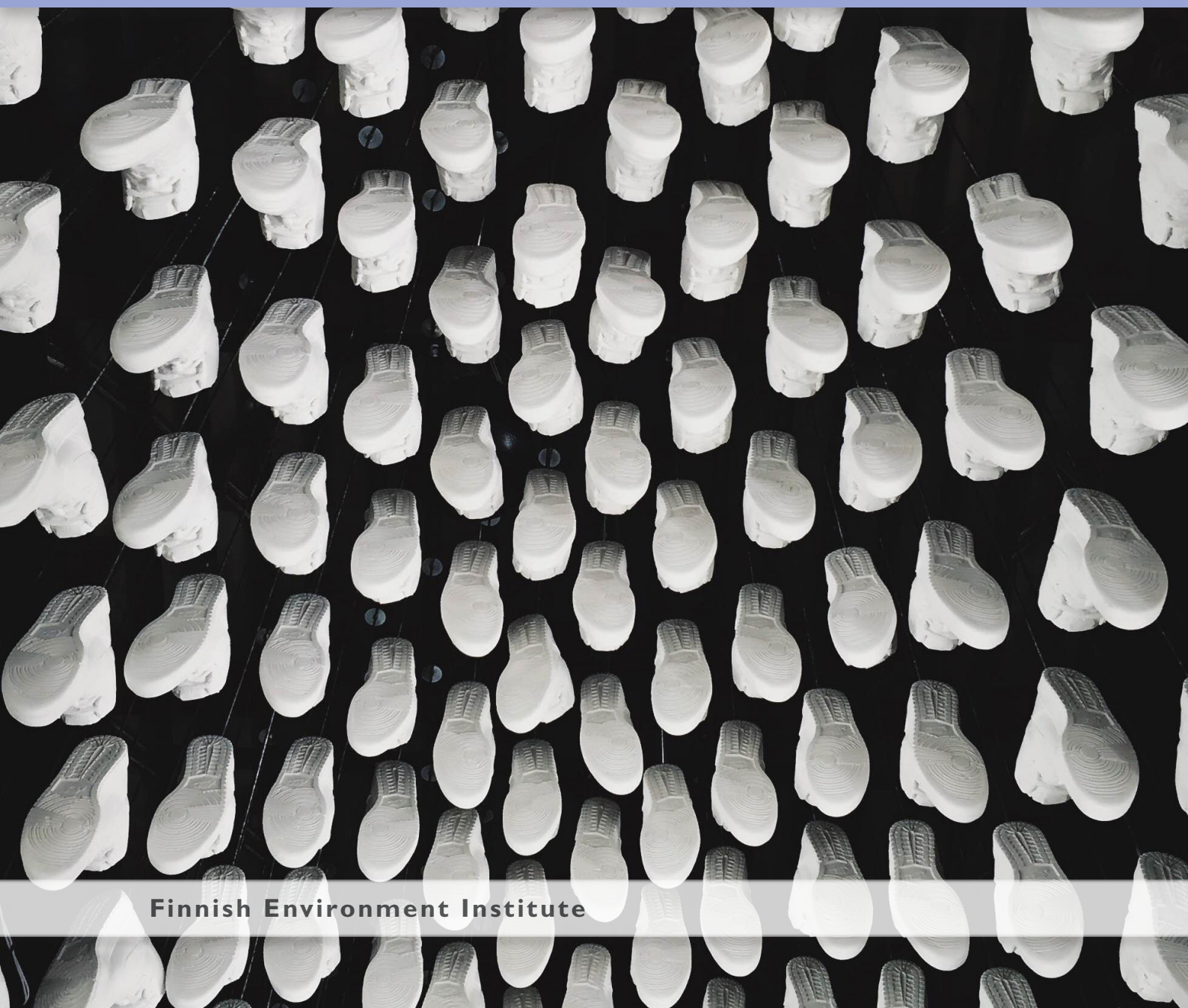


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# Product Environmental Footprint (PEF) method

Use for evaluating the climate impacts of public procurement

Johanna Suikkanen & Ari Nissinen



Finnish Environment Institute



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The Centre for Consumption and Production

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## Abstract

### Product environmental footprint (PEF) method

#### – Use for evaluating the climate impacts of public procurement

Carbon footprint describes a product's climate impacts over the course of its life cycle. According to a report published by the Finnish Environment Institute (SYKE) in 2019, the carbon footprint of public procurements in Finland was 8.3 Mt CO<sub>2</sub>e in 2015, more than half of which was caused by municipal procurements. Therefore, municipalities have an enormous potential to lead the way by creating markets for products with reduced climate impacts.

This Canemure report was prepared in collaboration with the City of Helsinki Urban Environment – Environmental Services Division. The City of Helsinki promotes low-carbon procurement as part of the LIFE-IP Canemure project. The project examines the possibility of developing carbon footprint criteria and compares various methods of carbon footprint calculation. The report discusses topics at a general level, and its findings can be applied by other municipalities and public bodies implementing procurements.

The report examines whether the product environmental footprint (PEF) is suitable for calculating the carbon footprint data requested in connection with public procurements. The PEF is a harmonised method based on life cycle assessment, and it was developed by the European Commission. It is used to assess the environmental impacts of products over the course of their life cycles, taking into consideration sixteen environmental impact classes. According to the recommendation published in the Official Journal of the European Commission (2013/179/EU), the PEF method can be used to support environmentally friendly procurement, but concrete guidance or practical experience does not yet exist.

The report describes the use of the method for carbon footprint calculation in connection with public procurement and discusses its use in connection with the product categories of dairy products and IT equipment separately. In addition, the report describes the materials and databases made available to the public by the European Commission to support the calculation process. In order to be able to use PEF information as part of tendering processes, product category-specific rules (PEFCRs) must be applied, but currently, such rules have been drawn up only for 17 product categories. In addition, PEFCRs for another five product categories are being developed. A decision on the wider use of the PEF as part of the European integrated product policies is likely to be made in 2021.

**Keywords:** Environmental footprint, carbon footprint, public procurement, dairy products, IT equipment

## Tiivistelmä

### Tuotteiden ympäristöjalanjälkimenetelmä PEF

#### – Käyttö julkisten hankintojen ilmastovaikutusten arvioinnissa

Hiilijalanjälki kuvaa tuotteen elinkaarisia ilmastovaikutuksia. Suomen ympäristökeskus SYKE:n vuonna 2019 julkaiseman selvityksen mukaan julkisten hankintojen hiilijalanjälki oli vuonna 2015 8,3 Mt CO<sub>2</sub>e, josta yli puolet aiheutui kuntien hankinnoista. Kunnilla on siis valtava potentiaali osoittaa suuntaa ja luoda markkinoita ilmastovaikutuksiltaan pienemmille tuotteille.

Tämä raportti toteutettiin yhteistyössä Helsingin kaupungin kaupunkiympäristön ympäristöpalveluiden toimialan kanssa. Helsingin kaupunki edistää LIFE-IP Canemure -hankkeessa vähähiilisiä hankintoja. Hankkeessa tarkastellaan mahdollisuutta kehittää kriteerejä hiilijalanjäljelle ja vertaillaan erilaisia hiilijalanjäljen laskentamenetelmiä. Raportissa tulokset esitetään yleisellä tasolla, ja ne ovat sovellettavissa muiden kuntien ja hankintoja toteuttavien julkisten tahojen käyttöön.

