

BASF SE

**Neol® Neopentyl Glycol Pure Liquid
ZeroPCF_EU**

Propionic Acid ZeroPCF_EU

Qualifying Explanatory Statement
in support of the

**Achievement of and Ongoing
Commitment to Carbon Neutrality***

Application Period: 01.08.2022 to 31.07.2023

Date: July 29th, 2022

1. Executive Summary

This document is the Qualifying Explanatory Statement (QES) which provides collected evidence in support of the declaration that BASF SE:

1. has achieved carbon neutrality* for its Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU and Propionic Acid ZeroPCF_EU marketed globally for the period commencing August 1st, 2022, to July 31st, 2023 (see Section 3); and
2. is committed to maintaining carbon neutrality* for its Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU and Propionic Acid ZeroPCF_EU (see section 4).

The carbon neutrality* declaration has been made and the collected supporting evidence has been provided in accordance with the requirements prescribed by PAS 2060:2014 – Specification for the demonstration of carbon neutrality*.



Cordula Mock-Knoblauch

Director Renewables & Sustainability, Global New Business Development

July 29th, 2022

* The product carbon footprint (PCF) of both products is “zero” in a cradle-to-gate assessment (see figure 3 in appendix 3) taking into account all product-related greenhouse gas emissions and the biogenic uptake of the renewable raw materials used in the value chain and attributed to the product via a certified mass balance approach. The calculation does not include downstream value chain emissions like e.g. transportation emissions from factory gate to customer, emissions from further processing and the end of life emissions (e.g. from waste treatment). To achieve carbon neutrality for the product in relation to the complete product life cycle (cradle-to-grave), all downstream value chain emissions have to be offset by the respective actors in the value chain, e.g. by purchasing carbon credits. A cradle-to-gate system boundary was chosen, as the products are sold in a business-to-business context only. For inclusion of climate impact considerations in purchasing decisions in business, cradle-to-gate PCFs are preferred over cradle-to-grave PCFs.

2. General information

PAS 2060 Requirement	Information Relating to the Carbon Neutral Declaration
Entity making PAS 2060 declaration:	BASF SE
Subject of PAS 2060 declaration:	<ul style="list-style-type: none"> • Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU, Cradle-to-Gate#, marketed globally • Propionic Acid ZeroPCF_EU, Cradle-to-Gate#, marketed globally #Cradle to Gate: factory gate before transport to customers
Description of Subject:	<p>Neopentyl Glycol (NPG), or 2,2-dimethyl-1,3-propanediol, is a polyalcohol offering superior performance advantages in many end-use applications due to its high chemical and thermal stability:</p> <ul style="list-style-type: none"> • Adhesives and Sealants: NPG is used as a building block for the production of polyurethane adhesive resins (polyester polyol and polycarbonate diol) providing flexibility and adhesion. • Coatings: Neopentyl Glycol (NPG) is mainly used as a building block for coating resins such as saturated polyesters (major application in powder coatings), alkyds (e.g. coating metal furniture and fixtures), unsaturated polyesters (e.g. artificial marble and gelcoat for boats), and finally for the production of polyurethane resins (polyester polyol and polycarbonate diol). NPG provides high hydrolytic stability, high UV stability (UVA/UVB), weatherability, adhesion and a good balance between hardness and flexibility. • Others: NPG is utilised in the production of polyester lubricants and plasticizers. <p>Propionic acid is a water-soluble organic acid serving a range of applications.</p> <p>It is used as a versatile preservative in food or feed industry. For bakery products it preserves as a propionate. In animal feed applications, propionic acid preserves compound feed, grain or corn while reducing mold or yeast. In silage applications it improves fermentation. It also serves as a synthetic building block to produce pharmaceuticals, crop protection agents and solvents, as well as thermoplastics.</p>
Rationale for selection of the subject:	<p>Due to the applied production set-up in Ludwigshafen the product carbon footprint of the fossil-based NPG and Propionic Acid is already significantly below the average of our peers. As the interest in solutions with reduced climate impact is growing in the industries where NPG and propionic acid are used, BASF decided to add Neol® Neopentyl Glycol</p>

