



SIEGWERK'S PARTIAL PRODUCT CARBON FOOTPRINT (P-PCF)

in accordance to ISO 14067:2019



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1. PRODUCT CARBON FOOTPRINT

1.1 What is to be understood by Partial Product Carbon Footprint?

The Partial Product Carbon Footprint (P-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 protocol²) are also included in the P-PCF (e.g. methane, nitrous oxide, (halogenated) fluorocarbons & sulfur hexafluoride). To ensure comparability, the values are listed as CO₂ equivalents (CO_{2eq}) by using various conversion factors based on **ISO 14067:2019**.

The P-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 P-PCF. A clear delimitation between the 3 relevant scopes is taken into consideration (see Figure 1).

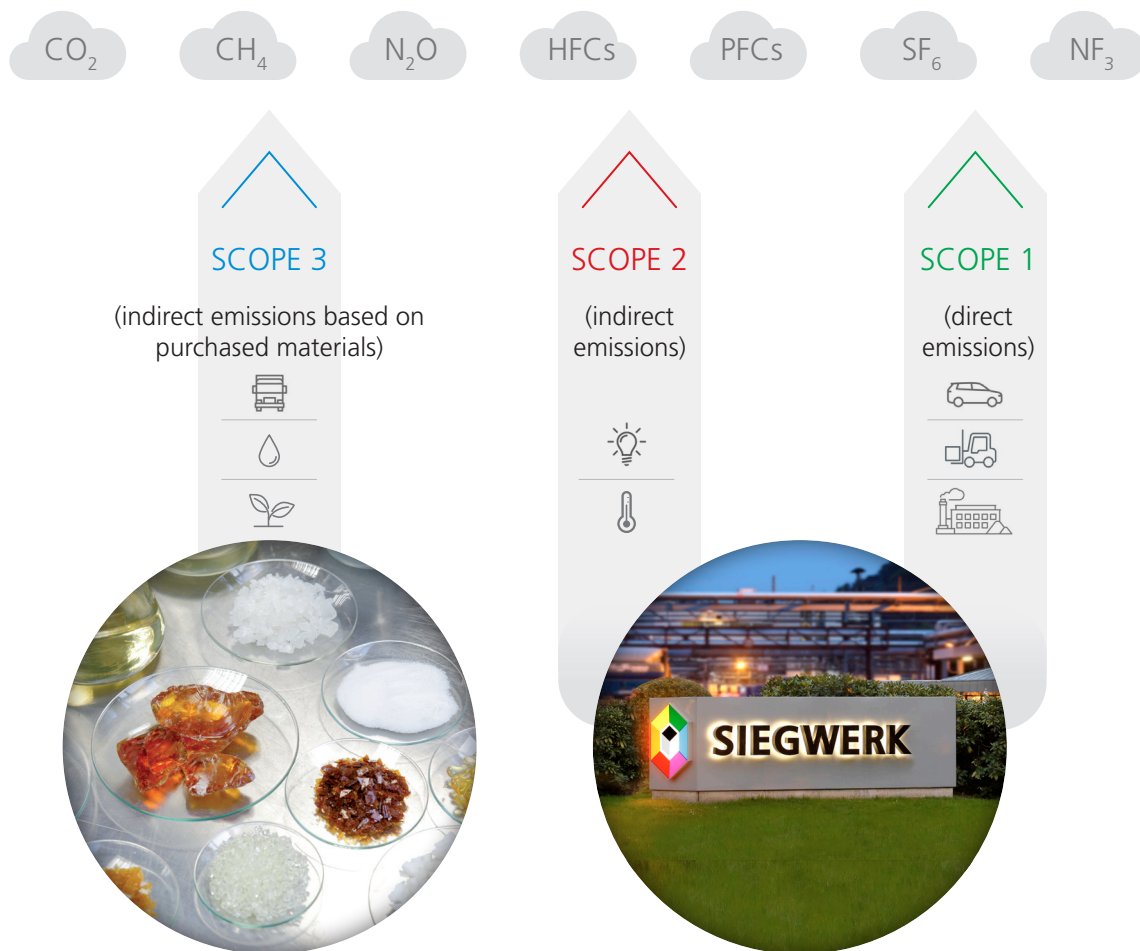


Figure 1: Subdivision of the carbon footprint into different scopes – representation for Siegwirk as ink and coatings manufacturing company

¹ ISO Norm 14067:2019 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification

² Kyoto protocol of the United Nations framework convention on climate change

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 CO_{2eq} 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 PARTIAL 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. Related to Scope 3, which represents the largest part of the overall GHG emissions, Siegwerk, as the first ink manufacturer worldwide, its targets validated by the Science Based Targets Initiative (SBTi) and is therefore committed to achieve individual targets. Siegwerk has committed to Net Zero targets.⁴

For the correct consideration of the Scope 3 emissions, the different product technologies (solvent based, water based, energy curing, vegetable oil based) which utilize different raw material chemistries need to be taken into consideration.

Siegwerk is carefully monitoring these emissions and continually aims at a progressive reduction.

The information given as P-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 the purchased raw materials to Siegwerk's gate and the transportation of Siegwerk products to the customer's gate (Scope 3). Siegwerk's P-PCF includes these listed emission sources.

