Schlötter Galvanotechnik

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Corporate Carbon Footprint

Annual Report for 2021

Last updated: 21 July 2023

Schlötter Galvanotechnik

CORPORATE CARBON FOOTPRINT

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I. General information about the report

a. Calculating emissions

The Umberto 11 software has been used to calculate emissions. All raw materials and activities are entered as so called “Entries”. If no direct data from supplier is available, entries are mapped using the Ecoinvent database (method is described in chapter I.b). For the purposes of this report, Ecoinvent version 3.9.1 and Umberto version 11.9.1 was used.

b. Method of mapping datasets

The following procedure was used to obtain reliable data:
Suppliers were contacted and asked for emission factors for their products (primary data). If data was unavailable, datasets from the Ecoinvent database (secondary data) were used. The data reliability was evaluated in cases where multiple datasets for one product exist. Datasets including supply chain emissions (“market”) are preferred (datasets for “production“ do not include supply chain emissions). Datasets also have differences due to geographical reasons. The dataset with the higher emission factor was used if the origin of the product is unknown (worst-case-scenario).

Rules:

primary data	>	secondary data
market dataset	>	production dataset
higher emission factor	>	lower emission factor

Datasets are not available for every product. In these instances, similar datasets or summarized categories datasets were used.

II. Glossary

CO_2e	Carbon Dioxide equivalents
COD	Chemical Oxygen Demand
GHG	Greenhouse Gas
GWP	Global Warming Potential
HDPE	High Density Polyethylene
IBC	Intermediate Bulk Container
PCF	Product Carbon Footprint
TOC	Total Organic Carbon
TtW	Tank-to-Wheel
WBCSD	World Business Council on Sustainable Development
WtT	Well-to-Tank
WtW	Well-to-Wheel
WRI	World Resources Institute

1 Organization Goals and Inventory Objectives

The Earth is surrounded by greenhouse gases (GHG). They have the capability to absorb and trap Infra Red radiation on its way to space. This has an important effect on the Earth's climate. However, this greenhouse gas effect is amplified by humans, who have emitted more greenhouse gases since the industrial revolution. Climate change or global warming related to this anthropogenic source has been termed the GHG effect.
Companies can use the knowledge of their Corporate Carbon Footprint as basis for assessing their contribution to climate protection.

About Dr.-Ing. Max Schlötter GmbH & Co. KG

Dr.-Ing. Max Schlötter GmbH & Co. KG is one of Germany's leading specialists for electroplating. In 1912 the company was founded by Max Schlötter in Leipzig, originally called "Elektrochemisches Laboratorium", which can be translated as electrochemical laboratory. The company is currently led by the fourth generation of the family with locations in Geislingen (Germany), Salzburg (Austria), Pershore (UK), Naas (Ireland), Norrköping (Sweden), Singapore, Wuxi and Dongguan (China).

Schlötter has over a 100 years' experience in research and development of electroplating additives and plants. For sustainable success we provide integrated solutions for electroplating chemistry, plants, and service. We work closely with our customers to fully understand their requirements and create innovative and effective surfaces.

Since the beginning, innovation is a core focus of our work. Our understanding of innovation includes the development of ecological solutions, to contribute to climate protection and for the world we care about. We are enthusiastic about taking innovative and courageous steps going forward to ensure a liveable world for the future generations.
With the passion and innovation of our founder Max Schlötter we intend to progress through strategies which will ensure satisfied workers, successful customers, and a healthy environment.

About the report

This report includes the calendar year 2021 carbon emissions calculation of the company Dr.-Ing. Max Schlötter GmbH & Co. KG; an annual report will follow. 2020 was impacted by the corona pandemic which resulted in short-time work and thus lower than normal emissions. Therefore, since we expected anomalies for the emissions of 2020, we decided to use 2021 as the basis of the report. This report is written by the climate change officer of Schlötter (Dr. Anna-Theresa Schmidt) with support of different departments for collecting data.

The report of GHG emissions is based on DIN EN ISO 14064-1:2018 (Greenhouse gases — Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals), while the division of emissions is based on the better-known Greenhouse Gas Protocol (developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD)). ISO 14064-1:2018 specifies principles for the quantification of greenhouse gas emissions of organizations. Requirements for the design, development, management, reporting, and verification are characterized. This report is written in accordance (with the best of knowledge and belief) with the principals of relevance, completeness, consistency, accuracy, and transparency.
All included emissions in this report are shown in Table 1.

Table 1: Overview of included activities.

Scope 1		• stationary combustion, Combined heat and power plant (electricity and gas), photovoltaic system, solar thermal • mobile combustion (company cars) • wastewater treatment
Scope 2		• electricity
Scope 3	**Upstream Activities**	
1.	Purchased Goods and Services	• raw materials - chemistry • packaging • cafeteria packages and coffee cups • paper
4.	Upstream Transportation and Distribution	• raw materials - chemistry
5.	Waste generated in Operations	
6.	Business Travel	
7.	Employee Commuting	
Scope 3	**Downstream Activities**	
9.	Downstream Transportation and Distribution	

This report is intended to be used internally and externally. External use provides data for our customers. The verified report will be published on our homepage https://schloetter.de/. Internally the report will be used to define reduction targets.

