
Inputs						**TiR**	**TeR**	**GR**	**P**	**DQR**	
Raw material											
Softwood logs	Species list, as bone dry weight (bone dry weight = 45% of transported total weight)	kg/t	Softwood forestry, at forest, sustainable managed, per kg wood	https://lcdn.quantis-software.com/PEF/	0c4ebc79-741a-4643-9bac-d6d6a13c54d4	2,01	2,01	2,01	2,01	2,01	EU-28+3
			Softwood forestry non-sustainable managed at forest per kg wood	https://lcdn.quantis-software.com/PEF/	cdd64c25-3876-44fc-8ba2-27c6c85a0cd1	2,0	2,0	2,9	2,0	2,2	EU-28+3
Hardwood logs	Species list, as bone dry weight (bone dry weight = 45% of transported total weight)	kg/t	Hardwood forestry, at forest, sustainable managed, per kg wood	https://lcdn.quantis-software.com/PEF/	683eafd2-7295-4dc6-867c-3bccb7cb4043	2,0	2,0	2,0	2,0	2,0	EU-28+3
			Hardwood forestry non-sustainable managed at forest per kg wood	https://lcdn.quantis-software.com/PEF/	b16ddd1c-07cc-4632-9020-9dcffa6bd5a7	2,0	2,0	2,9	2,0	2,2	EU-28+3
Woodchips, softwood	Species list, as bone dry weight	kg/t	Wood chips, softwood production mix at plant per kg wood	https://lcdn.quantis-software.com/PEF/	e3b9fc32-da89-4e4d-ab33-a2265f49a8ad	2,0	2,0	2,0	2,0	2,0	EU-28+3
Woodchips, hardwood	Species list, as bone dry weight	kg/t	Wood chips, hardwood, at plant, production mix, per kg wood	https://lcdn.quantis-software.com/PEF/	dfdcb4ed-4df4-4789-bb6e-4363461d0268	2,0	2,0	2,0	2,0	2,0	EU-28+3
Recovered paper			Data gap								
Transport of raw materials											
Truck	Average	km/t	Articulated lorry transport, Euro 5, Total weight >32 t (without fuel) diesel driven, Euro 5, cargo consumption mix, to consumer more than 32t gross weight / 24,7t payload capacity	http://lcdn.thinkstep.com/Node/	42e1c0c4-2d0d-4ae8-9cb4-5ea5a91bc41a	1	1	1	2	1	EU-28+3
Train	Average	km/t	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	http://lcdn.thinkstep.com/Node/	02e87631-6d70-48ce-affd-1975dc36f5be	1	1	1	2	1	EU-28+3
Ship	Average	km/t	Transoceanic ship, containers heavy fuel oil driven, cargo consumption mix, to consumer 27.500 dwt payload capacity, ocean going	http://lcdn.thinkstep.com/Node/	6ca61112-1d5b-473c-abfa-4accc66a8a63	1	2	2	2	1	GLO
Energy											
Bought electricity	Annual average	GJ/t	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	SELECT COUNTRY-SPECIFIC FROM LIST BELOW*						
			Own mix								

Bought steam/heat	annual average	GJ/t	Process steam from biomass (solid) 90%, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 90% efficiency	http://lcdn.thinkstep.com/Node/	6f053940-bbe1-44e9-8a74-b8a2e5a6f91e	1	2	2	2	1	EU-27
			Process steam from hard coal, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 90% efficiency	http://lcdn.thinkstep.com/Node/	e0704c47-dde7-43fd-b4cd-3d065a7525a5	1	1	1	2	1	EU-28+3
			Thermal energy from heavy fuel oil (HFO), production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	602bba9c-3262-4555-a0a4-7b9f6bc50f82	1	1	1	2	1	EU-28+3
			Thermal energy from light fuel oil (LFO), production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	e7510ad9-4bfa-4113-94b0-426e5f430c98	1	1	1	2	1	EU-28+3
			Thermal energy from lignite, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	b2e8b5a9-ac00-4d3a-a180-e52fe73e29fd	1	1	1	2	1	EU-28+3
			Thermal energy from LPG, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	ade98dea-0c74-4ebb-94ef-f9686eb0ddc5	1	1	1	2	1	EU-28+3
