



BIOECONOMY
Unit



International Confederation of Paper
and Board Converters in Europe

Challenges of applying the PEFCR for Intermediate Paper Products

Summary report prepared for Eurosac, FEFCO and
Pro Carton, co-operating under the banner of CITPA

Prepared by Michael Sturges, Senior Consultant

Reviewed by Katarina Lorentzon, Senior Project
Manager

April 2021

Challenges of applying the PEFCR for Intermediate Paper Products

Summary report prepared for Eurosac, FEFCO and Pro Carton, co-operating under the banner of CITPA

Prepared by Michael Sturges, Senior Consultant
Reviewed by Katarina Lorentzon, Senior Project
Manager
April 2021

Distribution restricted to: CITPA

Contents

Contents	2
1 Background	3
2 Overview of the main challenges	4
3 Complexity of impact assessment	6
The nature of the challenge.....	6
Recommendations	7
4 The climate change impact category	9
The nature of the challenge.....	9
Recommendations	10
5 Ambiguities regarding company specific data requirements	12
The nature of the challenge.....	12
Recommendations	16
6 Secondary datasets	17
The nature of the challenge.....	17
Recommendations	23
7 Conclusions	24

1 Background

Within the paper packaging sector, CCB/FEFCO, Pro Carton, and CEPI-Eurokraft/Eurosac (hereby referred to as “the associations”) have for many years compiled a gate-to-gate life cycle inventory for their respective materials and packaging solutions. These life cycle inventories are used for completing sector life cycle studies and are also made available for external LCA practitioners to make LCA studies (for example, via incorporation into the Ecoinvent database).

In parallel, the inventories are also used to calculate the carbon footprint of each sector. This calculation is completed using the guidance and tool jointly developed by the stakeholders under the umbrella of CITPA (“*Guidelines for calculating carbon footprints for paper-based packaging, March 2018*”). In turn, this guidance and tool is based on the guidelines published by CEPI (“*Framework for Carbon Footprints for Paper and Board Products, April 2017*”).

However, the European Commission has recently been working to develop and introduce a common method for quantifying the environmental impacts of products. It seems increasingly likely that this Product Environment Footprint (PEF) approach will become mandatory in some way when companies wish to make environmental claims about their products or materials.

It is intended that Category Rules will be developed for different products to support the overarching PEF methodology. Through a process of consultation and compromise, CEPI and a large number of co-authors have produced Product Environmental Footprint Category Rules (PEFCR) for Intermediate Paper Products.

As with any major methodological document produced via a committee format, there are likely to be some inconsistencies and ambiguities within the PEFCR. Furthermore, and in contrast to the CITPA and CEPI documents, the target audience of the PEFCR is an individual paper company seeking to produce a PEFCR compliant cradle-to-gate LCA study of one of their products or product groups. Hence, some aspects of the PEFCR do not fit for producing the average PEF of a sector.

With this in mind, via CITPA, the associations have jointly commissioned RISE to evaluate the PEFCR. The aim of the work is to identify and report on challenges presented when applying the PEFCR, and to make recommendations for improving (or clarifying) the PEFCR in the future. The analysis is made primarily from the viewpoint of the trade associations responsible for producing sector-wide data and analysis, but many of the points will also be valid for individual companies wishing to produce a PEF compliant LCA study of their specific products.

2 Overview of the main challenges

Figure 1 summarises the aspects of the PEFCR which may be challenging when applying the PEFCR in the context of sector-wide data and analysis. Each of these individual aspects is discussed in detail in the corresponding sections of this report. Each section covers the following:

- The nature of the challenge
- Recommendations for improving/clarifying the PEFCR in the future.