This report is going to be verified with a reasonable level of assurance. The materiality threshold will be set to 5 %.

2 Organizational Boundaries

Dr.-Ing. Max Schlötter GmbH & Co. KG has a worldwide presence, including locations in Geislingen (Germany), Salzburg (Austria), Pershore (UK), Naas (Ireland), Norrköping (Sweden), Singapore, Wuxi, and Dongguan (China). The connections within the Schloetter Group are shown in Table 2.

Table 2: Overview of Schloetter Group.

Schlötter Group / Location	**Legal Structure**	**Equity Share**	**Operational Control**	**Financial Control**
Germany, Geislingen/Steige		100 %	100 %	100 %
Austria, Salzburg		100 %	100 %	100 %
UK, Pershore	Sister Company	0 %	0 %	0 %
Ireland, Naas	Sister Company	0 %	0 %	0 %
Sweden, Norrköping	Sister Company	0 %	0 %	0 %
Singapore	Sister Company	0 %	0 %	0 %
China, Wuxi	Subsidiary	100 %	0 %	0 %
China, Dongguan	Sister Company	0 %	0 %	0 %

The emissions of locations in Geislingen and Salzburg are included in this report. Although the equity share of Wuxi is 100 % this location is not a part of the reported emissions. Reporting about all locations within the Schlötter group has been given due considerations, but it is nor yet known when that can be completed.

The defined organizational scope is based on our financial report.

3 Reporting Boundaries

3.1 Division of Emissions according to GHG Protocol and ISO 14064-1

Division according to GHG Protocol

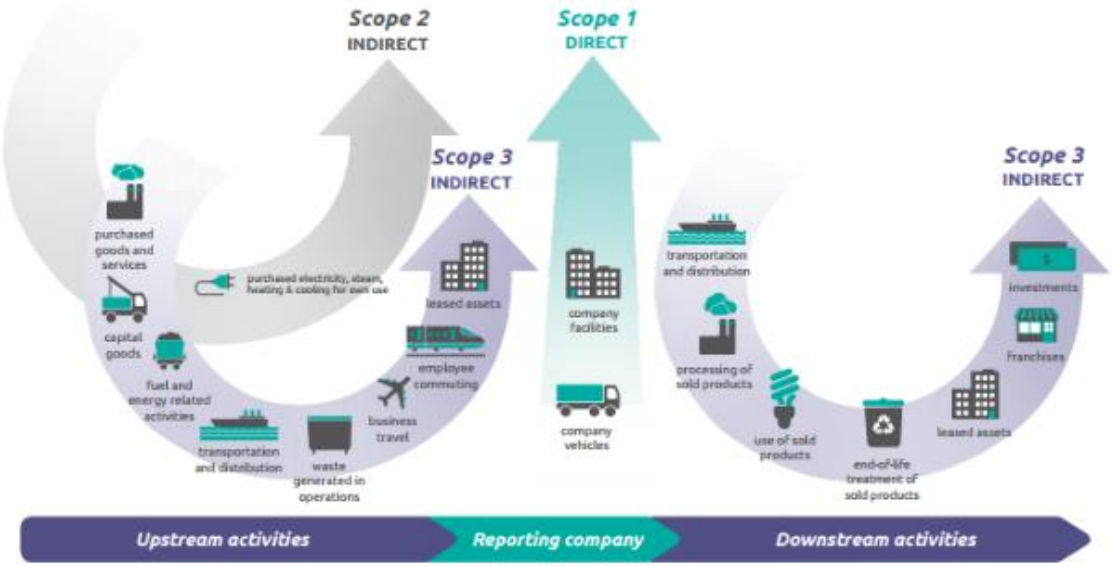

Figure 1: Division according to GHG Protocol; Source: http://ghgprotocol.org/sites/default/files/ghgp/tools/GHGP%20Scopes.

The GHG Protocol distinguishes between direct emissions (scope 1), indirect emission from purchased energy (scope 2) and indirect emissions from upstream and downstream activities (scope 3). Scope 3 emissions are subdivided in 15 fields, as shown in Table 3.

Table 3: Subdivision of scope 3 activities according to GHG Protocol.

	Upstream Activities		**Downstream Activities**
1.	Purchased Goods and Services	9.	Transportation and Distribution downstream
2.	Capital Goods	10.	Processing of sold Products
3.	Fuel and Energy related Activities	11.	Use of sold Products
4.	Transportation and Distribution upstream	12.	End-of-Life Treatment of sold Products
5.	Waste	13.	Leased Assets downstream
6.	Business Travel	14.	Franchises
7.	Employee Commuting	15.	Investments
8.	Leased Assets upstream		

Category 1: Direct GHG Emissions and Removals.

Category 2: Indirect GHG Emissions from imported Energy.

Category 3: Indirect GHG Emissions from Transportation.