	Pure Liquid ZeroPCF_EU and Propionic Acid ZeroPCF_EU to the portfolio with a cradle-to-gate product carbon footprint of zero.
Control approach:	Cradle-to-Gate (factory gate before transport to customers)
Type of conformity assessment:	Independent third-party certification (see Appendix 2)
Baseline date for PAS 2060 programme:	1 August 2022
Individuals responsible for evaluation and provision of data necessary for declaration:	Cordula Mock-Knoblauch, Director Renewables & Sustainability, Global New Business Development

3. Declaration of achievement of carbon neutrality

PAS 2060 Requirement	Information Relating to the Carbon Neutral Declaration
<p>Declaration of achievement:</p>	<p>Carbon neutrality of cradle-to-gate carbon footprint of Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU and of Propionic Acid ZeroPCF_EU achieved by BASF SE in accordance with PAS 2060 at July 2022 for the period commencing August 1st 2022, to July 31st, 2023, certified by the Carbon Trust.</p>
<p>Recorded carbon footprint of the subject during the period stated above</p>	<ul style="list-style-type: none"> • Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU, Cradle-to-Gate: After replacing fossil feedstocks with bio-based feedstocks in the value chain (Mass Balance Chain of Custody), the product carbon footprint is <0 kgCO₂e/kg of product, communicated as 0 kgCO₂e/kg of product (carbon-neutral as opposed to carbon-negative). • Propionic Acid ZeroPCF_EU, Cradle-to-Gate: After replacing fossil feedstocks with bio-based feedstocks in the value chain (Mass Balance Chain of Custody), the product carbon footprint is <0 kgCO₂e/kg of product, communicated as 0 kgCO₂e/kg of product (carbon-neutral as opposed to carbon-negative). <p>See section 3.2 for further details.</p>
<p>Carbon offsets purchased</p>	<p>Not applicable (tCO₂e). The product carbon footprint (PCF) of both products is “zero” in a cradle-to-gate assessment taking into account all product-related greenhouse gas emissions and the biogenic uptake of the renewable raw materials used in the value chain and attributed to the product via a certified mass balance approach. The calculation does not include downstream value chain emissions like e.g. transportation emissions from factory gate to customer, emissions from further processing and the end of life emissions (e.g. from waste treatment). To achieve carbon neutrality for the product in relation to the complete product life cycle (cradle-to-grave), all downstream value chain emissions have to be offset by the respective actors in the value chain, e.g. by purchasing carbon credits. The cradle-to-gate PCF will be reassessed at the next certification period and updated if necessary.</p>

3.1. Carbon footprint methodology

PAS 2060 Requirement	Information Relating to the Carbon Neutral Declaration
<p>Description of the standard and methodology used to</p>	<p>BASF has developed SCOTT, a proprietary digital solution to efficiently calculate product-related cradle-to-gate carbon footprints (PCF).</p>