			Thermal energy from natural gas, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	81675341-f1af-44b0-81d3-d108caef5c28	1	1	1	2	1	EU-28+3
External fuels											
Natural gas	Annual average	GJ/t	Natural gas mix, consumption mix, to consumer, technology mix, medium pressure level (< 1 bar)	http://lcdn.thinkstep.com/Node/	SELECT COUNTRY-SPECIFIC	n/a	n/a	n/a	n/a	n/a	
Heavy fuel oil	Annual average	GJ/t	Heavy fuel oil at refinery, production mix, at refinery, from crude oil, 1 wt.% sulphur	http://lcdn.thinkstep.com/Node/	SELECT COUNTRY-SPECIFIC	n/a	n/a	n/a	n/a	n/a	
Light fuel oil	Annual average	GJ/t	Light fuel oil at refinery from crude oil production mix, at refinery 0.1 wt.% sulphur	http://lcdn.thinkstep.com/Node/	386821c2-309d-4019-8972-04a072082ef5	1	1	1	2	1	EU-28+3
Diesel oil	Annual average	GJ/t	Diesel mix at refinery, production mix, at refinery, from crude oil, 10 ppm sulphur, 7.23 wt.% bio components - EU-28+3	http://lcdn.thinkstep.com/Node/	da248653-790b-44bf-9e43-d4ae66cafbe1	1	1	1	2	1	EU-28+3
LPG	Annual average	GJ/t	Liquefied Petroleum Gas (LPG) (70% propane, 30% butane) from crude oil production mix, at refinery mix of 70% propane and 30% butane	http://lcdn.thinkstep.com/Node/	5b1851f1-02f1-4679-b48a-b926d1da7998	1	1	1	2	1	EU-28+3
Hard coal (Coke)	Annual average	GJ/t	Hard coal mix technology mix consumption mix, to consumer	http://lcdn.thinkstep.com/Node/	SELECT COUNTRY-SPECIFIC	n/a	n/a	n/a	n/a	n/a	
Brown coal (Lignite)	Annual average	GJ/t	Lignite mix technology mix consumption mix, to consumer	http://lcdn.thinkstep.com/Node/	e31b6d83-6cee-40d4-8d59-d458162fcdb8	n/a	n/a	n/a	n/a	n/a	EU-27
Brown coal briquettes	Annual average	GJ/t									
Peat	Annual average	GJ/t	Peat mining technology mix production mix, at plant	http://lcdn.thinkstep.com/Node/	1a53cbb8-bb56-4151-be72-9943d6c01ac7	n/a	n/a	n/a	n/a	n/a	FI

External supply: Biofuel - Biogas	Annual average	GJ/t	Biogas for bioenergy technology mix consumption mix, to consumer	http://lcdn.thinkstep.com/Node/	c6b2258a-f15b-4e32-80fe-aab92096ba05	n/a	n/a	n/a	n/a	n/a	DE
External supply: Biofuel - Bark	Annual average, wet mass	GJ/t									
External supply: Biofuel - Black liquor	Annual average	GJ/t									
External supply: Biofuel - Sludge	Annual average	GJ/t									
Enternal supply: Biofuel - Scrap wood	Annual average, wet mass	GJ/t	Data gap								
Water												
Ground water	Annual average	m3/t	From nature…								
Surface water	Annual average	m3/t	From nature…								
Municipal water supply	Annual average	m3/t	Tap water technology mix at user per kg water	https://lcdn.quantis-software.com/PEF/	212b8494-a769-4c2e-8d82-9a6ef61baad7	2,42	2,038	2,025	2,02	2,126	EU-28+3
Chemicals												
Sulphuric acid (H2SO4)		kg/t	Sulphuric acid production technology mix production mix, at plant 100% active substance	http://ecoinvent.lca-data.com/	eb6abe54-7e5d-4ee4-b3f1-08c1e220ef94	1	1	2,0	2	2	RER
Sodium hydroxide (NaOH)		kg/t	Sodium hydroxide production technology mix production mix, at plant 100% active substance	http://ecoinvent.lca-data.com/	2ba49ead-4683-4671-bded-d52b80215e9e	2	1	1	2	2	RER
Oxygen (O2)		kg/t	Oxygen production technology mix production mix, at plant 100% active substance	http://ecoinvent.lca-data.com/	b12a9897-9ebb-41e9-8c3b-18db23ecd99e	1	1	1	2	1	RER
Hydrogen peroxide (H2O2)		kg/t	Hydrogen peroxide, 100% production technology mix production mix, at plant 100% active substance	http://ecoinvent.lca-data.com/	edaebb9c-73a9-4e3a-a682-4fbb75b7a1d9	2	2	1	2	2	RER