All other potential emissions sources, like packaging of products etc. are not included in Siegwerk's P-PCF calculation. The packaging of Siegwerk's product is customer specific. Therefore it is not possible to include general emission data for the packaging to Siegwerk's P-PCF value. Furthermore the portion of the packaging to the P-PCF is <1% and is therefore negligible.

Siegwerk, by providing these information to customers will enable the respective companies to precisely and easily determine their own complete P-PCF.

The P-PCF (given in the unit kgCO_{2eq}/kg) which is specified individually for each product sold by Siegwerk, is to be understood as a "cradle to customer gate" P-PCF. A detailed explanation of the approach is given in the upcoming chapter. The approach, in accordance to the ISO norm 14067:2019, has been validated by TÜV SÜD.⁵

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

⁴ (https://www.siegwerk.com/en/news-media/press-releases/details/siegwerk-submits-commitment-letter-to-science-based-targets-initiative.html?_gl=1*g3unp1*_up*MQ..*_ga*NTU4NzA0OTMxLjE3MTM5NTYzOTA.*_ga_62C8LQRBQS*MTcxMzk1NjM5MC4xLjAuMTcxMzk1NjM5MC4wLjAuMA..)

⁵ Validation statement No. 3846898-2-PCF

2.2 Siegwirk's Database generation

In order to be able to share detailed product specific Scope 3 information, an ISO 14067:2019 compliant data collection was initiated for the whole purchased raw material portfolio.

- Specific supplier information regarding the P-PCF values of their products were used whenever the supplier was able to offer valuable data in accordance to ISO 14067:2019.
- Different Life Cycle Assessment (LCA) databases were used which nearly cover Siegwirk'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 Supplier Information

The most accurate information for a purchased raw materials should be directly received from the supplier of Siegwirk (as the producer of the raw materials used in Siegwirk's products). Therefore, on case by case basis, particular supplier data on individual raw materials is used. The collection of suppliers data needs to follow the strict ISO standard 14067:2019 requirements.

2.2.2 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 Siegwirk'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.
- In order to cover special classes of raw materials, like pigments which for the time being are not yet available in **Ecoinvent 3.8**,⁶ alternative Databases (**Environmental Footprint Database**⁷ and the **Evah Pigment Database**⁸) are being used.
- All databases are used with the **OpenLCA 2.0.2**⁹ Life Cycle and Sustainability Assessment software for finally calculating the PCF.
- The used impact assessment method **EF 3.1 Climate Change**¹⁰ is the best available approximation to be **ISO 14067:2019** 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.

3. SIEGWIRK'S PRODUCT CARBON FOOTPRINT – VALUES SHARED

Siegwerk meets the standards required by ISO 14067:2019 regarding the level of detail of the information shared with its customers. This allows the P-PCF values to be divided into the different scopes and into the different emission sources.

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.

⁵ Validation statement No. 3846898-2-PCF

⁶ Ecoinvent v3.8 (<https://ecoinvent.org/the-ecoinvent-database/data-releases/ecoinvent-3-8/>)

⁷ Environmental Footprint Database (<https://eplca.jrc.ec.europa.eu/EnvironmentalFootprint.html>)

⁸ Evah Pigment Database (<http://www.evah.com.au/our-services.html>)

⁹ Open LCA 2.0.2 (<https://www.openlca.org/download/>)

¹⁰ EF 3.1 Climate Change (<https://eplca.jrc.ec.europa.eu/LCDN/developerEF.html>)

Siegwerk shares the P-PCF values as follows:

Scope 1:	
Scope 1 related fossil GHG emissions	X,XX [kgCO _{2eq} /kg]
Scope 2:	
Scope 2 related fossil GHG emissions	X,XX [kgCO _{2eq} /kg]
Scope 3:	
<i>Emissions generated by transportation of SW product</i>	
Raw material transport related fossil GHG emissions	X,XX [kgCO _{2eq} /kg]
Product transport related fossil GHG emissions	X,XX [kgCO _{2eq} /kg]
<i>Emissions generated by transportation of SW product</i>	
Scope 3 related fossil GHG emissions	X,XX [kgCO _{2eq} /kg]
Scope 3 related biogenic GHG emissions	X,XX [kgCO _{2eq} /kg]
Scope 3 related land use & change GHG emissions	X,XX [kgCO _{2eq} /kg]
<i>Biorenewable raw materials used in Siegwirk's inks</i>	
Biogenic Carbon	X,XX [kgC/kg]
Biogenic Carbon	X,XX [kgCO _{2eq} /kg]
<i>Sum values:</i>	
Fossil GHG emissions of P-PCF	X,XX [kgCO _{2eq} /kg]
Biogenic GHG emissions of P-PCF	X,XX [kgCO _{2eq} /kg]
Land use & change GHG emissions of P-PCF	X,XX [kgCO _{2eq} /kg]

A detailed description of the values shared is to be found in the following chapters.

3.1 Scope 1 & 2

For Scope 1 and Scope 2, Siegwirk's direct (**UI**) and indirect emissions (**VI**) are indicated as two separate values.

