

Product Carbon Footprint of Siegwirk's products

1. Product Carbon Footprint

1.1 What is to be understood by Product Carbon Footprint?

The Product Carbon Footprint (PCF) is the sum of all direct and indirect greenhouse gas (GHG) emissions that arise or are caused by various activities, processes and products. In addition to carbon dioxide, other GHGs (according to Kyoto protocol¹) are also included in the PCF (e.g. methane, nitrous oxide, (halogenated) fluorocarbons & sulfur hexafluoride). To ensure comparability, the values are listed as CO₂ equivalents (CO₂eq) by using various conversion factors based on **ISO 14067:2018**.²

The PCF has gained importance in recent years, being the decisive factor for the factual measurement of the climate impact of activities, products and processes. It is utilized as indicator for the achievement of desired climate targets or certain climate protection measures.

1.2 Different Scopes of Carbon Footprint

There is a sequential approach when dealing with the PCF. A clear delimitation between the 3 relevant scopes needs to be taken into consideration (see Figure 1).

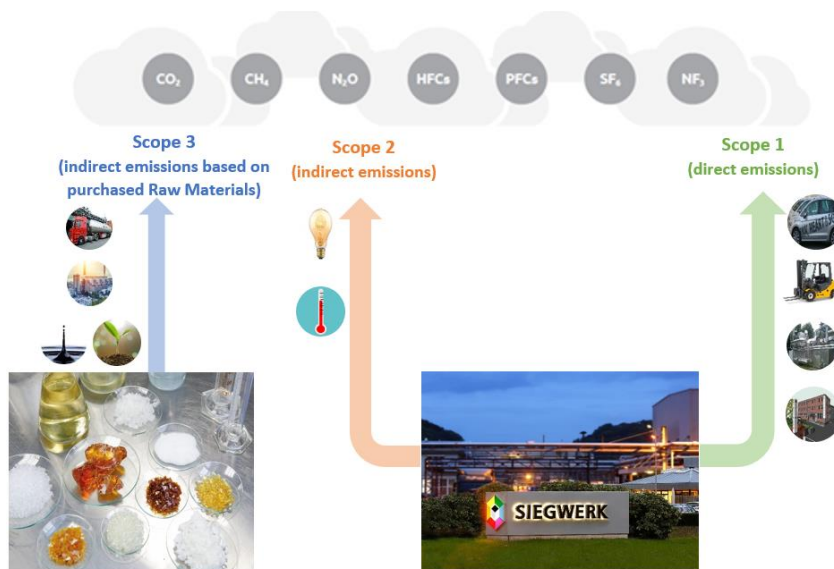


Figure 1: Subdivision of the carbon footprint into different scopes – representation for Siegwirk as ink and coatings manufacturing company

¹ Kyoto protocol of the United Nations framework convention on climate change

² ISO Norm 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification



The different scopes distinguish primarily between direct and indirect emissions and vary in the data to be considered.

1.2.1 Scope 1

Scope 1 focuses only on the direct GHG emissions that a company generates. Above all, direct GHG emissions from company facilities, like the boiler house or the solvent incinerator, forklifts and company cars play the most significant role.

1.2.2 Scope 2

Scope 2 considers the company's indirect GHG emissions. These are limited to the corresponding converted CO₂eq of the electricity and steam purchased.

1.2.3 Scope 3

Scope 3 needs to be divided into upstream- and downstream-emissions.

- Indirect GHG emissions are generated by the raw materials used (including GHG emissions from production, processing and transport of all purchased raw materials to Siegwerk's sites) as well as the transportation of Siegwerk's products to customers are part of the **Scope 3 Up-stream emissions**.
- GHG emissions generated e.g. by the use phase, by processing or at end of life are part of the **Scope 3 Down-stream emissions**.

2. Siegwerk's Product Carbon Footprint

2.1 Siegwerk's approach

As a result of the European Green Deal³ and the associated goals that the European Commission has set for the industry regarding climate neutrality latest by 2050, Scope 1 and Scope 2 are of particular importance.