<p>determine GHG emissions and reductions</p>	<p>SCOTT was used for calculating the PCFs of both products. It applies the following methodology:</p> <p>The Product Carbon Footprint (PCF) is calculated based on the ISO 14067:2018, which is based on ISO 14040:2006 and 14044:2006 for life cycle assessment. Additionally, our calculation is aligned with the GHG Protocol Product Standard. 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 model). The PCF, expressed in kg CO₂ equivalents, 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.</p> <p>The declared unit for which the PCF of a product system is calculated is 1 kg of unpacked product at the factory gate of BASF. The baseline for calculating the carbon footprint data of the Subject is the weighted average of production during the period 2018 – 2020, which is representative for the 2020 footprint, without the use of bio-based raw materials. Therefore, the 2022 estimated carbon footprint has been calculated based on the 2020 footprint to reflect the application period stated above.</p> <p>The SCOTT data workflow consists of 3 steps: (i) harmonized extraction of GHG-related primary data based on existing information systems; (ii) Data consolidation along BASF’s global production value chains for proper GHG allocation on product level; and (iii) reporting and data analytics available at a front end (SCOTT expert tool). CO₂e emission factors are taken from the following data sources: 1) Scope 2 emissions from utilities are taken from market-based emission factors from energy suppliers. 2) Scope 3 emissions from utilities are taken from location-based factors. 3) Scope 3 emissions from external purchase raw materials are taken from 3rd party LCA database.</p> <p>The time boundary of emission factors of the utilities is always the most recent calendar year. Emission factors for purchased raw materials are taken from the latest LCIs available. In the upcoming annual updates of SCOTT, the time boundary for primary data and emission factors for utilities will be updated accordingly.</p> <p>Production losses of purchased products are taken into account: the input factors for raw materials are derived from actual consumption in the production (derived from production orders in ERP system). Losses of raw materials result in corresponding output quantities of emissions, by-products, and waste.</p> <p>The cradle-to gate carbon footprint of zero is reached for both products by replacing fossil feedstock with bio-based feedstock in the value chain (Mass Balance Chain of Custody). The consequences of the feedstock exchange on the PCF, including the biogenic C assimilation (biogenic</p>
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	<p>uptake) are calculated and adjusted separately, as there is not a fully automatic calculation in SCOTT, yet.</p> <p>General assumptions and limitations:</p> <ul style="list-style-type: none"> • A product carbon footprint only considers climate change impacts. Depending on the goal, scope, and intended use of the assessment, the relevance of other impact categories must be checked, and the choice of inclusion or exclusion be justified. • Cradle-to-gate only comprises contributions from resource extraction (cradle) to the BASF gate -out -before it is transported to the customer. • Packaging is outside of the cradle-to-gate boundary definition (cf. System Boundaries). Moreover, the carbon footprint of packaging is negligible, amounting to less than 1% of the PCF of fossil-based equivalents of the certified products. • Inbound transportation and site-to-site transfer are considered for the PCF calculation; outbound transport is excluded (cf. System Boundaries) • Sensitivity analyses are carried out case-by-case by validators. The main uncertainties are related to secondary data quality. The correct mapping of all raw materials and the data quality (product and region) is validated by experts. Case-by-case sensitivity checks serve to check the effect of a particular raw material dataset or an allocation decision on the PCF of the end product. Functionality for running sensitivity analysis is not implemented in the SCOTT software. Case-by-case sensitivity checks are sufficient because (1) the system boundary is clearly defined as cradle-to-gate;(2) the choice for inclusion or exclusion of processes is uniformly established; (3) no use stage is considered, hence there are no use stage assumptions; (4) allocation decisions are derived from available PCRs and an algorithmic decision tree that selects between mass and economic allocation following guidance by WBCSD Life Cycle Metrics for Chemical Sector. Case-by-case scenarios with different modelling choices (e.g., another dataset for a raw material, another allocation method for the foreground product system) can be performed separately in another LCA software tool. • If the consolidated input factor of an input material is less than 0.0001kg/kg, this is omitted from the BOM. <p>The provisions of the methodology for calculating the carbon footprint were applied as detailed out and the principles set out in PAS 2060 were met.</p>
<p>Justification for the selection of the methodologies chosen</p>	<p>All assumptions and calculations made, and any assessments of uncertainty can be found above in Section 3.1.</p> <p>A cradle-to-gate system boundary was chosen, as the products are sold in a business-to-business context only. For inclusion of climate impact considerations in purchasing decisions in business, cradle-to-gate PCFs are preferred over cradle-to-grave PCFs.</p>

	<p>Due to missing specifications for individual production processes, data bases and calculation assumptions, PCFs provided by BASF may differ from competitors' data for the same product. BASF supports establishing global standards for making PCFs of different origin comparable.</p> <p>The graphical user interface "SCOTT Expert Tool" enables BASF experts to validate and improve the product carbon footprints (PCFs) computed for every product in scope of the SCOTT calculation. In scope of SCOTT are all BASF A companies, which translates into ca 45.000 sales products.</p> <p>The triplet consisting of the product, production process and production site is the basis for a contribution analysis, and the contribution analyzer shows the contributions of emissions from purchased raw materials and business processes to a given product.</p>
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3.2. Carbon footprint breakdown