Tässä raportissa selvitetään, soveltuuko tuotteiden ympäristöjalanjälki (*Product Environmental Footprint*, PEF) laskentatavaksi julkisten hankintojen yhteydessä pyydettävään hiilijalanjälkitietoon. PEF on Euroopan komission luoma yhdenmukainen, elinkaariarviointiin perustuva menetelmä. Sen avulla arvioidaan tuotteiden elinkaarisia ympäristövaikutuksia kuudessatoista ympäristövaikutusluokassa. Euroopan komission virallisessa lehdessä julkaistun suosituksen (2013/179/EU) mukaan PEF-menetelmää voi käyttää ympäristöystävällisten hankintojen tukena, mutta konkreettista ohjeistusta tai käytännön kokemusta ei tästä vielä ole olemassa.

Raportissa kuvaillaan PEF-menetelmän käyttöä hiilijalanjälkilaskentaan julkisen hankinnan yhteydessä ja käsitellään erikseen sen käyttöä maitotuotteiden ja IT-laitteiden tuoteryhmiin liittyen. Lisäksi raportissa kuvataan Euroopan komission avoimesti saatavilla olevat ohjeistukset ja tietokannat, joita voi käyttää laskennan tukena. Jotta PEF-tietoa voisi käyttää osana kilpailutusta, on oltava tuoteryhmäkohtaiset PEFCR-säännöt, joita on tällä hetkellä vain 17:lle tuoteryhmälle. Lisäksi PEFCR-säännöt viidelle uudelle tuoteryhmälle ovat parhaillaan valmistelussa. Ympäristöjalanjäljen laajemmasta käytöstä osana Euroopan yhdennettyä tuotepolitiikkaa päätettäneen EU:ssa vuonna 2021.

**Asiasanat:** Ympäristöjalanjälki, hiilijalanjälki, julkiset hankinnat, maitotuotteet, IT-laitteet

## Sammandrag

### Metod för produkternas miljöavtryck PEF

#### – Användning för att utvärdera klimatpåverkan vid offentliga upphandlingar

Koldioxidavtrycket beskriver produktens klimatkonsekvenser under sin livscykel. Enligt en utredning publicerad av Finlands miljöcentral SYKE 2019 var de offentliga upphandlingarnas koldioxidavtryck 2015 8,3 Mt CO<sub>2</sub>e, varav hälften berodde på kommunernas anskaffningar. Kommunerna har alltså en enorm potential att visa riktning och skapa marknader för produkter med mindre klimatkonsekvenser.

Den här Canemure-rapporten genomfördes i samarbete med stadsmiljösektorn – miljöservicen vid Helsingfors stad. Helsingfors stad främjar upphandlingar med liten koldioxidhalt i LIFE-IP Canemure-projektet. Inom projektet granskas möjligheten att utveckla kriterier för koldioxidavtrycket och olika metoder för att kalkylera koldioxidavtrycket jämförs. I rapporten presenteras resultaten på allmän nivå och de kan tillämpas av andra kommuner och offentliga instanser som genomför upphandlingar.

I den här rapporten utreder man om produkternas miljöavtryck (Product Environmental Footprint, PEF) lämpar sig som kalkyleringssätt för den koldioxidavtrycksuppgift som begärs i samband med offentliga upphandlingar. PEF är en enhetlig metod som baserar sig på livscykeluppskattningar skapad av Europeiska kommissionen. Med hjälp av den uppskattas produkternas miljökonsekvenser under deras livscykel inom sexton miljökonsekvenskategorier. Enligt rekommendationen som publicerats i Europeiska kommissionens offentliga tidning (2013/179/EU) kan PEF-metoden användas som stöd för miljövänliga upphandlingar, men det finns ännu inga konkreta anvisningar eller praktiska erfarenheter på detta.

I rapporten beskrivs användningen av metoden för koldioxidavtryckskalkyleringar i samband med offentliga anskaffningar och dess användning behandlas separat för produktgrupperna mejeriprodukter och IT-utrustning. I rapporten beskrivs även de material och databaser som Europeiska kommissionen gjort offentligt tillgängliga och som kan användas som stöd för kalkyleringen. I rapporten konstateras att PEF:s anvisningar och material kan användas i samband med upphandlingarna för att producera miljöinformation. Man kan begära miljö- eller koldioxidavtrycksuppgifter av leverantören utifrån PEF-anvisningarna. För att uppgifterna ska kunna användas som en del av upphandlingen måste det dock finnas produktgruppsspecifika PEFCR-regler som för närvarande endast finns för 17 produktgrupper. Dessutom förbereds PEFCR-regler för fem nya produktgrupper. Man torde fatta beslut om en mer omfattande användning av PEF som en del av Europas integrerade produktpolitik 2021.

**Nyckelord:** Miljöavtryck, kolavtryck, offentliga upphandlingar, mejeriprodukter, IT-utrustning





## Preface

Emissions caused by consumption in Finland have not decreased in the 2000s. In 2015, public consumption caused 12 per cent of emissions (Nissinen & Savolainen 2019, 19). The total volume of public procurements in Finland is approximately EUR 35 billion annually (KEINO 2018). In 2015, more than half of the carbon footprint of public procurements was generated in municipalities (Nissinen & Savolainen 2019). The current Act on Public Procurement and Concession Contracts allows observing environmental matters in procurements (Alhola *et al.* 2019). Due to their enormous procurement volumes, municipalities also have a special role in the creation of the low-carbon market. Municipalities have the opportunity to promote the demand for products with lower environmental impacts and thereby act as leaders in climate issues.

This study was conducted as a part of the Canemure project with the Environmental Services of the City of Helsinki's Urban Environment Division in October–December 2019. Canemure (Towards carbon neutral municipalities and regions) is a six-year EU Life project implementing the national energy and climate strategy through several concrete sub-projects. Furthermore, the project supports regional climate cooperation in several regions and forerunner networks. The expert network (Finnish Environment Institute SYKE, the University of Tampere, Natural Resources Institute Finland and the Finnish Meteorological Institute) produces information and tools to support climate actions and share good practices. Among others, the project supports processes that create the preconditions for low-carbon production and consumption. The City of Helsinki is implementing a sub-project developing low-carbon procurement criteria, and the good practices developed will also be shared for use by other municipalities. The project aims to root the good practices in the city's operations.

The purpose of this study was to assess whether the Product Environmental Footprint (PEF) developed by the European Commission in 2013–2019 could be used as a method to calculate the carbon footprint of products procured by municipalities. In particular, the study is based on the product category-specific PEFCRs and other available materials. The Finnish Environment Institute SYKE (Johanna Suikkanen) and the City of Helsinki's Urban Environment Division (Satu Turula, Reetta Huomo, Mia Malin, Petteri Huuska) discussed the needs and opportunities. The discussions were focused on dairy products especially since competitive bidding for the procurement of them was being prepared at the time, and IT equipment, for which a procurement was being developed. Furthermore, the Finnish Environment Institute SYKE looked into the rights of use of databases and other materials from European Commission officials involved in matters related to the PEF. The Nordic Council of Ministers' SCEPEF project (2016–2019) led by SYKE created a knowledge base for the author that allowed them to continue with the application of PEF in public procurements<sup>1</sup>.