Siegwerk within its Sustainability Program called HorizonNOW commits to Scope 1 and Scope 2 carbon neutrality by 2025. A scope 3 reduction target is being developed. The consideration of scope 3 is essential as it constitutes the largest part of Siegwerk's overall GHG emissions. Within Scope 3 emissions from sourced raw materials contribute the most to the overall GHG footprint.

Different product technologies (solvent based, water based, energy curing, vegetable oil based) utilize different raw material chemistries which needs to be taken into consideration.

Regardless of source, Siegwerk is carefully monitoring these emissions and continually aims at a progressive reduction.

³ European Green Deal (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en!)



The information given as PCF of Siegwerk's products thus includes not only the direct emissions from the various production locations (Scope 1) and the associated electricity purchased (Scope 2), but also all indirect emissions that occur from all raw materials purchased as well as the transportation of Siegwerk products to the customer's gate (Scope 3). Siegwerk's PCF includes these listed emission sources and is therefore to be understood as a "cradle-to-customer gate" PCF.

Siegwerk, by providing these information to customers will enable the respective companies to precisely and easily determine **their own complete Product Carbon Footprint**.

The **PCF which is specified individually for each product sold by Siegwerk, is to be understood as a "cradle to customer gate" PCF**. A detailed explanation of the approach is given in the upcoming chapter. The approach is supported by the **ISO norm 14067:2018**⁴

2.2 Siegwerk's Database generation

In order to be able to share detailed product specific Scope 3 information, an ISO 14067:2018 compliant data collection was initiated for the whole purchased raw material portfolio.

- Different Life Cycle Assessment (LCA) databases were used which nearly cover Siegwerk's entire raw material portfolio.
- Raw material data not directly covered by these LCA databases are determined by using the principle of highest chemical similarity for LCA data allocation.

2.2.1 Databases

The choice of the right database for the establishment of LCA data is one of the most critical steps in the baseline setting. Therefore a thorough analysis of available tools was done and a verification with an external consultant on applicability was conducted.

In light of Siegwerk's raw material portfolio it was concluded that the use of different databases is necessary. The current procedure can be described as follows:

- Data for nearly all raw materials (90%) are covered by the LCA database **Ecoinvent 3.8**.⁵
- In order to cover special classes of raw materials, like pigments - which for the time being are not yet available in Ecoinvent 3.8, alternative Databases (**Environmental Footprint Database**⁶ and the **Evah Pigment Database**⁷) are being used.
- All databases are used with the **OpenLCA 1.11.0**⁸ Life Cycle and Sustainability Assessment software for finally calculating the PCF.

⁴ ISO Norm 14067:2018 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

⁵ Ecoinvent v3.8 (<https://ecoinvent.org/the-ecoinvent-database/data-releases/ecoinvent-3-8/>)

⁶ Environmental Footprint Database (<https://eplca.jrc.ec.europa.eu/EnvironmentalFootprint.html>)

⁷ Evah Pigment Database (<http://www.evah.com.au/our-services.html>)

⁸ Open LCA 1.11.0 (<https://www.openlca.org/download/>)



- The used impact assessment method **EF 3.0 Climate Change**⁹ is the best available approximation to be **ISO 14067:2018 compliant**. This is used to calculate the emissions of the raw material production as well as the emissions generated by transportation in a 100 year time period.
- The information retrieved is updated on regular basis.

2.2.2 Supplier Information

The most accurate information for a purchased raw materials should be directly received from the supplier of Siegwerk (as producer of the raw materials used in Siegwerk’s products). Therefore, on case by case basis, particular supplier data on individual raw materials is used.

3. Siegwerk’s Product Carbon Footprint – Values shared

All values are specified indicating two decimals to ensure sufficient accuracy. Consequently, partial carbon footprint data/values might be displayed as “zero”, if their resp. contribution remains below three decimals and thus their contribution to the total GHG emissions is considered to be negligible.