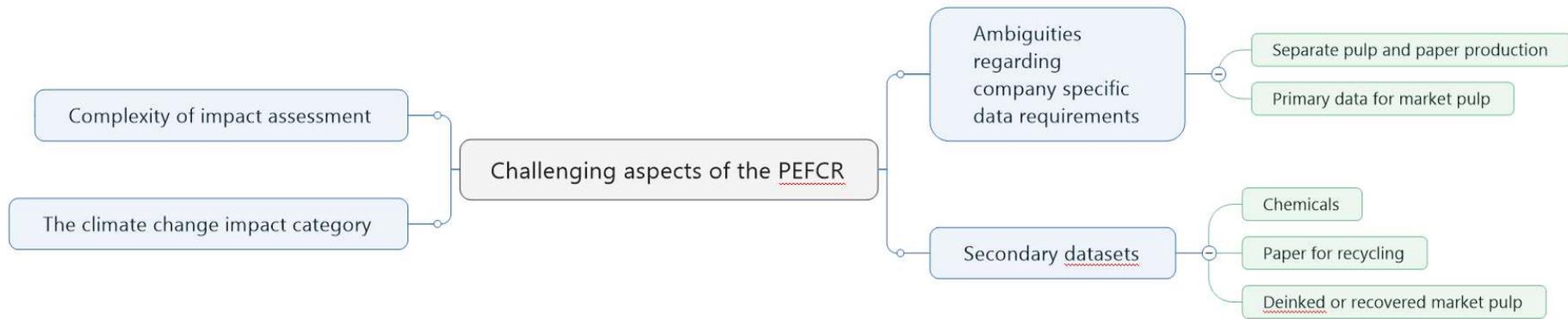


Figure 1 Challenging aspects of the PEFCR

3 Complexity of impact assessment

The nature of the challenge

The PEF methodology, and therefore the PEFCR, requires the calculation of the impact assessment results for all 16 impact categories summarised in Table 1.

Table 1 Impact categories in the PEFCR

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-11eq	Steady-state ODPs 1999 as in WMO assessment
Human toxicity, cancer	Comparative Toxic Unit for humans (CTUh)	CTUh	USEtox model (Rosenbaum et al, 2008)
Human toxicity, non-cancer*	Comparative Toxic Unit for humans (CTUh)	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 U235	kBq U235eq	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 NMVOCeq	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 Peq	EUTREND model (Struijs et al, 2009b) as implemented in ReCiPe
Eutrophication, marine	Fraction of nutrients reaching marine end compartment (N)	kg Neq	EUTREND model (Struijs et al, 2009b) as implemented in ReCiPe
Ecotoxicity, freshwater	Comparative Toxic Unit for ecosystems (CTUe)	CTUe	USEtox model, (Rosenbaum et al, 2008)
Land use	<ul style="list-style-type: none"> • Soil quality index* • Biotic production • Erosion resistance • Mechanical filtration • Groundwater replenishment 	<ul style="list-style-type: none"> • Dimensionless (pt) • kg biotic production** • kg soil • m³ water • m³ groundwater 	<ul style="list-style-type: none"> • Soil quality index based on LANCA (EC-JRC)*** • 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 Sbeq	CML 2002 (Guinée et al., 2002) and van Oers et al. 2002.
Resource use, fossils	Abiotic resource depletion – fossil fuels (ADP-fossil)	MJ	CML 2002 (Guinée et al., 2002) and van Oers et al.

*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.

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

***Forthcoming document on the update of the recommended Impact Assessment methods and factors for the EF.

The full impact assessment is valuable information and provides a more complete insight into the environmental performance of the system under study compared with a focus on a single impact category (such as climate change). However, considering all impact categories makes for a complex picture. Communicating all the results to non-LCA experts will be challenging. There is a real risk that stakeholders are overwhelmed by the full impact assessment results and/or lack the knowledge to properly interpret the results, leading to inappropriate decisions based on the data.

Furthermore, few stakeholders (particularly B2B customers) are currently asking for data from the full range of impact categories. There remains a focus on the climate change impact category, reflecting the pressing need to address the climate emergency and the subsequent high priority given to GHG emissions reduction by businesses, investors, consumers and other influential stakeholders. To meet the needs of stakeholders, the associations currently produce cradle-to-grave carbon footprint results for their sectors. Many paper and board companies also produce carbon footprint statements for their products.

The PEFCR does not allow the user to select and report certain impact categories – all impact categories must be calculated and reported in the PEF report for PEFCR compliance. However, what is not clear from the current proposals is whether all of the impact categories reported in the PEF report must be included in all communications, or whether it is possible to make communications based on results for selected impact categories. A stated aim of the legislative proposal on substantiating green claims is to require companies making claims ***related to the impacts*** covered by the PEF methods to substantiate them via the PEF methods¹. It does not necessarily follow that claims and communications must cover all of the impact categories, only that those communicated have been calculated in accordance with the PEF.

