

Product carbon footprint calculation

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About this document

The following document provides background information and supports suppliers of Voith in calculating product carbon footprint (PCF). It is based on DIN EN ISO 14067:2018 methodology to calculate cradle-to-gate product carbon footprint.

1. Introduction

Voith Paper aims at achieving transparency regarding its products carbon footprint (PCF). Initiating product carbon footprint calculation is driven by Voith Paper and its customers.

Voith strives to provide sustainable products to its customers. Calculating product carbon footprint is one of the methods to assess product sustainability. The results of the calculation can be used at different departments within Voith, which engage in assessing product sustainability. For example, the results can support R&D department in designing new products or purchasing department in selecting raw materials supplier.

As a supplier of wear parts to paper industry, product carbon footprints of our products portfolio will help to provide data for the carbon footprint calculation of our customers' purchased materials (Scope 3.1 emissions of customers). This transparency is crucial for our customers who are strongly and increasingly targeting GHG Scope 3 tracking and reduction, but also important to our investors and the authorities.

In November 2022, Voith started to ask its suppliers to deliver product carbon footprint of their products. Calculation of a product carbon footprint should follow the guidelines of ISO 14067:2018 standard, which builds on the principles and requirements of the ISO standards 14040:2006 and 14044:2006 for life cycle assessment.

The data on product carbon footprint should be updated annually for corresponding calendar year.

2. Methodological principles and requirements according to ISO 14067:2018

2.1. Declared unit

The declared unit for which the product carbon footprint of a product system should be calculated is 1 kg of unpackaged product at factory gate.

2.2. Product system

Product carbon footprint focuses on ecological dimension of sustainability. It is based on a life cycle assessment (LCA) using the single impact category of climate change.

The characterization method focuses on greenhouse gas (GHG) emissions. The impact of greenhouse gas emissions – such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) is assessed over a fixed period of 100 years according to the Bern carbon cycle model. The product carbon footprint, expressed in kg CO₂ equivalents (CO_{2e}), reflects the climate change impact of air emissions of greenhouse gases (GHGs). Increased GHGs in the troposphere result in warming of the earth's surface.

The climate change category considers that different gases have different climate change impacts on global warming. The total impact is described in CO₂ equivalents. The product carbon footprint is calculated considering all six gases from Kyoto Protocol (Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF₆)), plus Nitrogen trifluoride (NF₃), measured by mass and converted into CO₂ equivalents using the 100-year global warming potential (GWP) coefficients of the 2021 IPCC 6th Assessment Report with climate carbon feedbacks. This includes CO₂ from land use and land use change.

Product carbon footprint should be calculated in a cradle-to-gate product system. It is defined from the extraction of the resources up to production of the final product. It includes all product related direct GHG emissions, from Scopes 1, 2 and 3 (Figure 1).

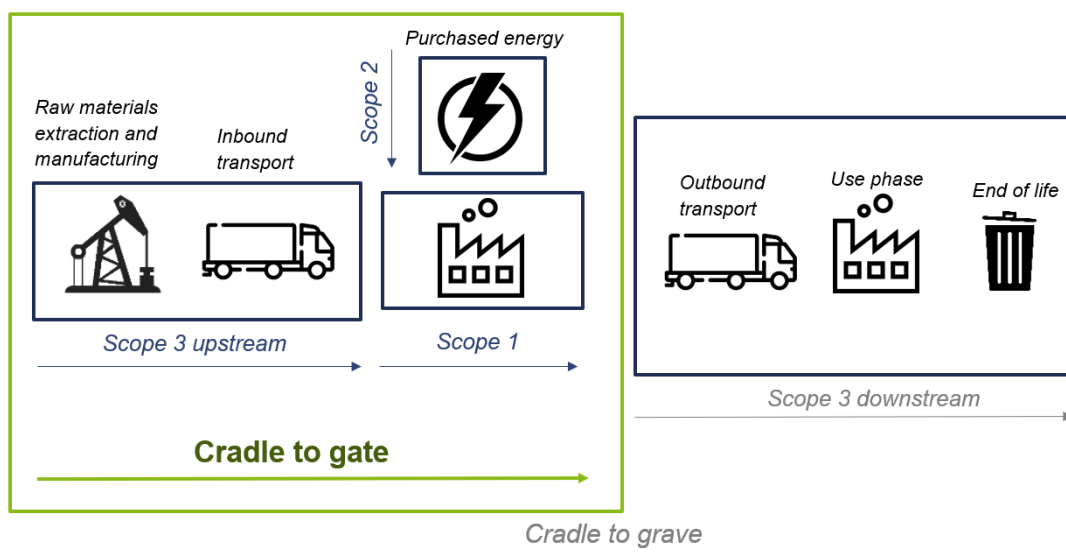


Figure 1. System boundary definition according to GHG Protocol

Scope 1 CO_{2e} emissions result from production processes that are owned or controlled by reporting company.