The development of the environmental footprint has been developed for a long time already. It is currently in a transition phase during which the further use of the PEF method is being planned. The method is already available for use to support procurements and, in the future, it may be a base method used for the determination of environmental impacts in product policy instruments (Nissinen *et al.* 2019). Decisions are expected from the EU from 2021 onwards.

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<sup>1</sup> The Nordic Swan Ecolabel, circular economy and environmental footprint: <https://www.syke.fi/hankkeet/scepef>

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# 1 Introduction

Low-carbon public procurements consider the life cycle greenhouse gas emissions of the product or service being procured. A need exists for the development of criteria, tools and calculators for the promotion of low-carbon procurements. In recent years, the EU has been developing a method for the calculation of the Product Environmental Footprint (PEF) based on life cycle assessment. This report discusses the suitability of said PEF method for the calculation of carbon footprint in conjunction to a procurement.

## 1.1 Background: low-carbon public procurements

Municipal procurements are significant both in terms of finances and environmental impacts. In Helsinki, for example, procurements account for 40% of the city's expenditure (City of Helsinki 2018, 91), and cities and municipalities make two thirds of all public procurements in Finland (Alhola *et al.* 2019). Furthermore, in 2015, almost four fifths of the carbon footprint of public procurements were generated in municipalities and joint municipal authorities (Nissinen & Savolainen 2019, 24).

Sustainable procurements allow cities and municipalities to reduce the life cycle harmful environmental impacts of products. Low-carbon procurement refers to that the life cycle greenhouse gas emissions of a product or a service have been taken into consideration in the procurement and that requirements and/or comparison criteria have been set for them (Alhola *et al.* 2019, 10). The action programme of the City of Helsinki seeks to observe the climate effects of procurements by means of, for example, the calculation of effects and the development of procurement criteria (City of Helsinki 2019, 24).

According to the updated Public Procurement and Concession Contracts Act, tenderers can be requested to provide a statement of their actions related to the management of environmental issues, environmental aspects may be included in the comparison criteria of the procurement's price/quality ratio and, when certain conditions are met, environmental preconditions may be specified for the realization of the procurement contract (Finlex 2016, articles 90-98). The carbon footprint describes the life cycle climate effects of a product and measuring it as a part of the procurement may be one possibility for the long-term reduction of emissions caused by municipal procurements.

## 1.2 Purpose of this report

The purpose of this report is to study the kind of support that EU's PEF method gives to the calculation of carbon footprint in conjunction with public procurements. The report studies the suitability of the PEF method for public procurements. Furthermore, it studies the extent to which the materials and databases made available by the European Commission could be used for the calculation of the carbon footprint in conjunction with a procurement process. The report also describes the calculation and supporting materials in more detail for dairy products and IT equipment.

## 2 Product Environmental Footprint (PEF)

Product Environmental Footprint (PEF) is a method based on life cycle assessment. It addresses sixteen environmental impact categories, one of which is climate change. Existing standards and methods have been observed in the development of the PEF, but it is more detailed and prescriptive than previous guidance. For example, the PEF guidance specifies the impact assessment methods to be used for each environmental impact category and specifies the required data for each product category. Due to these characteristics, the comparability of results calculated according to the PEF method is better than in previous methods.

### 2.1 European Commission's recommendations on PEF

The Product Environmental Footprint (PEF) is a method developed by the European Commission through extensive co-operation, to be used for the comprehensive assessment of the life cycle environmental impacts of products and for ensuring the comparability of data. The PEF study considers the product category's most significant environmental impacts out of 16 environmental impact categories as well as the life cycle phases in which the impacts mostly arise.

According to the recommendation published in the Official Journal by the European Commission, the PEF method can be used to support green procurements. This and the other goals, scopes of application and applications of the method have been published in the "Commission Recommendation on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations" (2013/179/EU, 9 April 2013) (European Commission 2013).

The PEF Guide has been published in Annex II of the Commission Recommendation. The PEF Guide describes the method and the rules applicable to the definition of a product's life cycle environmental impacts. It provides guidance on how to calculate a PEF, as well as how to develop product category-specific methodological requirements for use in Product Environmental Footprint Category Rules (PEFCRs) (European Commission 2013). The European Commission has also published the final pilot-phase PEFCR Guidance that is used for the development of product category-specific rules, i.e. PEFCRs (European Commission 2017). The Joint Research Centre (JRC) published recommendations for the updating of the PEF method in 2019 (Zampori & Pant 2019). The JRC report can therefore be considered as the latest information about the method, but it does not replace the official recommendation published in 2013.

Comparative assertions about the product being examined compared to other products in the same product category can only be made when a PEFCR is available for the product category. The PEFCR supplements the consistency, accuracy, relevance and reproducibility of the PEF study and facilitates focusing attention on the most important parameters. The purpose is to reduce the time, efforts, and costs involved in completing a PEF study. (European Commission 2013, 9). Using the PEF method in conjunction with procurements therefore requires that a PEFCR exist for the product category (Zampori & Pant 2019, 28).

PEFCRs have thus far been published for seventeen product categories, including food products, IT equipment, photovoltaic panels, rechargeable batteries, T-shirts, laundry detergents, leather as well as some construction products such as metal sheets and water supply pipes. (European Commission 2020).

## 2.2 Contents of the PEF study

A PEF study follows the principles of life cycle assessment (ISO14044:2006) regarding, for example, the definition of goals, functional unit and reference flow, determination of system boundaries and work phases. As a general principle, all of the sixteen specified default EF impact categories and associated specified EF impact assessment models shall be applied. Any exclusion shall be explicitly documented, justified, reported in the PEF report. (European Commission 2013, 23)

### 2.2.1 PEF profile

An inventory of all material/energy resource inputs/outputs and emissions into air, water and soil for the product supply chain shall be compiled as a basis for modelling the PEF. All resource use and emissions associated with the life cycle assessment stages included in the defined system boundaries shall be included in the profile. In general, phases to be included are raw material acquisition and pre-processing, capital goods, production, product distribution and storage, use, logistics and end-of-life. Where possible, primary data i.e. facility-specific inventory data, shall be used. If direct information is not available at the company for a specific background process, secondary data shall be used. The PEFCR specifies the processes for which primary data must be provided. Further information about the data requirements can be found in chapter 2.4.

### 2.2.2 Environmental impact categories included in the PEF

The default environmental impact categories included in the PEF are as follows (European Commission 2013, 22):

- 1 Climate change
- 2 Ozone depletion
- 3 Ecotoxicity for aquatic fresh water
- 4 Human toxicity – cancer effects
- 5 Human toxicity – non-cancer effects
- 6 Particulate matter
- 7 Ionising radiation – human health effects
- 8 Photochemical ozone formation
- 9 Acidification
- 10 Eutrophication – terrestrial
- 11 Eutrophication – freshwater
- 12 Eutrophication – marine
- 13 Resource depletion – water
- 14 Resource depletion – mineral
- 15 Resource depletion – fossil resources
- 16 Land use transformation

### 2.2.3 Impact assessment

The environmental impact assessment of a product is done based on the inventory using the selected impact categories and impact assessment models. The impact assessment methods use models for quantifying the causal relationships between the material/energy inputs and emissions and each impact category being assessed. Each category hence refers to a certain stand-alone environmental footprint impact assessment model (European Commission 2013, 21). The models are so-called midpoint models. The impact categories, mid-point indicators and impact assessment models used in the PEF studies are specified in the PEF Guide.