3.1 Scope 1 & 2

For Scope 1 and Scope 2, Siegwerk’s direct (V I) and indirect emissions (W I) are indicated as two separate values.

	Displayed Information	Unit
V I	Siegwerk Scope 1	kg(CO ₂ eq)/kg(product)
W I	Siegwerk Scope 2	kg(CO ₂ eq)/kg(product)

Both values are based on the global scope 1 and scope 2 emissions of Siegwerk divided by the global production volumes. Scope 1 and scope 2 data are calculated based on the GHG protocol.

These data will be updated regularly in order to reflect Siegwerk’s GHG emission reduction efforts as described by the sustainability program.

3.2 Transport related Upstream emissions

Emissions generated during the transportation of Siegwerk’s purchased raw materials to Siegwerk’s production sites are included in the calculation of the sum value YT (see 3.3).

Due to the “cradle-to-customer gate” approach the emissions generated during the transportation of Siegwerk’s products to the customer gate are given in one separate value (X I).

⁹ EF 3.0 Climate Change (<https://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml>)



	Displayed Information	Unit
X I	Siegwerk Transport Upstream	kg(CO ₂ eq)/kg(product)

This value is based on detailed calculations of transport emissions during delivery to customer sites (average distance of “300” km per road transport)

3.3 Scope 3 – Raw Materials

The following specified values are based on ISO 14067:2018 and allow a clear distinguishment between the different sources of GHG emissions.

	Displayed Information	Unit
Y I	Partial PCF fossil	kg(CO ₂ eq)/kg(product)
Y II	Partial PCF biogenic	kg(CO ₂ eq)/kg(product)
Y III	Partial PCF land use	kg(CO ₂ eq)/kg(product)
YT	Sum of partial PCFs	kg(CO ₂ eq)/kg(product)
Z I	Biogenic Carbon	kg(C)/kg(product)
Z II	Biogenic Carbon	kg(CO ₂ eq)/kg(product)

The three different partial PCFs (Y I to Y III) are giving information about the fossil (Y I; e.g. fossil energy consumption during the production process) and biogenic GHG emissions (Y II, for example emissions from combustion and harvest) as well as information about indirect emissions that are generated by land use and land use change (Y III; e.g. that may be converted from wild land to human-specific land uses). **The sum of all three PCFs indicated in the table as “YT” is the Scope 3 PCF of Siegwerk’s products.**

In addition to the PCF as summarized under “YT”, information about the **Biogenic Carbon** is given in order to take into account the emission-saving effect of raw materials based on bio-renewable sources*. **Z II will show the GHG emissions (part of the sum of partial PCFs) which are related to previously stored atmospheric carbon dioxide (via photosynthesis during plant growth).** The data (Y I to YT, Z I to Z II) can be transferred in the value chain to downstream users in order to be considered in the end of life scenarios of the printed products manufactured with Siegwerk’s inks or coatings.

Consequently Siegwerk’s PCF is based on the framework conditions of ISO 14067:2018 and will be indicated as a sum-value (V I + W I + X I + YT) and additionally as single scope values as detailed above. The Biogenic Carbon (Z I & Z II) is not part of this summation and gives information about the biogenic CO₂ eq. emissions that are included in the sum value.



4. Confirmation of the approach

The approach presented here was developed and reviewed in cooperation with the external consultant Ramboll.

The approach, which is based on ISO 14067:2018, was confirmed and thus enables Siegwerk's customers to precisely determine their own GHG emissions on the basis of the data provided by Siegwerk.

**Please note that Siegwerk is able to provide detailed additional information regarding the percentage of used biorenewable raw materials in the products sold. The information is given for the wet as well as for the dry product. To get more information about the biorenewable content of Siegwerk's products a whitepaper which is dealing with this topic in detail is available on demand. Please contact your Siegwerk's representative.*