Thus, if the PEF becomes mandatory for all environmental claims, it may or may not be possible to publish the carbon footprint results as a stand-alone report, but it may still be necessary to calculate and report on all the other impact categories. It is necessary to closely follow policy developments on communication.

Recommendations

The paper and board industry should closely follow policy developments on communication.

The paper and board industry should lobby the Commission to ensure that it is possible to apply the PEF method to calculate and publish results for selected impact categories only. This is entirely in line with the requirements of the International Standards for conducting LCA studies^{2,3}, which state that the selection of impact categories should be “justified and consistent with the goal and scope of the LCA”, rather than being

¹ Inception Impact Assessment, Legislative proposal on substantiating green claims, at: <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12511-Environmental-claims-based-on-environmental-footprint-method>

² ISO14040: Environmental management – Life cycle assessment – Principles and framework

³ ISO14044: Environmental management – Life cycle assessment – Requirements and guidelines

determined by a mandatory list which may include impact categories which are not relevant to the product system being studied (i.e. production of paper and board).

4 The climate change impact category

The nature of the challenge

As previously stated, the associations already calculate and publish a sector-wide carbon footprint study for their respective packaging solutions using the CITPA methodology⁴, which in turn is based on the CEPI Framework⁵. Many paper and board companies also calculate and publish carbon footprints for their products based on the CEPI framework or the CITPA methodology.

However, the CITPA methodology treats biogenic carbon differently from the PEFCR.

According to the PEFCR, the climate change impact category is comprised of three sub-indicators: 'Climate change - fossil', 'Climate change - biogenic' and 'Climate change - land use and land transformation'. The PEFCR states that the total climate change shall be reported as the sum of the three sub-indicators, and 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.

This division of the climate change impact category into sub-indicators is slightly different to the current carbon footprint calculations which consider carbon emissions in four groups: Fossil, biogenic emissions, biogenic removals, and direct land-use (equivalent to the sub-indicator 'Climate change - land use and land transformation').

Together, biogenic emissions and biogenic removals are comparable to the sub-indicator "Climate change – biogenic". The "Climate change – biogenic" sub-category covers carbon emissions to air (CO₂, CO and CH₄) originating from the oxidation and/or reduction of biomass by means of its transformation or degradation (e.g. combustion, digestion, composting, landfilling) and CO₂ uptake from the atmosphere through photosynthesis during biomass growth – i.e. corresponding to the carbon content of products, biofuels or above ground plant residues such as litter and dead wood.

However, according to the PEFCR, a simplified modelling approach shall be used when modelling the biogenic emissions: "**Only the emission 'methane (biogenic)' is modelled, while no further biogenic emissions and uptakes from atmosphere are included.**"⁶ This approach is underpinned by the underlying PEF methodology⁷ and was confirmed and further emphasised in the subsequent JRC working document making suggestions for changes to the PEF method⁸.

This is different from the CEPI 10 toes and subsequent CITPA approach which states:

⁴ *Guidelines for calculating carbon footprints for paper-based packaging*, CITPA, March 2018

⁵ *Framework for Carbon Footprints for Paper and Board Products*, CEPI, Beaufort-Langevald, A. d., April 2017

⁶ Biogenic carbon emitted later than 100 years after its uptake is considered as permanent carbon storage, see Annex H in PEFCR Guidance. However, this is rarely the case for intermediate paper products.

⁷ *Product Environmental Footprint Category 2 Rules Guidance*, Version 6.3, May 2018,

⁸ *Suggestions for updating the Product Environmental Footprint (PEF) method*, Zampori & Pant, Joint Research Centre, 2019

“Green House Gas emissions are expressed in CO₂ equivalents. The footprints consist of four separate figures:

- *Fossil origin CO₂-equivalent (CO₂-eq) emissions*
- *Biomass origin CO₂-equivalent (CO₂-eq) emissions*
- *Biogenic CO₂ removals*
- *Emissions and removals of biogenic CO₂ (CO₂-eq) due to direct land use change (dLUC)*

In each case, these impacts are expressed per ton of product. These can be added up to give a total footprint”⁹

The PEFCR means that we cannot count the uptake of CO₂ by the growth of the fibre in the forests. Nor should we count the emissions to atmosphere of biogenic CO₂ from combustion (e.g. from biofuels at the mill, or from end-of-life paper and board at the incineration plant) or emissions of biogenic CO₂ from degradation of paper and board in landfill. However, we should account for the emissions of biogenic methane arising from degradation of paper and board in landfill.