In the first phase, the flows are classified according to the environmental impact they affect.

The information about the flows is presented as compounds (such as CO<sub>2</sub>, CH<sub>4</sub>) for which characterisation factors are available. All compounds that accelerate climate change, for example (greenhouse gases), are assigned to the climate change category. This action is done for the other impact categories as well. Characterisation factors are assigned to all the compounds categorised in each impact category. The factors represent the impact of the compounds on the category in question. The PEF includes specified characterisation factors that shall be used. In order to determine the impact, the quantity of the compound is multiplied by its characterisation factor, and the harmonised impacts of all the compounds in each category are summed to determine the total impact of the product for the environmental impact category in question.

The significance of the impact can be assessed by means of normalisation (recommended in PEF). This allows the determination of the burden compared to the reference unit (such as per person in a specific year or in a specific region) (European Commission 2013, 49). The result for the environmental impact category is divided by the normalisation value given in the PEF CR Guidance (European Commission 2017, 161) and the website (European Commission 2019b; Zampori & Pant 2019). The normalisation value for climate change updated on the website is 8,100 kg CO<sub>2</sub>/person.

The PEF method includes the weighting of the environmental impact assessment. When the sixteen default impact categories of the PEF study are compared or summed up to a single overall environmental impact score, the normalised results are multiplied by the weighting factors that describe the relative importance of the impact categories (Zampori & Pant 2019, 105). Table 1 shows the weighting factors that can be found on the European life cycle platform's website (European Commission Joint Research Centre 2019), based on the report by Sala *et al.* (2018). It should be noted that the weighting factor of climate change is many times higher than that of other impact categories. It can therefore be assumed that climate change is generally a most relevant impact category in the PEF CRs of all product categories.

**Table 1 Updated weighting factors (Sala *et al.* 2018).**

Impact category	Weighting factor (%)
Acidification	6.20
Climate change	21.06
Ecotoxicity, fresh water	1.92
Eutrophication, fresh water	2.80
Eutrophication, marine	2.96
Eutrophication, terrestrial	3.71
Human toxicity, cancer	2.13
Human toxicity, non-cancer	1.84
Ionising radiation	5.01
Land use	7.94
Ozone Depletion	6.31
Particulate matter	8.96
Ozone formation at the ground level of the troposphere	4.78
Resource depletion, fossil resources	8.32
Resource depletion, minerals and metals	7.55
Water use	8.51

This weighting has been done during the development of the PEF CRs in determining the product's most relevant impact categories. The most relevant environmental impact categories have already been specified in the PEF CRs, and the PEF study focuses on these. If the study only focuses on one environmental impact category, such as the assessment of climate effects, the weighting does not apply.

## 2.3 Calculation of carbon footprint in the PEF method

The PEF study addresses sixteen environmental impact categories related to the use of resources and emissions harmful to the environment and humans. However, the carbon footprint can also be calculated following the PEF-method.

### 2.3.1 Climate change

Climate change is assessed as follows based on the recommendation of the Intergovernmental Panel on Climate Change (IPCC, 2013):

- Impact assessment model: Bern model – Global Warming Potentials (GWP) over a 100 year time horizon
- Impact category indicators: kg CO<sub>2</sub> equivalent (CO<sub>2</sub>e).

In the determination of the PEF profile, an inventory of the use of material and energy as well as emissions and waste is performed for each stage of the life cycle. For these, individual greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, etc.) caused by the procurement and pre-processing of raw materials, capital goods, production, product distribution and storage, use, logistics and end-of-life are quantified.

The inventory flows are classified, i.e. all the inputs and outputs causing greenhouse gas emissions are assigned to the climate change category. In the characterisation phase, the share of each categorised input and output is given as the reference compound in its impact category. The reference compound for climate change is carbon dioxide, and all compounds impacting the climate change are given as CO<sub>2</sub> equivalents. The quantity of each greenhouse gas is multiplied by its characterisation factor, and after this, the impacts are summed up to obtain the impact of the entire product on climate expressed as carbon dioxide equivalents. (Zampori & Pant 2019, 104-105)

European Commission (2013) includes an example illustrating characterisation. In the example, the characterisation factor for methane is 25 CO<sub>2</sub>e, which means that its impact on global warming is thus 25 times higher than of CO<sub>2</sub> (1 CO<sub>2</sub>e). Table 2 shows this example of the calculation of climate impacts using the PEF method (European Commission 2013, 49). The characterisation factors have since been updated, and Table 2 is therefore only included in this report for illustrative purposes.

**Table 2. An example of the calculation of climate impacts using the PEF method (European Commission 2013, 49).**

Category	Quantity	Factor	Result
CO <sub>2</sub>	5132 g	1	=5.132 kg CO <sub>2</sub> e
CH <sub>4</sub>	8.2 g	25	=0.205kg CO <sub>2</sub> e
SO <sub>2</sub>	3.9 g	0	=0kg CO <sub>2</sub> e
NO <sub>x</sub>	26.8 g	0	=0kg CO <sub>2</sub> e
Total			=5.337kg CO <sub>2</sub> e

A database (a zip file) is available on the JRC website, allowing the integration of the characterisation factors into the life cycle software used. Table 3 shows the characterisation factors for climate change used in the PEF. These characterisation factors can also be found in the background report on characterisation factors published by the JRC (Fazio *et al.* 2018, 5).

**Table 3. Characterisation factors as CO<sub>2</sub> equivalents (Fazio et al. 2018, 14).**

Characterisation factors		GWP <sub>100</sub>
Carbon dioxide (fossil)	Air emission	1
Methane (fossil)	Air emission	36.75
Carbon monoxide (fossil)	Air emission	1.57
Carbon dioxide (fossil)	Resources from air	0
Carbon dioxide (biogenic)	Resources from air	0
Carbon dioxide (biogenic)	Air emission	0
Methane (biogenic)	Air emission	34
Carbon monoxide (biogenic)	Air emission	0
Carbon dioxide (land use change)	Resources from air	-1
Carbon dioxide (land use change)	Air emission	1
Methane (land use change)	Air emission	36.75
Carbon monoxide (land use change)	Air emission	1.57

### 2.3.2 Land use change

The life cycle impacts of many products include changes in land use that are relevant for the product's carbon footprint. European Commission (2013) describes the change in land use as follows: "Greenhouse gas emissions that occur as a result of direct land use change shall be allocated to products for (i) 20 years after the land use change occurs or (ii) a single harvest period from the extraction of the evaluated product." A more detailed specification is attached as Appendix VI to the Commission Recommendation. Furthermore, any greenhouse emissions arising from direct land use change must be included in the PEF study as described in Appendix VI to Recommendation 2013/179/EU. (European Commission 2013, 32)

### 2.3.3 Renewable energy

The Recommendation of the European Commission describes the accounting for renewable energy as follows (European Commission 2013, 32):

- Renewable energy may be taken into account as a credit if it is produced in excess of the amount consumed and it is provided to, for example, the electricity grid, provided that the credit has not already been taken into account in other systems.
- The credits shall be calculated with respect to the corrected average, country-level consumption mix of the country to which the energy is provided.
  - Where such data is not available, the corrected average EU consumption mix, or otherwise most representative mix shall be used.
  - If no data are available on the calculation of corrected mixes, the uncorrected average mixes shall be used.