Sodium chlorate (NaClO3)		kg/t	Sodium chlorate production technology mix production mix, at plant 100% active substance	http://ecoinvent.lca-data.com/	0535e645-967e-4240-9388-f5fec4ff9a3c	1	1	1	2	1	GLO
Calcium oxide (CaO)		kg/t	Lime production technology mix production mix, at plant 100% active substance	http://ecoinvent.lca-data.com/	64e2bd59-5f61-4eb3-bfd7-d19c3aec60b5	2	1	1	2	2	RER
Chlorine Dioxide (ClO2)		kg/t	chlorine dioxide production technology mix production mix, at plant 100% active substance	http://ecoinvent.lca-data.com/	de14c90d-1ea3-4561-98fb-8e25186fb9ad	2	2	1	2	2	GLO
Sodium bisulfite (NaHSO3)		kg/t									

Table A4- 2: Paper making

Requirements for data collection purposes			Requirements for modelling purposes								
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**	**Default Data quality parameters**					**Remarks**
Inputs						**TiR**	**TeR**	**GR**	**P**	**DQR**	
Pulps											
Internally produced pulps											
Pulp 1, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Pulp 2, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Pulp 3, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Pulp 4, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Purchased pulps											
Pulp 1, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Pulp 2, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Pulp 3, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Pulp 4, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Pulp 5, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Pulp 6, specify	as bone dry weight	kg/t	n/a	n/a		na	na	na	na	na	Non EF-compliant
Energy											
Bought electricity	annual average	GJ/t	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	SELECT COUNTRY-SPECIFIC FROM LIST BELOW*						
Bought steam/heat	annual average	GJ/t	Process steam from biomass (solid) 90%, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 90% efficiency	http://lcdn.thinkstep.com/Node/	6f053940-bbe1-44e9-8a74-b8a2e5a6f91e	1	2	2	2	1	EU-27
			Process steam from hard coal, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 90% efficiency	http://lcdn.thinkstep.com/Node/	e0704c47-dde7-43fd-b4cd-3d065a7525a5	1	1	1	2	1	EU-28+3
			Thermal energy from heavy fuel oil (HFO), production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	602bba9c-3262-4555-a0a4-7b9f6bc50f82	1	1	1	2	1	EU-28+3
			Thermal energy from light fuel oil (LFO), production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	e7510ad9-4bfa-4113-94b0-426e5f430c98	1	1	1	2	1	EU-28+3
			Thermal energy from lignite, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	b2e8b5a9-ac00-4d3a-a180-e52fe73e29fd	1	1	1	2	1	EU-28+3
			Thermal energy from LPG, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	ade98dea-0c74-4ebb-94ef-f9686eb0ddc5	1	1	1	2	1	EU-28+3
			Thermal energy from natural gas, production mix, at heat plant, technology mix regarding firing and flue gas cleaning, MJ, 100% efficiency	http://lcdn.thinkstep.com/Node/	81675341-f1af-44b0-81d3-d108caef5c28	1	1	1	2	1	EU-28+3
External fuels											
Natural gas	Annual average	GJ/t	Natural gas mix, consumption mix, to consumer, technology mix, medium pressure level (< 1 bar)	http://lcdn.thinkstep.com/Node/	SELECT COUNTRY-SPECIFIC	n/a	n/a	n/a	n/a	n/a	
Heavy fuel oil	Annual average	GJ/t	Heavy fuel oil at refinery, production mix, at refinery, from crude oil, 1 wt.% sulphur	http://lcdn.thinkstep.com/Node/	SELECT COUNTRY-SPECIFIC	n/a	n/a	n/a	n/a	n/a	