This change in approach will significantly change the calculated and published carbon footprint profiles for all packaging grades. Whilst the fossil carbon footprint is unchanged by this, we will no longer be able to quantify the removal of carbon by the growing forests which, due to the application of the cut-off method in the CITPA guidelines for accounting for recycling at end-of-life, outweighed biogenic emissions across the life cycle of the packaging, thereby reducing the total carbon footprint result (when fossil emissions, biogenic emissions, biogenic removals and land-use emissions were summed).

Recommendations

The climate change impact category as described in the PEFCR is driven by the overarching PEF methodology. It is unlikely that the PEF methodology will be subject to change on this point. Revisiting the debate is not in the interests of the other stakeholders or the Commission. Furthermore, any change to the approach would impact on the secondary datasets already compiled for the PEF Pilot database and the secondary datasets due to be compiled during 2021. Reworking of these datasets now is unlikely to be acceptable.

However, RISE and CITPA believe that stakeholders are interested in the biogenic carbon cycle (short carbon cycle). Therefore, alongside the climate change impact category as per the PEF, the PEFCR should include as additional information quantification of the biogenic carbon dioxide removals (due to forest growth and production of renewable inputs such as biofuels and starch) and the biogenic carbon dioxide emissions across the life cycle (e.g. from the combustion of biofuels at the pulp and paper mill, from incineration with energy recovery). This would be comparable to the biogenic carbon emissions and removals calculated in the current carbon footprint calculations.

⁹ Guidelines for calculating Carbon footprints for paper-based packaging, CITPA, March 2018

This modification would be entirely compatible with the guidelines for developing PEFCRs, which state:

“In case all emissions and removals are modelled separately, note that the corresponding characterisation factors for biogenic CO₂ uptakes and emissions are set to zero. Complementary characterisation factors shall be applied in case these flows are to be used to calculate additional information. In that case, the PEFCR shall describe how the additional information shall be calculated and which complementary characterisation factors shall be applied.”¹⁰

The paper and board industry could therefore also lobby the Commission to include separate flows of biogenic carbon dioxide (short cycle carbon) in the PEF databases and develop a separate impact category as additional information.

In addition, both the CEPI framework and the CITPA methodology will need to be updated to be in compliance with the PEF climate change impact category.

¹⁰ Product Environmental Footprint Category 2 Rules Guidance, Version 6.3, May 2018, lines 1929-1933

5 Ambiguities regarding company specific data requirements

The nature of the challenge

A key objective of category rules is to unambiguously set rules for the generation of a PEF compliant LCA study for the product category in question. However, some aspects of the rules set by the PEFCR for Intermediate Paper Products are ambiguous. They leave the reader with an impression of what is required without explicitly stating the requirement. This is particularly the case where company specific data requirements are concerned.

This ambiguity is undoubtedly unintentional and may be down to semantics. Nonetheless, as these ambiguities can lead to different interpretations of what is required further clarification is required. Examples of ambiguities include:

- **Separate pulp and paper production**

In Section 5.1 (Lists of mandatory company-specific data), the PEFCR states that there are two approaches to company-specific mandatory data depending on the integration level of the company:

- Separated process data for pulping and papermaking where these are separate processes, *“used especially for virgin paper production”*
- Integrated process data for pulping and papermaking where these are combined processes and it is not possible to separate data flows, *“used especially for recycled paper production”*

This could be interpreted to suggest that separate data must be collected for virgin pulp production and for papermaking at the integrated virgin papermills. This requirement is further inferred in Annex 4-III – Mandatory company-specific datasets. The tables in this Annex list Pulp and Papermaking data collection separately, and in the Papermaking data collection template they identify different Internally produced pulps as inputs (see Table 2).