- Emissions from upstream Transport and Distribution for Goods
- Emissions from downstream Transport and Distribution of Goods
- Emissions from Employee Commuting includes Emissions.
- Emissions from Client and Visitor Transport
- Emissions from Business Travel

Category 4: Indirect GHG Emissions from Products used by Organization.

- Emissions from Purchased Goods
- Emissions from Capital Goods
- Emissions from the Disposal of solid and liquid Waste
- Emissions from the use of Assets

Category 5: Indirect GHG Emissions associated with the Use of Products from the Organization.

- Emissions or Removals from the Use Stage of the Product
- Emissions from downstream leased Assets
- Emissions from end of life Stage of the Product
- Emissions from Investments

Category 6: Indirect GHG Emission from other Sources.

As shown above, both standards ISO14064-1:2018 and GHG protocol subdivide scope 3 emissions. In the GHG Protocol it is subdivided in 15 groups, while upstream and downstream emission are distinguished, although the subdivision is different in the ISO, the six groups of the ISO include the same emissions.

In this report the division has been done according to the better known GHG Protocol.

3.2 Setting Report Boundaries

Our Corporate Carbon Footprint calculation includes scope 1 (direct CO_2-emissions), scope 2 (indirect CO_2-emission from energy) and scope 3 (indirect CO_2-emissions from other activities). No biogenic emissions have to be reported within these reporting boundaries.

Not all scope 3 emissions can be included. Figure 2 shows the method for the materiality assessment, which is used to determine important emission sources. Therefore, quantities, our cost distribution, and possibility of influence are considered.

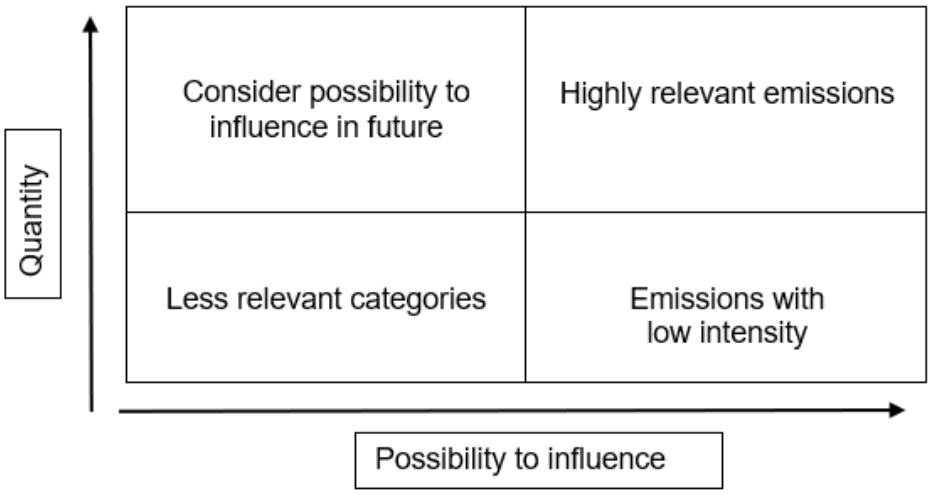

Figure 2: Materiality assessment matrix based on quantity and influence.

Costs without emissions and costs from services of a third party have been excluded. Emissions with a high quantity and high possibility to influence (highly relevant emissions) as well as low quantity but high possibility to influence (direct emissions, low intensity) are included emission sources in this report. Only emissions with available data are included.
The next chapters show the materiality method and reasons why emissions are or are not included.

3.3 Reporting Boundaries for Scope 1

Scope 1 includes all direct emissions.

Stationary Combustion

The supplier provides the amount of gas used based on received invoices and a yearly overview for all gas meters. They also provided the emission factor for gas which also includes supply chain emissions. The emission factor received refers to the lower calorific value while invoices give the higher calorific value. To calculate the lower calorific value the higher calorific value is divided by 1.1 (source: BAFA, https://www.bafa.de/SharedDocs/Downloads/DE/Energie/ea_ermittlung_gesamtenergieverbrauch.pdf?__blob=publicationFile&v=4). This value is used as direct emission; therefore, it is not listed in category scope 3 “Fuel and Energy related Activities”.

For completeness, the energy we produce by photovoltaic and solar thermal panels is included in Scope 1 emissions although no emissions occur.

Mobile Combustion

Emissions from company cars are assigned to mobile combustion category; although company cars are also used for business travel, they are included in Scope 1 because the company is in control of the cars. The consumption of fuel is accurately documented by invoices for refuelling. For this calculation a dataset has to be used. To use only data from one database, a dataset for the driven distance is used. The quantity of fuel is calculated based on an average consumption of 7 litre per 100 km. The dataset also contains emissions from supply chain, so it is not listed in category scope 3 “Fuel and Energy related Activities”.

There are no emissions from the internal fleet because it consist only of electrical forklifts.

Petrol is needed for maintenance, the volumes used are converted into an energy value. The calorific value for 1 litre of petrol is 32.49 MJ (source: (bdbe.de), viewed at 01.03.2023). The emission factor used includes emission from supply chain, so it is not listed in category scope 3 “Fuel and Energy related Activities”.