Carbon Footprint	Information Relating to the Carbon Neutral Declaration
Total Carbon Footprint	<ul style="list-style-type: none"> Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU, Cradle-to-Gate: After replacing fossil feedstocks with bio-based feedstocks in the value chain (Mass Balance Chain of Custody), the product carbon footprint is <0 kgCO₂e/kg of product, communicated as 0 kgCO₂e/kg of product (carbon-neutral as opposed to carbon-negative). The biogenic uptake included in the calculation of the total carbon footprint is 2.1 kgCO₂e/kg of product. Propionic Acid ZeroPCF_EU, Cradle-to-Gate: After replacing fossil feedstocks with bio-based feedstocks in the value chain (Mass Balance Chain of Custody), the product carbon footprint is <0 kgCO₂e/kg of product, communicated as 0 kgCO₂e/kg of product (carbon-neutral as opposed to carbon-negative). The biogenic uptake included in the calculation of the total carbon footprint is 1.8 kgCO₂e/kg of product. <p>We will achieve the carbon-neutrality of the Subjects, and we commit to maintain their carbon-neutrality, by replacing fossil feedstock with bio-based feedstocks in the value chain (Mass Balance Chain of Custody).</p>

Product footprint emissions broken down by product per functional unit:

Region	SKU (PRD)	Emissions	Units
Global	NPG: 30802292	<0, communicated as 0	kgCO ₂ e / kg product
Global	PA: 30734155	<0, communicated as 0	kgCO ₂ e / kg product

3.2.1. Data methods

The below methods were applied for measurement of the PCF in the first half of 2021, which was the basis for the certification.

Data-Quality

Production phase of BASF own operations: very good – based on actual, site-specific internal production data of years 2018-2020

Purchased raw materials (scope 3): good – based on high quality average data from databases (association data, Sphera CUP 2021.2, Ecoinvent 3.4); secondary data was selected to be most representative of the region and technology of the sourced raw material

Purchased energy (scope 2): very good - market-based factors from suppliers of the year 2019

Inbound and inter-site transports: Fair - Transport data is based on primary data for global sites at BASF (recorded in the SAP system), emission factors confirmed with the GaBi database.

Allocation

For its own processes, BASF applies allocation methods in line with published and accepted category rules (PCR) of analogous processes where available, e.g., Plastics Europe and according to ISO 14044 and 14044 hierarchy.

Co-products, which are only used in energy recovery, are treated by substitution.

If all co-products are gases and include hydrogen, volume allocation is applied.

Following the guidance of the WBCSD Chemicals*, the ratio of the economic value of co-products is a criterion to decide between physical allocation and economic allocation: if the ratio is small (less than a factor 5), then physical allocation is applied, else, economic allocation is applied. Economic allocation factors are calculated from average prices over multiple years, to avoid fluctuations.

* WBCSD Chemicals 2013, Life Cycle Metrics for Chemical Products: A guideline by the chemical sector to assess and report on the environmental footprint of products, based on life cycle assessment

Data validity after allocation is done by the following data checks:

- The sum of the allocated inputs and outputs of a unit process equals the inputs and outputs of the unit process before allocation.
- Allocation factors over all co-products of one multi-output process sum up to 1.
- The corresponding operating division must agree on the allocation approach or propose a more appropriate one for the selected BOM.

Validation

Validation of the resulting PCF of a product is done by experts from the corresponding operating divisions and data analysts. Among others, people involved in the validation includes technology experts, controllers, plant managers, site managers, and LCA experts.

The workflow to validate a PCF includes, among other checks:

- Check the appropriateness of the LCI selected for purchase raw materials (scope 3): check if technology represented in the LCI is the appropriate, if supplier data is available replace LCI, replace proxies used with real product-LCIs
- Check utility consumption
- Check the input factors (BOM)
- Check if on-stage direct emissions are realistic, e.g. by C-balance
- Check break-down factors of plant emissions to business processes
- Check allocation factors: are the allocation rules in line with existing PCRs? Are allocation rules consistent with other processes with same technology in SCOTT?
- Compare CO₂e benchmark against own calculations, same product from other BASF companies, existing LCA data, LCIs from other third-party databases
- Check why there are significant deviations to LCA benchmark data

The accuracy of data is displayed in a validation score.