Light fuel oil	Annual average	GJ/t	Light fuel oil at refinery from crude oil production mix, at refinery 0.1 wt.% sulphur	http://lcdn.thinkstep.com/Node/	386821c2-309d-4019-8972-04a072082ef5	1	1	1	2	1	EU-28+3
Diesel oil	Annual average	GJ/t	Diesel mix at refinery, production mix, at refinery, from crude oil, 10 ppm sulphur, 7.23 wt.% bio components - EU-28+3	http://lcdn.thinkstep.com/Node/	da248653-790b-44bf-9e43-d4ae66cafbe1	1	1	1	2	1	EU-28+3
LPG	Annual average	GJ/t	Liquefied Petroleum Gas (LPG) (70% propane, 30% butane) from crude oil production mix, at refinery mix of 70% propane and 30% butane	http://lcdn.thinkstep.com/Node/	5b1851f1-02f1-4679-b48a-b926d1da7998	1	1	1	2	1	EU-28+3
Hard coal (Coke)	Annual average	GJ/t	Hard coal mix technology mix consumption mix, to consumer	http://lcdn.thinkstep.com/Node/	SELECT COUNTRY-SPECIFIC	n/a	n/a	n/a	n/a	n/a	
Brown coal (Lignite)	Annual average	GJ/t	Lignite mix technology mix consumption mix, to consumer	http://lcdn.thinkstep.com/Node/	e31b6d83-6cee-40d4-8d59-d458162fcdb8	n/a	n/a	n/a	n/a	n/a	EU-27
Brown coal briquettes	Annual average	GJ/t									
Peat	Annual average	GJ/t	Peat mining technology mix production mix, at plant	http://lcdn.thinkstep.com/Node/	1a53cbb8-bb56-4151-be72-9943d6c01ac7	n/a	n/a	n/a	n/a	n/a	FI
External supply: Biofuel - Biogas	Annual average	GJ/t	Biogas for bioenergy technology mix consumption mix, to consumer	http://lcdn.thinkstep.com/Node/	c6b2258a-f15b-4e32-80fe-aab92096ba05	n/a	n/a	n/a	n/a	n/a	DE
External supply: Biofuel - Bark	Annual average, wet mass	GJ/t									
Enternal supply: Biofuel - Scrap wood	Annual average, wet mass	GJ/t	Data gap								
Water											
Ground water	Annual average	m3/t									
Surface water	Annual average	m3/t									
Municipal water supply	Annual average	m3/t	Tap water; technology mix; at user; per kg water	https://lcdn.quantis-software.com/PEF/	212b8494-a769-4c2e-8d82-9a6ef61baad7	2,4	2,0	2,0	2,0	2,1	EU-28+3
Chemicals											
Starch (maize)		kg/t (dry mass)	Maize starch, dried; , at plant, from wet milling, production mix,	http://lcdn.blonkconsultants.nl	3e59ff2f-0021-4568-a850-33ca7a4cad58	2,2	1,5	2,0	2,3	2,0	GLO
Starch (potato)		kg/t (dry mass)	Potato starch dried; , at plant, from wet milling, production mix, - EU+28	http://lcdn.blonkconsultants.nl	8524af42-2fbd-46fc-bb41-45c832ed6985	2,0	1,5	1,8	2,3	1,9	EU+28
Starch (cationic)		kg/t (dry mass)									
synthetic binders (latex)		kg/t (dry mass)	Latex production, production mix, at plant, technology mix, 100% active substance - GLO	http://ecoinvent.lca-data.com/	64c0542e-8d8c-4eb8-8b47-031a287010f4	1	2	2	2	2	GLO
GCC		kg/t (dry mass)	Ground calcium carbonate production, production mix, at plant, technology mix, 100% active substance - RER	http://ecoinvent.lca-data.com/	8a229880-bcf4-46ba-aa92-ad538a1ecd76	1	2	2	2	2	RER
PCC (purchased)		kg/t (dry mass)	Precipitated calcium carbonate production, production mix, at plant, technology mix, 100% active substance - RER	http://ecoinvent.lca-data.com/	b269778a-c602-4b95-9bee-94e89eba27e7	1	2	2	2	2	RER
PCC (produced on site)		kg/t (dry mass)									
Clay		kg/t (dry mass)	kaolin production, production mix, at plant, technology mix, 100% active substance - RER	http://ecoinvent.lca-data.com/	f57ebfdb-d033-4e45-aa13-25bbd71bb3e3	1	1	1	2	2	RER