Table 2 Internally produced pulps as a separate input to paper making

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						T R	T e R	G R	P	D Q R	
<i>Pulps</i>											
Internally produced pulps											
Pulp 1, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 2, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 3, specify	as bone dry weight	kg/t	n/a	n/a		a	a	a	a	na	Non EF-compliant
Pulp 4, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Purchased pulps											
Pulp 1, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 2, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 3, specify	as bone dry weight	kg/t	n/a	n/a		a	a	a	a	na	Non EF-compliant
Pulp 4, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 5, specify	as bone dry weight	kg/t	n/a	n/a		a	a	a	a	na	Non EF-compliant
Pulp 6, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant

However, the term “used especially for” is not prescriptive and can be interpreted as “used especially for but not limited to”. This is an example of an ambiguity in the PEFCR document.

The PEFCR goes on to state that “Data for each pulp type used, a set of data shall be included, including de-inked recycled pulp.”

RISE interprets this to mean that separate pulp and paper production data should be collected for both virgin pulps and de-inked/recycled pulps, whether these are generated at the mill or market pulps are used.

However, CEPI has developed an LCA tool fully based on the PEFCR for Intermediate Paper Product¹¹. The CEPI PEF tool enables any CEPI member company to calculate product LCAs in accordance with the PEFCR. In the CEPI PEF tool, the option is available to enter combined pulp and paper data for virgin mills. The CEPI PEF tool also allows for entry of combined pulp and paper making data where deinked pulp is produced at the papermaking mill. As CEPI oversaw the production of the PEFCR, it is assumed that it is their interpretation that separate pulp and papermaking data is not required for either integrated virgin paper production or for combined pulp and paper making data where deinked pulp is produced at the papermaking mill. However, this is not explicitly stated in the PEFCR.

¹¹ Capi launches an LCA tool for paper products, Capi press release, Brussels, 16 July 2020 (<https://www.cepi.org/wp-content/uploads/2020/07/Capi-Press-Release-Capi-launches-an-LCA-tool-for-paper-products.pdf>)

- **Primary data for market pulp**

Annex 4-III of the PEFCR (Mandatory company-specific datasets) seems to infer that primary data should be collected for the impacts of the production of market pulp, as no default dataset to be used is identified for Purchased pulps (see Table 3).

Table 3 Primary data for market pulps as an input to paper making

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						T	T	G	D		
						R	R	R	P	Q	
Pulps											
Internally produced pulps											
Pulp 1, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 2, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 3, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 4, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Purchased pulps											
Pulp 1, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 2, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 3, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 4, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 5, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant
Pulp 6, specify	as bone dry weight	kg/t	n/a	n/a		n	n	n	n	na	Non EF-compliant

However, the Data Needs Matrix (DNM) in Section 5.4 of the PEFCR states that all processes required to model the product and outside the list of mandatory company-specific data shall be evaluated using the Data Needs Matrix. 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 quoted in the PEFCR:

- 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

For situation 3, an example is given:

“could, for example, be the case for market from some papermaking companies” (sic)

RISE considers this to be a typo and interprets it to mean that Situation 3 could “*be the case for “market **pulp**” for some papermaking companies*”. In this case, according to the DNM, secondary datasets would be acceptable for market pulp where access to supplier (company-)specific data is not easily available.

The CEPI PEF tool does not currently include the option to use secondary data for market pulp. However, following a discussion with CEPI it is understood that they are now considering adding this as an option.

Indeed, Section 6.3 of the PEFCR seems to suggest that the quantity of market pulp by type is company-specific mandatory data, whilst suggesting that secondary datasets can be used for calculating the impact of this market pulp (see Table 4)¹². However, this is not explicitly stated in the PEFCR.

Table 4 Market pulp by type as a company-specific mandatory data point

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	T _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	d3b333ad-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
Chemithermomechanical 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-9c01-415f-9000-000000000000	2	2	2	2	Y

¹² Secondary market pulp data is available in the PEF pilot database

Recommendations

When the PEFCR is next reviewed, these ambiguities should be clarified and the expectations should be explicitly stated. In the meantime, consideration should be given to issuing additional guidance for applying the PEFCR which clarifies the expectations for a study to be compliant with the PEFCR. This could be done in the form of examples to illustrate key aspects of the PEFCR or as a Frequently Asked Questions document.