Details of the SCOTT methodology are available on the internet: XXXX Link still has to be added

The countries of sales and details on the data quality of the GHG emission categories are as follows:

List of country of sales:

Country of Sales
Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU will be marketed globally
Propionic Acid ZeroPCF_EU will be marketed globally

Description of GHG emissions:

Life cycle stage	Description	GHG Emissions Category	Uncertainty and data quality
Sourcing	Purchased raw materials	Scope 3 (Category 1)	Good data quality – based on high quality average data from databases (association data, Sphera CUP 2021.2, Ecoinvent 3.4); secondary data was selected to be most representative of the region and technology of the sourced raw material
Transport (extern)	Transportation of raw materials	Scope 3 (Category 4)	Medium uncertainty, included in datasets provided from Sphera and Ecoinvent
Transport (intern)	Transportation of intermediates from one BASF site to another	Scope 1	Low uncertainty, well known distances, PCF calculated with EcoTransIT
Production	Processing of raw materials	Scope 1	Very low uncertainty, inventory is taken from SAP data (3 years average)
Energy (intern)	Steam and Electricity from own production (GuD plant)	Scope 1	Very low uncertainty, own production
Energy (extern)	Electricity supply from national grid	Scope 2	Low uncertainty, data provided from Sphera and ecoinvent
<p>Excluded emissions and justification: Packaging is excluded. The two products are bulk chemicals typically packaged in tank containers, IBCs or Barrels. The packaging's carbon footprint allocated to 1 kg of product (Subject) is negligible.</p>			

4. Declaration of ongoing commitment to carbon neutrality

PAS 2060 Requirement	Information Relating to the Carbon Neutral Declaration
<p>Declaration of on-going commitment:</p>	<p>BASF SE commits to maintaining carbon neutrality cradle-to-gate for Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU and for Propionic Acid ZeroPCF_EU in accordance to PAS 2060 for the period August 2022 to July 2023.</p> <p>Carbon Neutrality for Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU and for Propionic Acid ZeroPCF_EU will be revised after the application period August 2022 to July 2023 to ensure that BASF has purchased and allocated sufficient bio-based feedstock for the volumes of product produced in that year.</p>

4.1. Carbon management plan

PAS 2060 Requirement	Information Relating to the Carbon Neutral Declaration
<p>Targets for GHG reduction for the defined subject appropriate to the timescale for achieving carbon neutrality</p>	<p>The subjects Neol® Neopentyl Glycol Pure Liquid ZeroPCF_EU and Propionic Acid ZeroPCF_EU are already carbon neutral; no further reduction options are relevant.</p>
<p>Planned means of achieving and maintaining GHG emissions reduction</p>	<p>We will achieve the carbon-neutrality of the Subjects, and we commit to maintain their carbon-neutrality, by replacing fossil feedstock with bio-based feedstocks in the value chain (Mass Balance Chain of Custody).</p> <p>Moreover, BASF Group set itself a goal of achieving carbon-neutrality for Scope 1 and Scope 2 emissions by 2050, with a 25% absolute reduction goal by 2030, compared to 2018 baseline.</p>
<p>The offset strategy to be adopted</p>	<p>In the unlikely scenario of BASF being requested to purchase offsets in the future at next certification, Gold Standard carbon offsets would be purchased in the volume necessary to maintain carbon neutrality.</p> <p>The offsets purchased would meet the following criteria:</p> <p>The offsets generated represent genuine, additional GHG emission reductions elsewhere. Projects involved in delivering offsets meet the criteria of additionality, permanence, leakage and double counting.</p>

Carbon offsets are verified by an independent third-party verifier.

The credits from the selected carbon offset projects are:

- only issued after the emission reduction has taken place.
- retired within 6 months from the date of the declaration of achievement.
- supported by publicly available project documentation on a registry which provides information about the offset project, quantification methodology and validation and verification procedures.
- stored and retired in an independent and credible registry.