Scope 2 CO_{2e} emissions result from the generation of purchased energy such as electricity and steam.

Scope 3 (upstream) CO_{2e} emissions result from the use of purchased raw materials, indirect emissions due to the generation and extraction of fuels consumed by the product-manufacturing plants and site-to-site transportation of raw materials.

2.3. System boundary

Table 1 describes the system boundary for cradle-to-gate product carbon footprint calculation.

Table 1. System boundary of cradle-to-gate product system

Included	Excluded
Raw materials Transport of raw materials to production site Site-to-site transportation (if applicable) Production data (energy and fuel use, waste) <i>Optional: Treatment of production waste if it is made on-site</i>	Packaging Outbound transportation

2.4. Data requirements for calculation

Calculation should encompass primary data from reporting company and high-quality secondary average data from databases (e.g. MLC Databases 2023 Edition by Sphera Solutions GmbH, Ecoinvent, IDEMAT) or from third parties for purchased energy and raw materials.

Minimum criteria on data quality of primary data collection are shown in Table 2.

Table 2. Minimum criteria on data quality of primary data

Data quality criteria	Requirement
Data source	Primary data from reporting company and high-quality secondary average data from databases (e.g. MLC Databases by Sphera Solutions GmbH, Ecoinvent, IDEMAT) or from third parties for purchased energy and raw materials
Geographical representativeness	Data from all sites must be relevant for the product under study
Temporal representativeness	The data considered must <ul style="list-style-type: none"> • refer to the most recent annual administration period, • is not older than 5 years, • covers at least 12 calendar months to avoid seasonal changes
Consistency	A minimum of consistency and justification will have to be ensured by checking for 15% deviation from the previous year's primary data. In case of a larger deviation, a justifying comment must be provided by the practitioners
Reliability	Data must be based on measurements of actual and site-specific internal production data
Precision	Data must be internally verified; it is advised to check plausibility by internal reviewer

The below hierarchy for the selection of secondary data for Scope 3 processes shall be applied:

1. If the production origin (region or country) of the supplied raw material and fuel is known choose a regional or country-specific production mix.
2. If the production origin is not known choose a regional or country-specific consumption mix based on the location of tier-1 supplier.
3. If there is no regional or country-specific dataset available choose the same raw material or fuel from another country or region which is the most appropriate in terms of GHG emissions.
4. If the specific raw material or fuel is not available choose an appropriate proxy e.g., a chemical substance from the same chemical group.

2.5. Cut-off criteria

Cut-off criteria is a specification of the amount of material or energy flow or the level of GHG emissions associated with unit processes or the product system to be excluded from a product carbon footprint study.

Cut-offs may become necessary in cases where no data are available, where elementary flows are very small (below quantification limit), or where the level of effort required to close data gaps and to achieve an acceptable result becomes prohibitive. Carbon footprint calculation should include all material inputs that have a cumulative total of at least 99% of the total mass inputs to the unit process. It should include all energy inputs that have a cumulative total of at least 99% of total energy inputs to the unit process.

In cases where no matching life cycle inventories are available to represent a raw material or where processes and elementary flows are very small (below quantification limit), proxy data should be applied based on assumptions regarding GHG emissions.

2.6. Checklist

Following steps shall help to validate product carbon footprint calculation.

- Check the overall mass balance (raw material inputs, waste)
- Check the appropriateness of the secondary datasets selected for Scope 3, check if supplier data is available to replace dataset
- Compare your results against own calculations, same product from other sites, publicly available LCA data
- Check why there are significant deviations to LCA benchmark data
- Submit data for internal verification
- Prepare the data to report to Voith

3. Reporting requirements

When reporting product carbon footprint, a supplier must provide following information:

- Name of producer
- Name of product
- Location of production
- Declared unit
- System boundaries
- Sources of secondary data
- Time-related scope
- Geographical scope
- Technological scope
- Allocation
- LCIA method used

In case of using LCA for Experts Software Solution System from Sphera Solutions GmbH, we recommend using following characterization method: "ISO14067 GWP100 (based on IPCC AR6), Fossil GHG emissions [kg CO₂ eq.]".

For more information on PCF calculation please refer to DIN EN ISO 14067:2018. If there are any questions regarding the methodology, do not hesitate to contact Voith.