6 Secondary datasets

The nature of the challenge

Compiling a PEF compliant study involves combining company specific activity data with secondary datasets for upstream processes (e.g., chemicals production, energy carriers, raw materials, etc). However, there are some significant gaps in the secondary datasets available:

- **Chemicals**

According to the PEF CR, “*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.*”

However, in Annex 4-III of the PEF CR (Mandatory company-specific datasets) a list of chemicals for which data is to be collected for pulp production and for papermaking is provided and standard background datasets for use in calculating the environmental footprint are identified (see Tables 5 and 6).

Table 5 Chemicals data to be collected for pulping

Chemicals											
Sulphuric acid (H ₂ SO ₄)		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	RFR
Oxygen (O ₂)		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 (H ₂ O ₂)		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 (NaClO ₃)		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 (ClO ₂)		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 (NaHSO ₃)		kg/t									

Table 6 Chemicals data to be collected for papermaking

Chemicals							
Starch (maize)	kg/t (dry mass)	Maize starch, dried; , at plant, from wet milling, production mix,	http://cdn.blonkconsulants.nl	3e59ff2f-0021-4568-a850-33ca7a4cad58	2, 1, 2, 2, 2, 2, 5 0 3 0		GLO
Starch (potato)	kg/t (dry mass)	Potato starch dried; , at plant, from wet milling, production mix, - EU+28	http://cdn.blonkconsulants.nl	8524af42-2fbd-46fc-bb41-45c832ed6985	2, 1, 1, 2, 1, 0 5 8 3 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)						

Many other chemicals/non-fibre inputs are also used in pulping and papermaking besides those listed in Table 5 and Table 6. Presumably, these other chemicals have been excluded as they fall outside of the cut-off criteria (as assessed during the pilot PEF projects). However, CITPA and the member associations are concerned that some chemicals excluded from the list may be significant for certain paper and board grades, and that the cumulative effect of the exclusions may be greater than 1% of selected environmental impact categories.

Table 7 compares the list of chemicals for which data is currently collected by the associations against the mandatory chemicals data from the PEF CR.

Table 7 Chemicals data mandatory versus collected

Chemical / non-fibre inputs	Included in mandatory list in PEFCR?	Included in current data collection?
CaO (quicklime)	Yes	Yes
Chlorine dioxide ClO ₂	Yes	Yes
Hydrogen peroxide H ₂ O ₂	Yes	Yes
Sulphuric acid H ₂ SO ₄	Yes	Yes
Sodium chlorate NaClO ₃	Yes	Yes
Sodium hydroxide NaOH	Yes	Yes
Oxygen O ₂	Yes	Yes
Sodium bisulfite (NaHSO ₃)	Yes	No
Synthetic binders (latex)	Yes	No
Wet strength agent	Yes	Yes
Dry strength agent	Yes	No
Clay	Yes	Yes
GCC (ground calcium carbonate)	Yes	Yes
PCC (purchased)	Yes	Yes
PCC (produced on site)	Yes	No
Starch – Maize	Yes	Yes
Starch - Potato	Yes	Yes
Starch – Cationic	Yes	No
Starch – Corn	No	Yes
Flour	No	Yes
Alum Al ₂ (SO ₄) ₃	No	Yes
Sizing agents/Rosin size	No	Yes
Carbon dioxide CO ₂	No	Yes
Soda/Sodium carbonate Na ₂ CO ₃	No	Yes
Magnesium sulphate	No	Yes
Retention aids and polymers	No	Yes
Defoamer	No	Yes
Sodium chloride NaCl	No	Yes
Borax	No	Yes
Polyacrylates	No	Yes
Polyvinyl acetate	No	Yes
Sodium sulphate Na ₂ SO ₄	No	Yes
Sulphur S	No	Yes
Sulphur dioxide SO ₂	No	Yes
Biocides	No	Yes
Colourants	No	Yes
Lubricants	No	Yes
Pitch dispersants	No	Yes
Retention agents	No	Yes
Sizing agents	No	Yes
Hydrochloric acid HCl	No	Yes
Ammonia NH ₃	No	Yes

- **Paper for recycling as an input**

According to the PEFCR, the following are included in the system boundaries for upstream processes:

- The collection of paper for recycling from households, industry and offices and transport to a sorting facility

- Sorting into paper grades (according to EN 643) e.g. at a depot, and
- Transport to the mill

It is mandatory that primary data is collected on the quantity of “Paper for recycling” consumed in the pulping process, and then secondary data can be applied for the upstream impacts.