Wet strength agent		kg/t (dry mass)									
Dry strength agent		kg/t (dry mass)									
Transportation of raw materials											
Truck	average	km/t	Articulated lorry transport, Total weight >32 t, mix Euro 0-5 diesel driven, Euro 0 - 5 mix, cargo consumption mix, to consumer more than 32t gross weight /	http://lcdn.thinkstep.com/Node/	328984f2-4a54-419a-b88a-5426a75d0b27	1	1	3	2	1	EU-28+3

			24,7t payload capacity										
Train	average	km/t	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	http://lcdn.thinkstep.com/Node/	02e87631-6d70-48ce-affd-1975dc36f5be	1,0	1,0	1,0	2,0	1,3	EU-28+3		
Barge	average	km/t	Barge technology mix, diesel driven, cargo consumption mix, to consumer 1500 t payload capacity	http://lcdn.thinkstep.com/Node/	4cfacea0-cce4-4b4d-bd2b-223c8d4c90ae	1,0	1,0	1,0	2,0	1,3	EU-28+3		
Transoceanic ship	average	km/t	Transoceanic ship, containers heavy fuel oil driven, cargo consumption mix, to consumer 27.500 dwt payload capacity, ocean going	http://lcdn.thinkstep.com/Node/	6ca61112-1d5b-473c-abfa-4accc66a8a63	1,0	2,0	2,0	2,0	1,8	GLO		

	Default dataset to be used	**Dataset source (i.e. node)**	**UUID**	**Default Data quality parameters**					
Country				**TiR**	**TeR**	**GR**	**P**	**DQR**	Remarks
EE	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	00eff4b4-02e1-49b8-9a33-3339d1ab861b	1	1	1	2	1	LCI result
GB	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	0187f09d-4953-4555-b9af-25a19302b250	1	1	1	2	1	LCI result
BE	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	06c93a58-b520-459f-a722-066e5274ffd8	1	1	1	2	1	LCI result
IT	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	0c868c55-0736-4f79-a6a6-0f5e75a4d753	1	1	1	2	1	LCI result
CZ	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	17415189-817a-49e6-b7ad-166a4d9f9d2b	1	1	1	2	1	LCI result
SK	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	20ae37ad-0352-4b73-a532-084320a7abf2	1	1	1	2	1	LCI result
LV	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	265c7e3c-1424-4365-aac9-b7d0beb38a15	1	1	1	2	1	LCI result
PT	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	36c60ab2-6379-40e2-bd0e-fb1d625a2040	1	1	1	2	1	LCI result
ES	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	370bf89e-7666-491c-8bfc-ca3073532197	1	1	1	2	1	LCI result
SI	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	3f7fd488-e6f5-4d51-974f-cdb06a40b56a	1	1	1	2	1	LCI result
MT	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	548cad25-f3fa-4560-9171-65813f350f81	1	1	1	2	1	LCI result
CH	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	5f4faa5a-e752-451a-83ec-6dca8b53c09d	1	1	1	2	1	LCI result
NL	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	60f24067-69a8-4512-b4d7-d98b73018c7c	1	1	1	2	1	LCI result
HU	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	66fa72b5-d095-4fe7-8a42-c8809f0da392	1	1	1	2	1	LCI result
IE	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	6f5be488-7c90-4717-8a24-0a8d2d8a89b8	1	1	1	2	1	LCI result
RO	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	7a116373-93ed-48fc-a7b7-c072c35d068a	1	1	1	2	1	LCI result
DE	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	8958a539-4dca-4ae5-88e3-4ada4d9bc161	1	1	1	2	1	LCI result
EU-28+3	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	8fb75312-431d-42f6-9a4f-22fa886f7fe3	1	1	1	2	1	LCI result
EU-28+3	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	9a32d658-3ce8-41c9-9557-77f940e8f60d	1	1	1	2	1	Partly terminated system