Appendix of qualifying explanatory statement

Appendix 1: Offsets

Project name	Country	Project type	Standard	Type of credits	Total credits	Generation period	Retirement date	Reference No. & link to registry	Offset volume (tCO ₂ e)
<i>Not relevant</i>									
Total tonnes (tCO₂e) offset									

Not applicable. We will achieve the carbon-neutrality of the Subjects, and we commit to maintain their carbon-neutrality, by replacing fossil feedstock with bio-based feedstocks in the value chain (Mass Balance Chain of Custody). It is therefore very unlikely we would need carbon offsets.

Appendix 2: Independent third-party assurance



Certificate of Achievement

BASF SE

has achieved carbon neutrality and is committed to on-going carbon neutrality of the total carbon footprint of its

Neol® Neopentylglycol Pure Liquid ZeroPCF and Propionic Acid ZeroPCF_EU

Carbon Trust Assurance Limited certifies that BASF SE has calculated the carbon footprint representing all Neol® Neopentylglycol Pure Liquid ZeroPCF and Propionic Acid ZeroPCF_EU sold Cradle-to-Gate (Business-to-Business) and marketed globally in accordance with:

- PAS 2060:2014 – Specification for the demonstration of carbon neutrality

A detailed list of certified results can be found in the associated Certification Letter CERT-13325.

Awarded: 1 August 2022

Valid Until: 31 July 2023

for and on behalf of Carbon Trust Assurance Ltd,



Hugh Jones,
Managing Director

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Appendix 3: Additional supporting information for interested parties

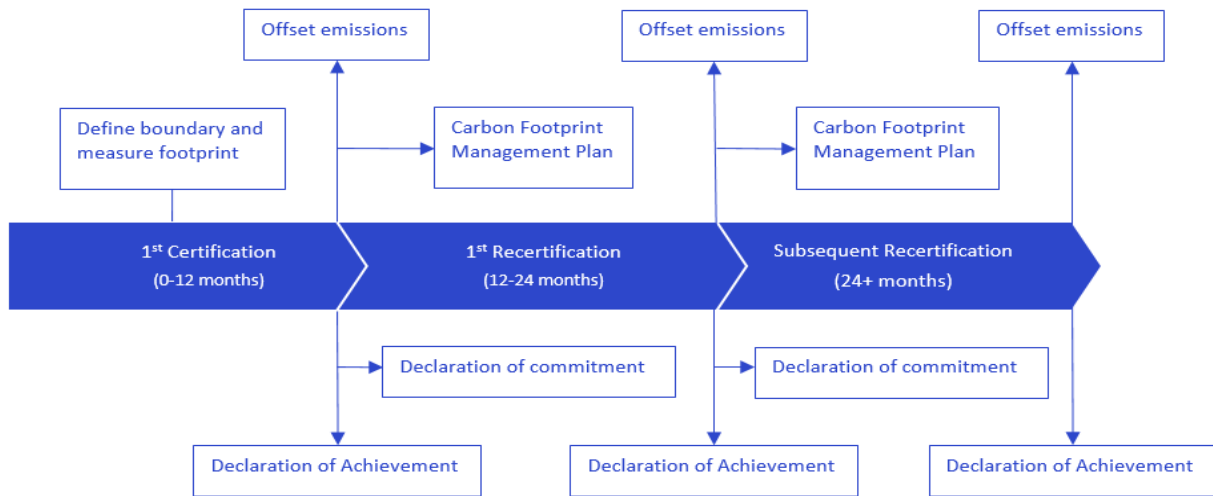


Figure 1. PAS 2060 certification process

Source : Carbon Trust. Adapted from “BSI - PAS 2060:2014: Specification for the demonstration of carbon neutrality: Figure 1 – Illustration of the cyclical process for demonstrating carbon neutrality, taking into account permitted baseline period exceptions”. [Simplified version]