### 2.3.4 Temporary carbon storage or delayed emissions

Credits associated with temporary carbon storage or delayed emissions shall not be considered in the calculation of the carbon footprint. However, these may be included as "additional environmental information" in the study. (European Commission 2013, 123)



## 2.4 Data quality requirements

The PEF Guide specifies the situations in which primary data, i.e. value chain specific data, must be collected and cases that can be modelled using secondary data, or general data. Primary data shall be obtained for all foreground processes and, where appropriate, also for background processes (European Commission 2013, 41).

The PEFCRs describe the environmental impacts, life cycle phases and processes that are the most relevant for the product category in question and for which primary data shall therefore be obtained. The PEFCRs detail the processes for which primary data shall be obtained as well as the requirement for data collection and coverage.

Primary data is data that is directly measured or collected and representative of activities at a specific facility or set of facilities. It can be obtained, measured or calculated based on activity data and the related emission factors. The emission factors may be derived from generic data subject to data quality requirements. Typical specific data sources are process- or plant-level consumption data; bills and stock/inventory changes of consumables; emission measurements (amounts and concentrations of emissions from gas and wastewater) and the composition of products and waste.

Secondary data is not based on direct process measurements or calculations. It can be sector-specific or multi-sector and it is often an average based on, for example, life cycle inventory databases. The data is usually used only for processes in the background system. Only if the secondary data are more representative or appropriate than primary data for foreground processes, in which case secondary data shall also be used for processes in the foreground system (European Commission 2013, 41-42).

The data to be used depends on the kind of access of the party calculating the PEF must process data. Zampori & Pant (2019, 101) describe three different situations:

1. The process is run by the company performing the PEF study.
2. The process is not run by the company performing the PEF study, but the company has access to (company-)specific information.
3. The process is not run by the company performing the PEF study and this company does not have access to (company-)specific information.

The PEF method specifies the data needs for each of the three situations mentioned above. The data needs are described as the so-called data needs matrix that determines the data to be used in case of “most relevant process” and “other process”. This matrix has been published in the PEFCR Guidance (European komissio 2017). Furthermore, each PEFCR includes this matrix, and Zampori & Pant (2019) gives several versions of the matrix. The data needs matrix intended for the user of PEFCR rules also includes options for processes other than the most relevant ones. (Zampori & Pant 2019, 101 & 178)

Data quality covers aspects, such as technological, geographical and time-related representativeness, as well as completeness. The achieved quality rating for each of the quality criteria shall be summed up and divided by the total number of criteria. The PEF method shows the Data Quality Rating (DQR) formula and the rating to the data level. PEF information can be used in Business-to-Business (B2B) and Business-to-Consumers (B2C) communications only if the data meets the quality requirements. The PEFCR Guidance provides further information about the scoring of data quality by product category. (European Commission 2013, 33-40)

## 2.5 Available materials to support the calculation

The European Commission’s *Single Market for Green Products* website provides the PEFCRs and an Excel spreadsheet for the collection of life cycle inventory data for each product category for which a PEFCR exists. The spreadsheet steers the data to be collected and indicates the data for which company-

specific data should be obtained or measured. The Excel spreadsheets guiding the inventory phase data collection also include the above mentioned DQR formula that describes the overall quality of data.

The JRC has been coordinating the technical and scientific development of the PEF method. Its website provides information for the generation of data and links to updated databases and reference packages ([European Platform on Life Cycle Assessment](https://eplca.jrc.ec.europa.eu/EnvironmentalFootprint.html)<sup>2</sup>). Furthermore, the website provides the characterisation factors, normalisation factors and weighting factors used in the PEF study ([Life Cycle Data Network: Environmental Footprint Reference Packages](https://eplca.jrc.ec.europa.eu/LCDN/develop-erEF.xhtml)<sup>3</sup>).

## 2.5.1 Databases

The EC has provided a number of databases for use in the environmental footprint work (hereinafter referred to as the EF databases). They are available in the format specified in the *International Life Cycle Data System guidebook*<sup>4</sup> available on the *Life Cycle Data Network*<sup>5</sup> within the website *European Platform on Life Cycle Assessment*<sup>6</sup>. This format allows importing them into software used for life cycle assessment. The party performing the PEF study must check with the provider of the software used whether data can be imported. At least Gabi and Simapro support importing from EF databases at the moment.

All the databases that the European Commission intends to make available for parties performing PEF studies were intended to be published by the end of March 2020. The materials can be accessed on the websites of the parties that have developed them (incl. JRC and companies such as Quantis, Thinkstep, Cycleco). Table 4 shows the available databases.

**Table 4: Databases according to EF (European Commission 2019a).**

Database name	Provider	Database link
Energy and transport	Thinkstep	<a href="http://lcdn.thinkstep.com/Node/">http://lcdn.thinkstep.com/Node/</a>
Packaging	Thinkstep	<a href="http://lcdn.thinkstep.com/Node/">http://lcdn.thinkstep.com/Node/</a>
Food production	Quantis	<a href="https://lcdn.quantis-software.com/PEF/">https://lcdn.quantis-software.com/PEF/</a>
Metals	Thinkstep	<a href="http://lcdn.thinkstep.com/Node/">http://lcdn.thinkstep.com/Node/</a>
Chemicals for paints	CEPE ecoinvent	<a href="http://lcdn-cepe.org">http://lcdn-cepe.org</a>
Others	Quantis	<a href="https://lcdn.quantis-software.com/PEF/">https://lcdn.quantis-software.com/PEF/</a>
Chemicals	Ecoinvent	<a href="http://ecoinvent.lca-data.com/">http://ecoinvent.lca-data.com/</a>
End-of-life	Thinkstep	<a href="http://lcdn.thinkstep.com/Node/">http://lcdn.thinkstep.com/Node/</a>
Feed	Fefac	<a href="http://lcdn.blonkconsultants.nl/Node/">http://lcdn.blonkconsultants.nl/Node/</a>
Waste incineration	Thinkstep	<a href="http://lcdn.thinkstep.com/Node/">http://lcdn.thinkstep.com/Node/</a>
Plastics	Thinkstep	<a href="http://lcdn.thinkstep.com/Node/">http://lcdn.thinkstep.com/Node/</a>
Textiles	Cycleco	<a href="https://node.cycleco.eu/node/">https://node.cycleco.eu/node/</a>
Electronics	Thinkstep	<a href="http://lcdn.thinkstep.com/Node/">http://lcdn.thinkstep.com/Node/</a>
Refrigerated transport	Thinkstep	<a href="http://lcdn.thinkstep.com/Node/">http://lcdn.thinkstep.com/Node/</a>
Recycling of glass	RDC	<a href="http://soda.rdc.vp5.be/login.xhtml?stock=FEVE_EF_comp">http://soda.rdc.vp5.be/login.xhtml?stock=FEVE_EF_comp</a>

<sup>2</sup> European Platform on Life Cycle Assessment: <https://eplca.jrc.ec.europa.eu/EnvironmentalFootprint.html>

<sup>3</sup> Life Cycle Data Network, Environmental Footprint Reference Packages: <https://eplca.jrc.ec.europa.eu/LCDN/develop-erEF.xhtml>

<sup>4</sup> International Life Cycle Data System (ILCD)

<sup>5</sup> The Life Cycle Data Network

<sup>6</sup> European Platform on Life Cycle Assessment

## 2.5.2 Conditions of use of the databases

When registering to the databases mentioned in the previous chapter, one of the questions concerns the use of data. When the materials are used for a PEF study and in compliance with the PEFCR or for developing a new PEFCR, the materials may be used, reproduced and adapted free of charge. According to the PEF website, the granting of rights for public use arranged by the EC shall be valid until 31 December 2021, except for the Cycleco database for which they will be valid until the end of 2020 (European Commission 2020). It should, however, be assumed that the granting of rights will continue until the end of 2024 (Fazio *et al.* 2019, 40).