Air Conditioner

An air conditioner with the refrigerant R410A is used for our server room. In 2021 no refrigerant was refilled. Therefore, refrigerants are not part of this year’s report.

Processes – Wastewater Treatment

Our wastewater contains inorganic and organic compounds, which must be treated before beeing released to drain.

All wastewaters are collected in the company and treated chemically. Through this process organic compounds are oxidized dans released as CO_2. Inorganic compounds are precipitated and separated from the liquid phase.

Organic compounds are oxidized with Fenton reagent and CO_2 is formed. Before the treatment of a batch the chemical oxygen demand (COD) is determined to use an optimal quantity of Fenton Reagent. For this calculation the COD is not suitable. Therefore, to calculate CO_2-emissions from the process the value for Total Organic Carbon (TOC) is needed. TOC shows the concentration of organic carbon in a sample. Therefore, the value for COD needs to be converted to TOC. However, the factor is dependent on the components. To get an average factor, four measurements for COD and TOC were done before and after treatment. These measurements result in the average factor to convert the annual quantity from COD to TOC. The quantity of TOC before and after treatment leads to the quantity of oxidized carbon during the process. Finally, to calculate the amount of carbon dioxide released, the annual TOC value is multiplied by 3.67, to change the mass of carbon into the mass of carbon dioxide.

3.4 Reporting Boundaries for Scope 2

Scope 2 emissions describe all emissions from purchased energy.

The purchased quantity of electricity can be quantified exactly from invoices. Suppliers must also confirm the emission factor for the purchased mix of electricity. Therefore, our emissions can be accurately set to 414 g/kWh, shown in Figure 3.

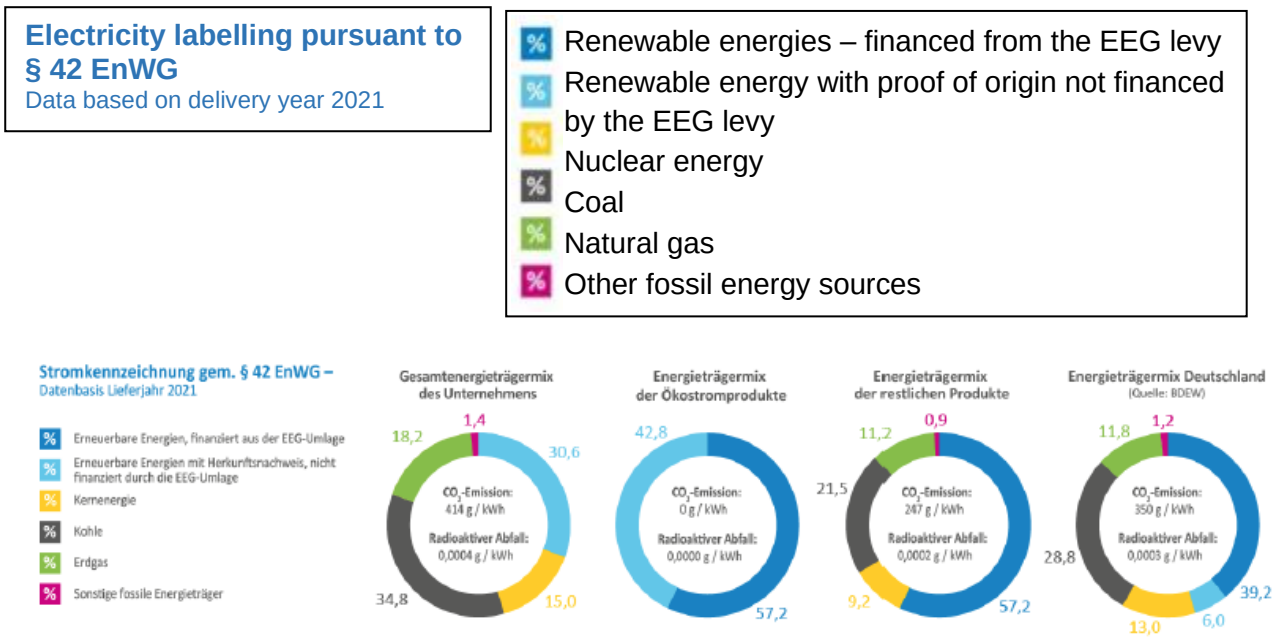

Figure 3: Energy mix and their emission values in 2020 from the supplier Albwerk.

This value includes emissions from supply chain. Therefore, it is not listed in category scope 3 “Fuel and Energy related Activities”.

The electricity consumption of our location in Salzburg is obtained from renewable energy sources only. Therefore, the value for CO_2 emissions is 0,0 g/kWh.

3.5 Reporting Boundaries for Scope 3

3.5.1 General Method

All costs for the year were taken into consideration so as to include all possible emissions. High costs were given equal consideration to high emissions and their materiality was assessed in two steps: For the materiality assessment all costs of the year 2021 are regarded to incorporate all emissions. This means, high costs are treated equal to significant emissions.