However, “Paper for recycling” is identified as a data gap in the default datasets to be used, as identified in Annex 4-III of the PEF CR (see Table 8).

Table 8 Paper for Recycling as a data gap

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
						Ti	Te	GR	P	DQ	
Inputs						R	R			R	
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://cdn.quantisoftware.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://cdn.quantisoftware.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://cdn.quantisoftware.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://cdn.quantisoftware.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://cdn.quantisoftware.com/PEF/	e3b9fc32-da89-4e4d-ab33-a2265f49a8a9	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://cdn.quantisoftware.com/PEF/	dfdc4ed-4df4-4789-bb6e-4363461d0268	2,0	2,0	2,0	2,0	2,0	EU-28+3
Recovered paper			Data gap								

Currently, in the studies for the associations primary data is collected covering the transport of recovered paper from the sorting depot to the mill. The current boundaries do not include the collection of paper for recycling from households, industry and offices and transport to the sorting facility or the sorting of recovered paper into paper grades. Primary data for these processes is unlikely to be available and therefore secondary data sources would be required.

Therefore, the inclusion of transport of recovered paper from the sorting facility to the mill (through the collection of primary data on transport scenarios combined with emission factors for transport modes) remains the best data available for this input, and represents an improvement on the data gap in the PEF CR.

• Production of market pulp from recovered fibres

The current PEF pilot database does not include secondary data for production of market pulp from recovered fibres. From the viewpoint of CITPA and the member associations this is not an issue for compiling the average industry data as there is currently no market pulp from recovered fibres used across the sectors. However, this is relevant when it comes to applying the circular footprint formula.

The PEFCR introduces the following formula to model the recycled content:

The following formula is used to model the recycled content:

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

Where:

- R_1 = proportion of material in the input to the production that has been recycled from a previous system
- 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).
- $E_{recycled}$ = 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 production¹³.
- A = A value, an allocation factor of burdens and credits between supplier and user of recycled materials – The PEF profile shall be calculated and reported using A equal to 1, but results shall also be calculated and presented as additional technical information with the A value set at 0.2 for all packaging materials
- Q_{sin}/Q_p is a quality ratio used in the Circular Footprint Formula for intermediate paper products, to take into account the quality of the ingoing recycled materials. This is always set to 1 for intermediate paper products, as the quality of the pulp (fibres) at point of substitution is of the quality needed for the paper production.

What the equation above does is effectively allocate a proportion of the production of virgin pulp to the production of recycled pulp. However, as the A value is set to 1 in the PEF profile, the proportion of virgin pulp impacts allocated to the recycled pulp is 0%.

As additional information the PEFCR state that the results shall also be presented with the A value set to 0.2. Setting the A value to 0.2 will significantly influence the footprint of recycled content paper grades. The recycled content part of the circular footprint formula is applied at the level of pulp (virgin pulp versus recycled pulp). However, there is currently no comparable dataset for recycled pulp grades compared to virgin pulp grades with which to define the emissions of E_V and $E_{recycled}$. This means that it may not be possible to re-calculate the results with the A value set to 0.2.

¹³ $E_{recycled}$ shall be company-specific for intermediate paper products containing recycled fibres, i.e. company specific values shall be used for re-pulping processes. In case of missing data, EF datasets shall be used (EF datasets for pulp are being made available during 2019).

- **Purchased electricity**

The PEFCR lists the secondary datasets to be used for purchased grid electricity (see Table 9).

Table 9 Purchased grid electricity – secondary datasets to be used

Country	Default dataset to be used	Dataset source (i.e. node)	UUID	Default Data quality parameters					Remarks
				Ti	Te	G	P	D	
				R	R	R	Q	R	
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

These datasets have been prepared and are published as part of the PEF database.