It should be noted regarding the free access to the databases that if the PEF study does not concern the entire environmental footprint specified by the PEFCR, the right of free access to the databases does not apply. This is the case when, for example, the study only concerns the carbon footprint, and not all the impact categories required by the PEFCR. The use of these databases is also subject to payment when performing a PEF study for a product category for which no PEFCR exist. The party performing the study shall acquire the license to use each of the databases needed separately from each provider (i.e. chemical data from Ecoinvent, transport data from Thinkstep etc.).

## 3 Product category-specific examples

The PEFCRs for dairy products guide the collection of data and the calculation of the environmental footprint for milk, for example, which is a product commonly procured by municipalities. The PEFCRs for IT equipment, on the other hand, only cover storage systems and may therefore be of limited use in terms of the carbon or environmental footprint calculation performed in conjunction with a public procurement. The possibilities for the calculation of the environmental footprint for these products, and in particular carbon footprint calculation associated with procurement, are presented below.

### 3.1 Dairy products

#### 3.1.1 Specification for the dairy product category

The PEFCRs for dairy products were published on 25 April 2018 and they are valid until 31 December 2020 (European Commission 2018c). Furthermore, a life cycle inventory spreadsheet has been published for the collection of data (European Commission 2018a).

The PEFCRs for dairy products are based on the PEF Guide (European Commission 2013), the PEFCR Guidance document (European Commission 2017) and the guidelines of the International Dairy Federation<sup>7</sup> (European Commission 2018c, 27).

In addition to liquid milk, the PEFCR also covers dried whey products, cheese, fermented milk products and butterfat products i.e. the product categories under the following CPA codes (European Commission 2018c, 29-33):

- 10.51.11 (Processed liquid milk)
- 10.51.3 (Butter and dairy spreads)
- 10.51.4 (Cheese and curd)
- 10.51.52 (Yoghurt and other fermented or acidified milk or cream)
- 10.51.54 (Lactose and lactose syrup)
- 10.51.55 (Whey).

The functional unit used in the PEF calculation of liquid milk is: “Liquid milk, consumed at home as final product without heating, cooking or further transformation”. The reference flow is “1,000 ml of liquid milk”. Packaging is accounted in the functional unit. Nutritional value can also be used as the reference flow in some cases. Detailed instructions are provided in the PEFCR. (European Commission 2018c, 36-38)

#### 3.1.2 Most relevant environmental impact categories and life cycle stages

The PEFCRs for dairy products specify the most relevant environmental impact categories and life cycle stages for dairy products. The PEFCR table 12 lists the most relevant environmental impact categories for the sub-category “Liquid milk”: **climate change**, particulate matter, eutrophication, acidification, land use, water use and use of fossil resources (European Commission 2018c, 55). Table 9 (p. 39) specifies the life cycle stages and activities to be included in the calculation as follows:

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<sup>7</sup> A Common Carbon Footprint Approach for Dairy. The IDF guide to standard life cycle assessment methodology for the dairy sector” (International Dairy Federation)

- **Raw milk supply:** Feed production, milk production, milk collection and transport
- **Dairy processing:** Dairy products processing, dairy ingredients processing, dairy ingredients transport to dairy processing unit, container filling or product packing, storage
- **Non-dairy ingredients supply, transport and packaging manufacturing**
- **Packaging:** Raw materials production, packaging manufacturing and packaging transport to dairy unit
- **Distribution:** Transport to distribution centre, warehousing at distribution centre, transport to point of sale, retailing at point of sale (incl. refrigerated storage), transport to final user
- **Use:** Chilling operations in domestic refrigerator and dishwashing
- **End-of-life:** Household waste: packaging (and food) waste transport and treatment.

Chapters 3.4.3 and 3.4.4 of the PEFCR for dairy also list the most relevant inputs and outputs to produce raw milk and the processing of milk (European Commission 2018c, 40-48). The mandatory company-specific activity data is described in more detail in chapter 5 of the PEFCRs (European Commission 2018c, 60). The activities for which data is required is explained in Tables 17–26 of the PEFCR.

### 3.1.3 Data to be collected

It is important to note that the most relevant environmental impact categories, life cycle stages and processes affect the quality requirements of the data to be collected. Chapter 5 of the PEFCR for dairy products includes a list of mandatory company-specific activity data to be collected (European Commission 2018c, 60). Secondary data can be used for the processes and flows not listed in the chapter. The inventory spreadsheet published by the European Commission (European Commission 2018a) is a compilation of all the data collection requirements for the entire life cycle. The spreadsheet lists, for each required process, the data to be collected, the unit of measurement and, if secondary data is used, the database to be used.

### 3.1.4 Climate impacts

The PEFCR for dairy products describe the modelling of climate effects, taking into account three sub-categories: fossil climate change, biogenic climate change and climate change related to land use and land transformation. (European Commission 2018c, 98-99)

## 3.2 IT equipment

### 3.2.1 Specification for the IT equipment product category

The PEFCRs for IT equipment were published on 20 April 2018 and they are valid until the end of 2020. In addition to the PEFCR Guidance and the PEF Guide, product specifications obtained from the industry and other reports, standards and directives relevant to IT products have been used in the development of the rules (European Commission 2018d, 66). The PEFCRs and the attached inventory spreadsheet are available<sup>8</sup> on the European Commission website (European Commission 2020).

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<sup>8</sup> “Inventory table” refers to the Excel model that guides the collection of data: European Commission 2018b

The scope of the PEFCRs is storage subsystems equipped with hard disk drives as storage devices. The CPA code for the products included in this PEFCR is 26.20.2 Storage units and other storage devices (European Commission 2018d, 20). This category is a part of economic category CPA 26.20 “Computers and peripheral equipment”<sup>9</sup> (Statistics Finland 2018). It is important to note that the PEFCR for IT equipment only covers the storage units and that using it for the calculation of the carbon footprint of a city’s IT equipment procurements may therefore not be appropriate.