The materiality is assessed in two steps:

1st Assess the significance with regards to GHG emissions
- A Costs without emissions are excluded
- B Costs originating from services are excluded (low quantity and influence, no data available)
- C Costs originating from scope 1 and scope 2 emissions are excluded

2nd Assess the significance with regards to the quantity of emissions
- A Low percentage of costs are excluded (low quantity)
- B Exception: low percentage of costs with high influence are included

3.5.2 First Step of Materiality Assessment

All categories from accounting are reviewed regarding their relevance of GHG emissions. Not all high costs result in high emissions. If a category, e.g. personnel cost, causes no emissions or emissions through a third party (services), it is excluded.

Category: Purchase Plant Construction

The purchases of plant constructions are excluded in this year's report. Although the high costs, the influence on emissions is low.

Materials to build the plant are passed through because all plants are built at the customer directly. At the moment it is not possible to include emissions from these materials to our CCF because there are hundreds of different parts, specifically manufactured, for one plant and data is not available. Nevertheless, purchases from plant construction need to be included in the future.

Table 4 shows the distribution after this first analysis.

Table 4: Cost distributions after the first step of materiality assessment.

Purchase Chemistry	85.3	%	**Vehicle Costs**	0.1	%
Freight	8.5	%	**Disposal- and Building Costs**	1.4	%
Office/IT/Telecommunications	0.3	%	**Other Personnel / Educational Costs**	0.3	%
R&D/Patents/Licenses	0.7	%	**Advertising- / Marketing-Costs**	0.4	%
Production Overheads	1.5	%	**Travel / Hospitality Costs**	0.2	%
Repair/Maintenance without B	1.1	%	**Other Costs / Earnings**	0.3	%

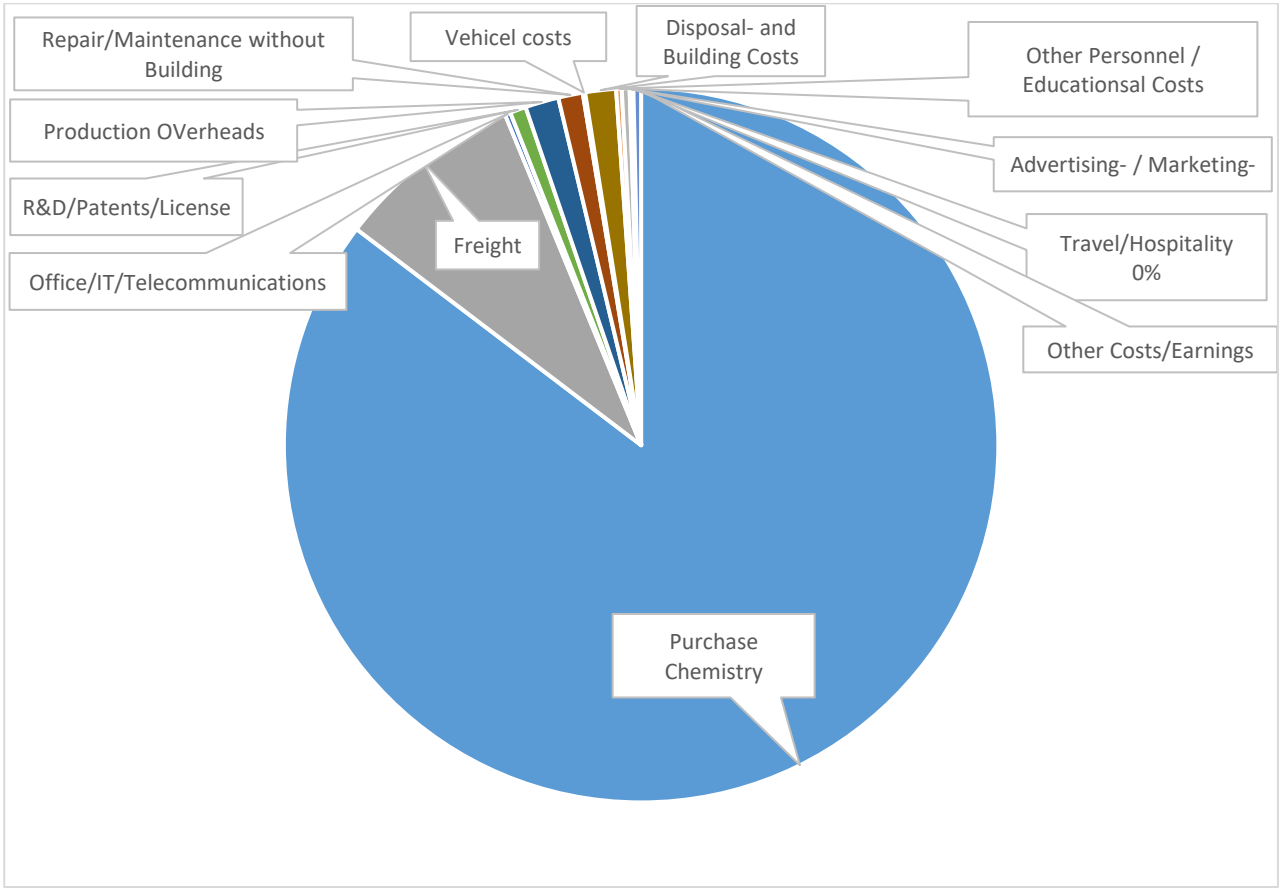

Figure 4: Pie Chart of the cost distribution after the first step of materiality assessment.