	DISPLAYED INFORMATION	UNIT
UI	Scope 1 related fossil GHG emissions	kg(CO _{2eq})/kg(product)
VI	Scope 2 related fossil GHG emissions	kg(CO _{2eq})/kg(product)

Both values are based on the global Scope 1 and Scope 2 emissions of Siegwirk divided by the global production volumes. Site specific information can't be forwarded. Scope 1 and Scope 2 data are calculated based on the GHG protocol.

Due to the negligible amount of biogenic and land use emissions of Scope 1 and 2 (<<0.1%) it was decided to cover all these emissions under the fossil emission value. As soon as biogenic or land use emissions increase significantly, Siegwirk will also divide its Scope 1 & 2 emissions into the different emission sources (fossil, biogenic, land use and change).

This data will be updated regularly in order to reflect Siegwirk's GHG emission reduction efforts as described by the sustainability program.

3.2 Transport related Upstream emissions

Due to the "cradle-to-customer gate" approach the emissions generated during the transportation of Siegwirk's purchased raw materials to Siegwirk's production sites (**WI**) as well as the generated emissions during the transportation of Siegwirk's products to the customer gate (**XI**) are given as separate values.

DISPLAYED INFORMATION		UNIT
WI	Siegwerk Transport Upstream	kg(CO _{2eq})/kg(product)
XI	Siegwerk Transport Upstream	kg(CO _{2eq})/kg(product)

Both values **WI** and **XI**, which are to be understood as the averages for all Siegwirk sites, are based on detailed calculations of transport emissions of the delivery routes of the raw materials required for production (**WI**) and detailed calculations of the transport emissions of the delivery routes for the delivery of Siegwirk's products (**XI**).

Due to the negligible amount of biogenic and land use emissions of the transport emissions it was decided to cover all these emissions under the fossil emission value. As soon as biogenic or land use emissions are increasing significantly Siegwirk will also divide the transport emissions into the different emission sources.

3.3 Scope 3 – Raw Materials

The following specified values are based on ISO 14067:2019 and allow a clear distinguishment between the different sources of GHG emissions.

DISPLAYED INFORMATION		UNIT
YI	Scope 3 related fossil GHG emissions	kg(CO _{2eq})/kg(product)
YII	Scope 3 related biogenic GHG emissions	kg(CO _{2eq})/kg(product)
YIII	Scope 3 related land use and change GHG emissions	kg(CO _{2eq})/kg(product)
ZI	Biogenic Carbon	kg(C)/kg(product)
ZII	Biogenic Carbon	kg(CO _{2eq})/kg(product)

In addition to the Scope 3 related values (**YI-III**), 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. **ZII will show the GHG emissions which are related to previously stored atmospheric carbon dioxide (via photosynthesis during plant growth).**

3.4 Siegwirk's P-PCF – Relevant information for the downstream supply chain

The data given 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 Siegwirk's inks or coatings.

Consequently Siegwirk's P-PCF is based on the framework conditions of ISO 14067:2019 and will be indicated as differentiation between the fossil (AI = V+W+X+YI), biogenic (AII = YII) and land use and change (AIII = YIII) emissions. The Biogenic Carbon (ZI & ZII) is not part of this summation and gives information about the biogenic CO_{2eq} emissions that are included in the sum value.

DISPLAYED INFORMATION		UNIT
AI (V+W+X+YI)	Fossil GHG emissions of P-PCF	kg(CO _{2eq})/kg(product)
AII (YII)	Biogenic GHG emissions of P-PCF	kg(CO _{2eq})/kg(product)
AIII (YIII)	Land use and change GHG emissions of P-PCF	kg(CO _{2eq})/kg(product)
ZI	Biogenic Carbon	kg(C)/kg(product)
ZII	Biogenic Carbon	kg(CO _{2eq})/kg(product)

Unless another form of representation of Siegwirk's P-PCF is requested, the compiled from as shown under chapter 3 will be used.

4. CONFIRMATION OF THE APPROACH

The approach presented here was developed and reviewed in cooperation with the external consultant Ramboll and validated by the external auditing body TÜV SÜD (**Validation statement No. 3846898-2-PCF**).

It is confirmed that Siegwirk's approach is in line with the requirements of ISO 14067:2019 which enables Siegwirk's customers to precisely determine their own GHG emissions on the basis of the data provided by Siegwirk.

In order to ensure that Siegwirk's P-PCF values are up-to-date and correct in the future, Siegwirk uses various mechanisms internally to ensure this.

In addition to the supplier-related data, which is used whenever possible, it is important to keep the LCA-based data for the remaining raw material portfolio up to date. For this purpose, new calculations are carried out if new CO_{2eq} conversion factors are published as part of an IPCC update or if the databases used exceed the maximum possible age of 5 years. These points are proactively tracked by GI-PSR and the re-calculations are carried out immediately as soon as necessary. Changes to Scope 1, Scope 2 and transport emissions are renewed annually based on the available data and transferred into the existing processes.

** Please note that Siegwirk 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 Siegwirk's products a whitepaper which is dealing with this topic in detail is available on demand. Please contact your Siegwirk's representative.*