The functional unit used in the PEFCR rules for IT equipment is: “A storage subsystem providing one terabyte of formatted capacity to be suited for the needs of the purchasing customer for one year”. The definition of storage system is obtained from the SNIA Dictionary maintained by the Storage Networking Industry Association<sup>10</sup>. (European Commission 2018d, 20)

### 3.2.2 Most relevant environmental impact categories and life cycle stages

The most important impact categories of IT equipment are **climate change**, resource depletion and particulate matter. The life cycle stages and included activities are:

- **Raw material acquisition and pre-processing:** Materials that constitute components of, accessories for, and packaging for IT equipment; transport of materials
- **Production of main product:** IT equipment assembly
- **Storage and distribution:** Transport of IT equipment
- **Use:** Use of IT equipment, consumables and transport of consumables
- **End-of-life:** Recycling of IT equipment and packaging, refurbishment and disposal of consumables. (European Commission 2018d, 22)

### 3.2.3 Data to be collected

Primary data is collected for the most relevant impact categories and life cycle stages. The most important impact categories of IT equipment are **climate change**, resource depletion and particulate matter. The most important life cycle stages are raw material acquisition and pre-processing, use and end-of-life. The most relevant processes of each of the most relevant impact categories are listed in Table 4.1 of the PEFCR for IT equipment. Use is the most important stage of the climate change impact category. The most important other processes are related to the procurement and pre-processing of raw materials for the various components (European Commission 2018d, 25-26). The company-specific data to be obtained is listed in Chapter 5 of the PEFCR. Sub-chapter 5.2 lists the processes expected to run by the company (European Commission 2018d, 30-31):

- **Raw material acquisition and pre-processing:** Transport of materials from production site of the materials to the production site where the assembly takes place
- **Storage and distribution:** Transport of IT equipment products from production sites to consumers
- **Use:** Life time of equipment, failure rate and transport from production sites to consumers
- **End-of-life:** Recycling of IT equipment and packaging as well as refurbishment.

The detailed data requirements are specified in the life cycle inventory table (European Commission 2018b).

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<sup>9</sup> Its other subcategories are as follows: Computing machinery and parts and accessories thereof (26.20.1), Other units of automatic data processing machines (26.20.3), Parts and accessories of computing machines (26.20.4) and 26.20.9 Computers and peripheral equipment manufacturing services (26.20.9) (Statistics Finland 2018).

<sup>10</sup> The Storage Network Industry Association Dictionary is a dictionary maintained by the industry association for storage. The PEFCR refers to the 2014 edition.

### 3.2.4 Climate impacts

The sub-impact categories 'Climate change - biogenic' and 'Climate change - land use and land transformation' shall not be reported separately because their contribution to the total climate change impact, based on the benchmark results, is less than 5% each. (European Commission 2018d, 23)

## 4 Carbon footprint in public procurements

Several carbon footprint calculation methods and calculators are nowadays available for different purposes. The development of the PEF method started from the need to harmonise the carbon footprint calculation methods and to also take other important environmental impacts into account in addition to the carbon footprint. The method includes characteristics that are useful for public procurements and improved from previous ones. The central goal to provide comparable and reliable data about the life cycle environmental impacts of products, for example, is important for public procurements, in particular. The comparability is ensured when the calculation of the environmental footprint is done according to the PEFCRs.

### 4.1 Use of carbon footprint calculators to support public procurements

The carbon footprint of public procurements in Finland was calculated for the first time in 2019 by SYKE using the macro-level ENVIMAT tool (Nissinen & Savolainen 2019). The approach used is suitable for the overall assessment of public procurements but not as a part of a specific procurement. Likewise, the Hankintapulssi tool updated jointly by SYKE and Hansel is suitable for the overall assessment of the procurements of an organisation, allowing authorities to estimate the carbon footprints of the product categories procured and the total carbon footprint of procurements on a rough level (Environmental Administration 2020).

In the EULIFE+ funded Julia 2030 project (2009–2011), SYKE and the City of Helsinki developed the JUHILAS carbon footprint calculator (Finnish Environment Institute 2013). The calculators developed for IT equipment, paper, office chairs, hygienic products and outdoor lighting were based on simplified life cycle calculation (“Streamlined LCA”), and the approach was based on the suitability for assessment in conjunction with competitive bidding processes. At the time of publication, they were the first of their kind (Mattinen & Nissinen 2010, 10). The calculators were based on the approaches used by Bala *et al.* (2010), with the carbon footprint consisting of materials, energy and the use stage as well as end-of-life (Mattinen & Nissinen 2010, 14). The calculators were rather simple and have not been updated since. The final report of the tool development states that the carbon footprint calculators to be developed to support public procurements shall provide comparable and reliable estimates of the greenhouse gas emissions of products since comparability and fairness are key issues affecting the public procurement processes (Mattinen & Nissinen 2010).

Various guidelines and standards exist for the calculation of life cycle climate effects of products (i.e. goods or services). The differences of the guidance lead to a lack of direct comparability of the carbon footprints calculated using different standards and guidelines (Mattinen & Nissinen 2010, 10). The development of the PEF method was prompted by the need to harmonise the carbon footprint calculation methods, and the goal was later expanded to cover the total environmental footprint (Chomkhansri & Pelletier 2011).

The following existing methods have been considered in the development of the PEF method: ISO14044, ISO 14067, ILCD, Ecological Footprint, WRI/WBCSD Product and Supply Chain Standards, Greenhouse Gas Protocol, French BPX 30-323 and PAS 2050 used in Great Britain. All the methods are based on the life cycle approach and include similar requirements in terms of data collection, modelling and quality. They differ, however, from each other with respect to product category-specific rules, system boundaries, general allocation and the allocation of end-of-life processes, the analysis and presentation of uncertainty and the interpretation of results. All the methods used the GWP 100 model



to assess the climate change and the IPCC framework to assess the land use change. Carbon sequestration and delayed emissions are excluded or reported separately in all the methods, and indirect land use change and off-setting are also excluded. The earlier methods could be not used for making comparative claims, not even when the same method guideline had been used for the products being compared. Reliable and comparable environmental footprint data requires an even more prescriptive method guide and product category-specific rules. (Chomkhansri & Pelletier 2011, 7, 57-58)

The international carbon footprint standard ISO 14067, for example, therefore includes data requirements like the ones used in the PEF, but the PEFCRs specify these requirements in even more detail. The system boundaries, functional unit and data requirements of the PEFCR rules ensure that the same preconditions apply to the comparison of products within a specific product category. The impact assessment models and characterisation factors specified in PEF are also a necessary part of ensuring the comparability. Furthermore, PEF allows the processing of other environmental impact categories at the same time with climate impacts.

#### 4.2 Suitability of the PEF method for the determination of product carbon footprint in public procurements

Life cycle assessment has been identified as an important source of environmental information in public procurements (European Commission 2016), and the PEF method developed based on LCA seeks to provide even more reliable information (Nissinen *et al.* 2019). The European Commission recommendations, guidelines and reports described in this report can be used to determine the cases in which the overall PEF data could be used for product comparison, but no unambiguous guidelines concerning solely the carbon footprint can be found in the guidelines related to the PEF method. They have therefore been supplemented by asking the European Commission about the matter. Some parts of the considerations about suitability shown below are therefore not based on published data since some of the interpretations are based on e-mail discussions.