FI	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	a1c1216b-7fc1-4847-be8f-bb8a13ad8ab8	1	1	1	2	1	LCI result
NO	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	a2d2742b-cb41-4920-a3c4-5d9f0cd95d0f	1	1	1	2	1	LCI result
BG	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	a4c035b8-d1fb-46cf-8af9-dfcae752bb4b	1	1	1	2	1	LCI result
IS	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	b580d794-9cb9-422b-867c-a260b2621d0e	1	1	1	2	1	LCI result
CY	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	bc4d5cac-f90d-427f-81f3-97080c766d58	1	1	1	2	1	LCI result
GR	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	bf18efa4-99a6-4e3f-bcd8-04521709f96f	1	1	1	2	1	LCI result
RO	Residual grid mix AC, technology mix consumption	http://lcdn.thinkstep.c	bf627a1b-c815-4d1c-b27b-	1	1	1	2	1	Partly

	mix, to consumer 1kV - 60kV	om/Node/	12f65744cded						terminated system
AT	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	c3ac762a-0796-4b99-a470-886214c20d36	1	1	1	2	1	LCI result
SE	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	c3e80442-1e8a-42c9-bfa1-d64952c436c5	1	1	1	2	1	LCI result
LU	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	d11077b7-7644-4d4c-8cef-9f6f0ef17510	1	1	1	2	1	LCI result
FR	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	d18f308a-29ce-48a8-86c5-370f719d1efe	1	1	1	2	1	LCI result
HR	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	d30b7bd9-61d8-4638-bd0f-321362f6d21d	1	1	1	2	1	LCI result
LT	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	e473fae3-e605-4951-8d2a-a43ab65cb9e2	1	1	1	2	1	LCI result
PL	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	ef86c304-0378-4987-93e2-327e4996409a	1	1	1	2	1	LCI result
DK	Residual grid mix AC, technology mix consumption mix, to consumer 1kV - 60kV	http://lcdn.thinkstep.com/Node/	fa66ef29-4abb-4852-a36d-9eb44ee2954b	1	1	1	2	1	LCI result

Outputs				
Emissions to air	***Elementary flow***	***Frequency of measurement***	***Default measurement method***	***Remarks***
Particulate matter (dust), total	kg/t			The requirements for the direct elementary flow data collection for all three processes have been described in national regulations. The national regulation in frequency of measurement and default measurement method shall be used.
Particulates, < 2.5um	kg/t			See above
Particulates, > 2.5um and < 10um	kg/t			See above
Particulates > 10um	kg/t			See above
CO2 fossil	kg/t			See above
CO2 biomass	kg/t			See above
NOx (as NO2)	kg/t			See above
SOx (as SO2)	kg/t			See above
TRS (H2S as S)	kg/t			See above
Emissions to water				
Cooling water	m3/t			See above
Process water after treatment	m3/t			See above
COD	kg/t			See above
BOD 5	kg/t			See above
Suspended solids (TSS)	kg/t			See above
Total Nitrogen	kg/t			See above
Total Phosphorus	kg/t			See above
AOX	kg/t			See above
Residues, wet mass				
Calcium Carbonate	Transport weight + % dry content			km and way of disposal

Inorganic ashes	Transport weight + % dry content	km and way of disposal
Inorganig sludges	Transport weight + % dry content	km and way of disposal
Organic sludges	Transport weight + % dry content	km and way of disposal
Rejects from recovered paper	Transport weight + % dry content	km and way of disposal
Green liquor dregs	Transport weight + % dry content	km and way of disposal
Lubricants and oil	Transport weight + % dry content	km and way of disposal