3.5.3 Second Step of Materiality Assessment

Our cost distribution has several subcategories. Those are reviewed in more detail and assigned to categories of scope 3 emissions. All subcategories with high quantity and high possibility to influence should be considered. This review also takes into consideration data availability and an effort to get this data against quantity ratio.

Detailed information about the review and the methods used for every category is described in the following chapters.

3.5.3.1 *Purchased Goods and Services*

Purchased Chemistry

The quantity and supplier of each purchased raw material is known through invoices. Every supplier is asked to share the Product Carbon Footprint (PCF) of purchased raw materials. If the supplier has no available data, raw materials are mapped using data from a database. Chapter I part b describes the detailed method as to how raw materials are mapped with entries from database.
For additives with known composition, the contents are mapped proportionally; for unknown compositions a general dataset is used for mapping. To estimate the dataset reliability, data is divided in categories, shown in Table 5:

Table 5: Categories and their numbers for records.

	Description	Number of datasets	Percentage
Category 1	Data from supplier	3	0.7 %
Category 1A	Averaged data from supplier	2	0.4 %
Category 2	Data from database	96	21.4 %
Category 2A	Calculated data from database	67	14.9 %
Category 3	Data of classes or similar compounds from database	281	62.6 %

Packages

Costs for packages are included in costs for purchased chemistry.
Currently there are no records for used packages like drums or IBCs. Therefore, records of raw packaging materials (HDPE) are used. This means package production processes (injection moulding) are not included.

In addition, IBCs are calculated utilizing HDPE records, using only 20 % of their weight for two reasons. First IBCs have an integrated steel pallet and cage which can be re-used and second the plastic container can be re-used after a cleaning process.

Production Overheads

Only the emissions of one subcategory are included, chemistry used in R&D. An overview provided by the supplier shows the raw material and quantity. Because some chemicals are only purchased in a small quantity, they are summarized in classes of compounds, e.g., “inorganic chemistry” or “organic chemistry”. Other goods from this category are excluded due to low quantity.

Office / IT / Telecommunication

This category includes the consumption of paper from photocopying stations. It is known how much paper is used through invoices. In our calculation every printed page is equal to one sheet of paper. A small excess of sheets (sheets printed on both sides are calculated as two pages) should cancel out paper consumption of other printers.

Advertising- / Marketing-Costs

Advertising and marketing costs cover only 0.4 % of costs. Due to their low cost and small possibility to influence emissions they are excluded completely.

Other Personnel / Educational Costs

Other personnel and educational costs cover only 0.3 % of costs. Due to their low cost and small possibility to influence emissions they are excluded completely.

Other Costs / Earnings

The category “other costs and earnings” has a small quantity (0.3 %) and could be excluded. Nevertheless, two parts are included, because the possibility to influence the emissions is high.
Included are the meal packages from the cafeteria and coffee cups. Both packages are disposable and avoidable plastics. Therefore, its relevance is classified high.

Cafeteria food packages:
Every meal is separately packed in a plastic box made from polystyrene or polypropylene for salads. Approximately 35 persons are eating every day in our cafeteria. 70 % of the meals include a salad.

	Package	Number of Meals	Package weight	Weight per day	Total weight in 2021
Meal	PS	35	15 g	525 g	97.1 kg
	PP	35	5 g	175 g	32.4 kg
Salad	PP	24.5	13 g	318 g	58.9 kg

The number of working days in 2021 is calculated as followed:

253 working days in Baden-Württemberg in 2021
- 2 days, the company is closed
- 20 days, the cafeteria closed during summer holiday

= 231 effective working days

These effective working days are multiplied with $^4/_5$, because cafeteria does not serve food on Fridays.

231 * $^4/_5$ = 185 days

On 185 days per year 35 persons in average are eating in the cafeteria.

Coffee cups:
The number of cups used from January 2021 to August 2022 is known. Assuming an average constant use per year, the total number of cups for one year can be calculated as follows.
In 20 months, 41.622 coffee cups are used. This results in 24.973 coffee cups for 12 months.
All cups are made from polystyrene with different dimensions for different beverages. The average weight for one cup is 5.5 g. This results in a yearly consumption of 137 kg of polystyrene cups.

Repair and Maintenance without Buildings

Costs for repair and maintenance add to 1.1 %. Due to the low quantity of costs and the small possibility to influence emissions the whole category is excluded. In addition, no data is available currently.

3.5.3.2 Capital Goods

No capital goods were purchased in the reported year.

3.5.3.3 *Fuel and Energy related Activities*

Emissions in this category are not listed separately. Emissions from supply chain are included in respective energy activity and therefore included in scope 1 and scope 2 emissions.