The goals of the calculation of carbon footprint related to procurements determine the possibilities to use the PEF method, and considering two different cases is therefore useful:

- **The carbon footprint data is used for the comparison of products during competitive bidding.** If the product carbon footprint data is requested as a part of competitive bidding so that it is used as one of the comparison criteria for the economically most advantageous tender, the situation is one of comparison. According to the PEF guidelines, PEF studies performed in accordance with the PEFCRs can be considered as comparable (European Commission 2013, 13). In order to ensure the reliability of data, the databases described in chapter 2.5 shall be used in the PEF study. If data covering all the environmental impact categories required in the PEFCR is requested from the supplier, the data can with certainty be considered comparable and the databases described in chapter 2.5 are available for use free of charge. If the PEF study only concerns the carbon footprint, the use of the databases is subject to a charge (see chapter 2.5.2). The PEF guidelines do not specify anything about the comparability of results of PEF focusing solely on the carbon footprint, but on the other hand, the goal of reliable and comparable data of all PEF guidance also applies to the carbon footprint. Grounds therefore exist for considering also the carbon footprint data as useful for the purpose of product comparison in competitive bidding.
- **Carbon footprint data is requested from the selected supplier.** If the carbon footprint data is required as a part of the procurement contract during the contract

period but the carbon footprint data is not used for product comparison during competitive bidding, it can also be performed for product categories for which no PEFCR guidelines are available:

- **If PEFCRs exist for the product category** and the purpose is to calculate the entire environmental footprint including all the environmental impact categories required in the PEFCRs, the databases can be used free of charge. But if the study does not cover all the environmental impact categories required by the PEFCRs and the PEF study focuses on the carbon footprint instead, the use of the databases is subject to a charge<sup>11</sup>.
- **If no PEFCRs exist for the product category in question**, the suppliers can be requested to provide carbon footprint data performed using the PEF method for the city's or supplier's own monitoring or development. The use of the databases is subject to a charge in this case. The data can be compared against the same product at specified intervals, for example.

When no PEFCRs exist, the user should be instructed to follow the PEF Guide (European Commission 2013, Appendix II), and the parts of the Guide relevant for the calculation of the carbon footprint should be explained. In such a case, the client or the supplier shall purchase the right to use the databases described in chapter 2.5 when the PEF study does not cover all the environmental impact categories required by the PEFCRs. In all the above-mentioned cases, the supplier must have access to an LCA software compatible with the databases (such as SimaPro or Gabi).

In addition to the two most relevant ways to use the PEF or carbon footprint results, there exists a third option, which is to specify it as a technical requirement in the invitation to tender. In this case, the acceptable carbon footprint level should be specified in the invitation to tender, which is challenging (Mattinen & Nissinen 2010, 10). However, it is possible to consider how the representative product of the PEF method could be used for the specification of level. It represents the European average product in the product category in question and its environmental footprint is calculated in the PEFCR screening study phase. It might be possible to use this average product for the specification of the acceptable level. On the other hand, it should be considered that this is an average product specified on the European level and using it as the required level of a low-carbon product procurement may not be fitting.

If the PEF study is used for external communications, the verification of data is mandatory (Zampori & Pant 2019, 116). The verification requirements are specified in the PEF Guide (European Commission 2013), and the data is updated in a JRC report (Zampori & Pant 2019, 116). When the municipal procurement organisation requires a PEF study (data) from the supplier, it can request the supplier to provide the data verification report or order one itself from a third party. The assessment report template and the reviewer eligibility criteria specified in the PEF Guide are used in both cases.

As a conclusion, it can be stated that the PEF method includes many improved characteristics that are useful for public procurements. The most relevant goal of the PEF method is to provide reliable and comparable data of the life cycle environmental impacts of products. Even though the PEF method could, according to the EC Recommendation, be used in public procurements (European Commission 2013, 12), it has not, according to the available information, been used for the substantiation of the environmental impact related to public procurements so far. Based on the e-mail from EC, however, a report on the matter can be expected<sup>12</sup>. Information concerning the use of carbon footprint calculators in public procurements will also be reviewed in Finland soon<sup>13</sup>.

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<sup>11</sup> E-mail Imola Bedo 10 December 2019; 16 December 2019

<sup>12</sup> E-mail Imola Bedo, 18 October 2019

<sup>13</sup> E-mail Katriina Alhola, SYKE, 18 December 2019

## 5 Conclusions and recommendations

This report studied whether the PEF calculation method developed by the EC would be suitable for the calculation of the carbon footprint in conjunction with public procurements. The purpose of the PEF study is to model the environmental impacts of a product throughout its life cycle, taking the 16 environmental impact categories into account. The PEF is a life cycle assessment method containing more detailed product category-specific rules for the modelling of the environmental impacts of the product than previous standards and calculation methods. For each product category, it determines the most relevant life cycle stages, processes and environmental impact categories and specifies the data requirements and data quality requirements for these. As a result, it allows the generation of more reliable and comparable environmental data than the previous methods.

On a general level, it can be stated that the PEF can be used for producing environmental information as a part of procurements. The supplier can be asked to provide the data specified in the PEF for the calculation of the environmental footprint or the carbon footprint. If PEF category rules exist for the product category being procured and the work is performed according to the rules, the information obtained can be used as grounds for comparison in the context of competitive bidding. When the PEFCRs are observed fully and the PEF study is performed for all the environmental impact categories required by the PEFCR in addition to the carbon footprint, the databases made available by the EC are provided for use free of charge. The right of use is valid until the end of 2021 but is expected to continue even after that. Further information about the continued development of the PEF method and the right of use to the databases after the transition period can be expected in 2020. The period of validity of the right of use should, however, be considered in the competitive bidding phase of the procurement.

The calculation of the carbon footprint based on the PEF method can be included in the contract. In such a case, the supplier is either requested to provide a carbon footprint calculation in accordance with the PEF(CR) or the data required in the PEFCR, allowing the client to use the data for the calculation of the carbon footprint. If the work is not performed fully according to the PEFCR, such as when only focusing on the carbon footprint, the use of the databases is subject to a charge, and this should be considered when requesting data from the supplier. Since PEFCRs currently only exist for seventeen product categories, they may not be available for the product category being procured.

Even if no PEFCRs are available for the product category being procured and the more generic PEF Guide is applied, the data obtained is useful for the internal monitoring of the product's environmental impacts. Requesting data would also prepare suppliers for the more comprehensive calculation of the carbon or environmental footprint that may be required in the future.

## Lexicon

<b>Background processes</b>	Processes that are not run by the company whose LCA is being undertaken
<b>CO<sub>2</sub>e</b>	Carbon dioxide equivalent. Signifies the unit for greenhouse gas emissions. Quantity is normally expressed in kilograms (kg), tons (t), kilotons (kt) or megatons, i.e. million tons (Mt), e.g. Mt CO <sub>2</sub> e.
<b>EF</b>	Environmental Footprint
<b>Foreground processes</b>	Processes which are run by the company whose LCA is being undertaken
<b>GWP</b>	Global Warming Potential
<b>JRC</b>	Joint Research Centre of the European Commission
<b>LCA</b>	Life Cycle Assessment
<b>PCR</b>	Product Category Rules
<b>PEF</b>	Product Environmental Footprint
<b>PEF Guide</b>	Published guide on the PEF method, European Commission Recommendation 2013/179/EU Annex II
<b>PEFCR Guidance</b>	Product Environmental Footprint Category Rule Guidance Document
<b>PEFCR</b>	Product Environmental Footprint Category Rules
<b>Primary data</b>	Data measured or collected directly from a site's operations
<b>Representative product</b>	Average product on the European market within a given product group
<b>Secondary data</b>	Data originating from databases or literature

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