However, in response to the climate emergency, national grid electricity mixes are changing rapidly. This means that the environmental profile of purchased grid electricity can change year-on-year. LCA data is not commonly updated annually. For this reason, some associations and some paper and board companies have been applying fossil carbon emission factors published annually by IEA when estimating the carbon footprint of their paper and board products. These IEA factors have limitations (e.g. they do not include the upstream impacts of extraction and processing of fuels), but do nonetheless reflect the current grid electricity mix.

However, due to the differences in approach and system boundaries, the carbon emission factors in the IEA database are very different for some countries from the fossil climate

change result in the PEF database. Subsequently, adopting the PEF data for purchased grid electricity will result in different carbon footprint results from those calculated and presented in existing studies.

The application of the PEF database entries for purchased grid electricity ensures that common background data is applied for purchased grid electricity, and therefore improves the transparency, reproducibility and justification of LCA studies. However, if these PEF datasets are not updated regularly, then results achieved will not represent the current purchased grid electricity mix. As purchased grid electricity typically makes a significant contribution to the footprint of paper and board production, this could result in significant over-statement of the carbon impacts of paper and board products.

Recommendations

- **Chemicals**

When conducting a PEF compliant LCA study, a full list of pulp and papermaking chemicals consumed should be collected and quantified as “additional information”

The paper and board sector should encourage the collection and supply of PEF compliant LCA data covering all pulp and papermaking chemicals for inclusion in the PEF background database.

- **Paper for recycling as an input**

For paper for recycling as an input, it is unlikely that primary data can be sourced for collection of paper from households, industry, and offices and transport to a sorting facility and for sorting into paper grades. The paper and board sector should seek to generate and publish secondary data for paper for recycling for inclusion in the PEF database. In the meantime, additional guidance to the PEFCR should encourage users of the PEF to include transport of recovered paper from the sorting depot to the mill.

- **Market pulp from recovered fibres**

The paper and board sector should encourage collection and supply of PEF compliant LCA data covering market pulp from recovered fibres for inclusion in the PEF background database. In the meantime, additional guidance to the PEFCR should be produced covering how to apply the A value at 0.2 for calculating the additional information required for a PEF compliant study.

- **Purchased grid electricity**

The paper and board sector should encourage annual updating of the purchased grid electricity data in the PEF database.

7 Conclusions

The observations in this report reflect the experiences of CITPA and the member associations in trying to apply the PEFCR in the context of preparing industry average data. The recommendations are given in good faith and are intended to improve the application of the PEFCR in the future.

It is noted that the PEFCR validity is set until 31-12-2020, and therefore could potentially change in 2021. However, we are not aware of any plans to revise the PEFCR, with the exception of the land-use impact category which CEPI is working on with Fraunhofer Institut. It is also understood that the European Commission does not have resources to revise the underlying PEF methodology, despite commissioning a report into potential suggestions for updated in the PEF methodology which was published in 2019¹⁴.

Hence, we recommend that the paper and board industry looks to issue additional guidance for applying the PEFCR which clarifies the points raised within this report. This additional guidance could be provided in the form of examples to illustrate key aspects of the PEFCR or as a Frequently Asked Questions document.

¹⁴ *Suggestions for updating the Product Environmental Footprint (PEF) method*, Zampori L, Pant R. Joint Research Centre, 2019

Through our international collaboration programmes with academia, industry, and the public sector, we ensure the competitiveness of the Swedish business community on an international level and contribute to a sustainable society. Our 2,200 employees support and promote all manner of innovative processes, and our roughly 100 testbeds and demonstration facilities are instrumental in developing the future-proofing of products, technologies, and services. RISE Research Institutes of Sweden is fully owned by the Swedish state.

I internationell samverkan med akademi, näringsliv och offentlig sektor bidrar vi till ett konkurrenskraftigt näringsliv och ett hållbart samhälle. RISE 2 200 medarbetare driver och stöder alla typer av innovationsprocesser. Vi erbjuder ett 100-tal test- och demonstrationsmiljöer för framtidssäkra produkter, tekniker och tjänster. RISE Research Institutes of Sweden ägs av svenska staten.



RISE Research Institutes of Sweden / RISE Innventia AB
Box 5604, 114 86 STOCKHOLM, Sweden
Telephone: + 46-8-676 70 00
E-mail: info.innventia@ri.se, Internet: www.ri.se

Unit
RISE Bioeconomy Report:
Not applicable