3.5.3.4 *Upstream Transport and Distribution*

The exact route for upstream transports and distributions are unknown. Therefore, the location of supplier is set as the starting point of the transport route. Suppliers are sorted by countries and each country's average distance to Geislingen is calculated. Transported quantities are known and for solutions an average density of 1 g/cm³ is assumed (1 kg = 1 l). All transport is carried out by trucks except from China and India; these distances are calculated as transports by ship.

3.5.3.5 *Waste*

All waste is summarized in our annual waste report. The waste report of 2021 is used as the basis and all kinds of waste are included. Some categories must be summarized because of limited data.

Liquid waste is treated in our wastewater treatment plant. All resulting emissions are included in categories of scope 1, scope 2, and purchased raw materials.

3.5.3.6 *Business Travel*

Business Travel is divided in three categories, travel by car, by train and by airplane. Emissions from business travel by company cars are counted to Scope 1 because the company is in control of the cars.

Car

The distance of a business trip using a private car is declared in invoices. All data is summarized and mapped with a dataset of an average car (petrol).

Train and Public Transport

Trains are differentiated in high-speed trains, regional trains and buses. For every train ride, the start and end station are known. Distances are measured by "Trassenfinder" from Deutsche Bahn (Trassenfinder). For day or week tickets average distances within the regarding zone are assumed.

Flight

To measure distances of flights CO_2-calculators are used (ICAO Carbon Emissions Calculator and Flug kompensieren – CO2-Rechner Flug – myclimate.org). Flights are differentiated in long-haul (>4000 km), medium-haul (1500 – 4000 km), short-haul (800-1500 km), and very short-haul (<800 km). These different distances are mapped with corresponding datasets.

3.5.3.7 *Employee Commuting*

For employee commuting emissions, it is assumed that every employee commutes by car. Looking at our car park, this is mostly true. The distance is mapped with a record for an average car.

To measure the distance which all employees commute every day, the distance between residence and location of the company is calculated and summarized. In total, the distance for one way is 2861 km.

Working days are assumed as follows:

253 working days in Baden-Württemberg in 2021
- 2 days, the company is closed
- 5 days, sick leave
- 30 days, holiday leave

= 216 effective working days

The average number of sick days is assumed.

3.5.3.8 Leased Assets upstream

This category includes emissions from leased assets like company cars, photocopying stations and other machinery. It is excluded completely because there is little or no data available. On the other hand, emissions from their use are assumed to be higher and these emissions are included in other categories, e.g., electricity (scope 2) or company cars (scope 1).

3.5.3.9 Downstream Transport and Distribution

General Method for Emissions of Transports

Transports emissions are divided in supply chain emissions and use of the vehicle emissions, shown in Figure 5. The provision of energy is called Well-to-Tank (WtT), the use is called Tank-to-Wheel (TtW) and the complete cycle is called Well-to-Wheel (WtW).

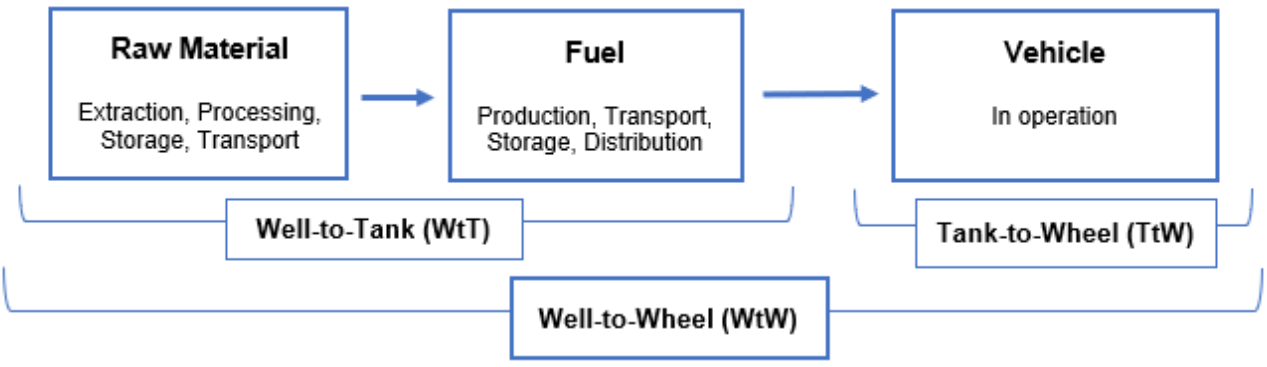

Figure 5: Transport divisions overview.

Freights

69 % of our downstream freights are carried out by one company. Divided between transport within Germany and exports, Dachser transports 92 % and 34 % respectively.