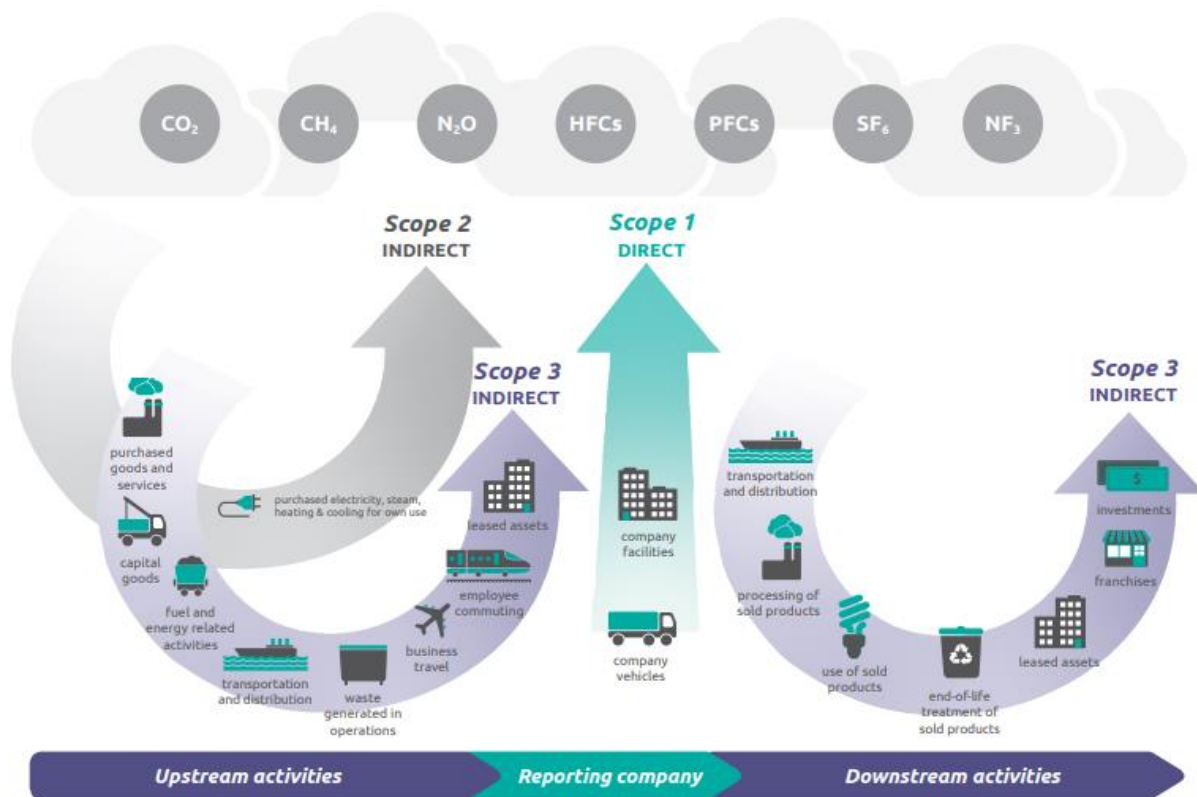


Figure 2. Organisational carbon footprinting

Source: Greenhouse Gas Protocol: <http://ghgprotocol.org/>

The BASF Product Carbon Footprint (PCF)

- The PCF is a measure for the climate impact of a product
- BASF's PCFs summarize the total amount of greenhouse gas (GHG) emissions that are associated with a product throughout its life cycle from cradle to gate

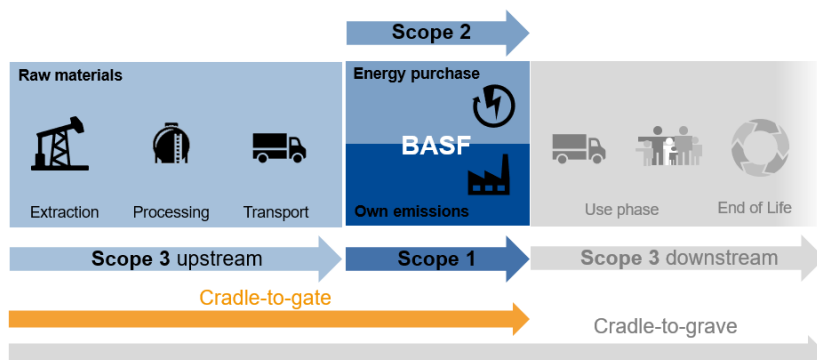


Figure 3. BASF Cradle-to-gate Product Carbon Footprint measurement