Information from freight forwarding agency Dachser

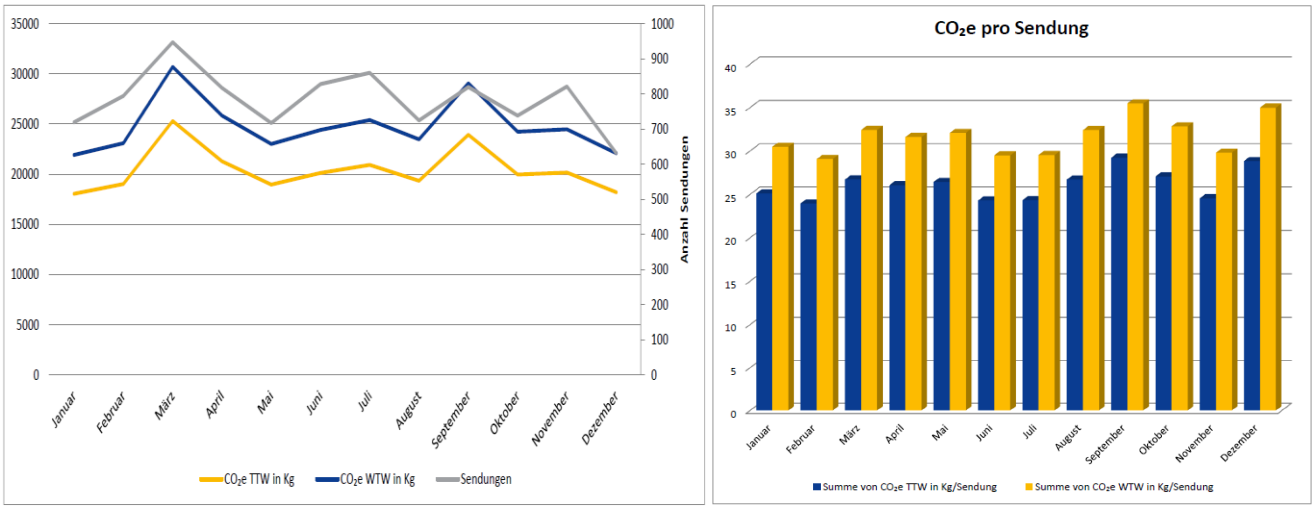

Figure 6: Transport emission Information freighted by Dachser (source. Dachser).

Calculation

All freight is extrapolated using data from Dachser as the basis, shown in Table 6.

Table 6: Extrapolation of data for downstream freights.

Forwarding agency	**Percentage**	**Tons CO_2e**
Dachser	68.9 %	297.6
Others	31.1 %	134.6
In total	100.0 %	432.2

3.5.3.10 Other Downstream Activities

All other downstream activities are excluded from this report.

Downstream categories are highly dependent on the customer use. This is the reason why it is not possible to determine emissions for the downstream categories “Processing of sold Products”, “Use of sold Products” and “End-of-Life Treatment of sold Products”.

All other categories, “Leased Assets downstream”, “Franchises” and “Investments” are not relevant for Schlötter.

3.6 Summary of Materiality Assessment

The quantitative impact on emissions is categorised according to various cost centres, as shown in Table 7 below. These cost centres form the reporting boundaries to calculate our Corporate Carbon Footprint.

Table 7: Included categories in Corporate Carbon Footprint.

Scope 1		• Stationary combustion (Combined heat and power plant (electricity and gas), photovoltaic system, solar thermal) • Mobile combustion (company cars) • Wastewater treatment
Scope 2		• Electricity
Scope 3	**Upstream Activities**	
1.	Purchased goods and services	• Raw materials - chemistry • Packaging • Cafeteria packages and coffee cups • Paper
4.	Upstream transportation and distribution	• Raw materials - chemistry
5.	Waste generated in operations	
6.	Business travel	
7.	Employee commuting	
Scope 3	**Downstream Activities**	
9.	Downstream transportation and distribution	

4 Quantified GHG inventory of emissions

4.1 Greenhouse Gases Calculations

REPORTING COMPANY	**Dr.-Ing. Max Schlötter GmbH & Co. KG**
Person responsible for the report	Dr. Anna-Theresa Schmidt
Reporting period covered	from 2021 / 01 / 01 to 2021 / 12 / 31
Organizational boundaries	Refer to Chapter 2
Reporting boundaries	Refer to Chapter 3

EMISSIONS	Carbon Dioxide [kg/a]	**In Total CO_2e [t/a]**
1. Scope 1: Direct GHG emissions	1,221,509	1,221.5
1.1 Direct emissions from stationary combustion	821,104	821.1
1.2 Direct emissions from mobile combustion	369,422	369.4
1.3 Direct process emissions	30,984	30.9
2. Scope 2: Indirect GHG emissions from imported energy	304,177	304.2
2.1 Indirect emissions from imported electricity	304,177	304.2
3. Scope 3: Indirect GHG emissions from up- and downstream activities	17,000,870	17,000.8
3.1 Indirect emissions from purchased goods and services	15,551,109	15,551.1
3.2 Indirect emissions from upstream transport and distribution	551,896	551.9
3.3 Indirect emissions from the disposal of solid and liquid waste	28,522	28.5
3.4 Indirect emissions from business travels	19,847	19.8
3.5 Indirect emissions from employee commuting	417,344	417.3
3.6 Indirect emissions from downstream transport and distribution	432,152	432.2
In total	18,526,557	**18,526.5**

4.2 Graphical Presentation

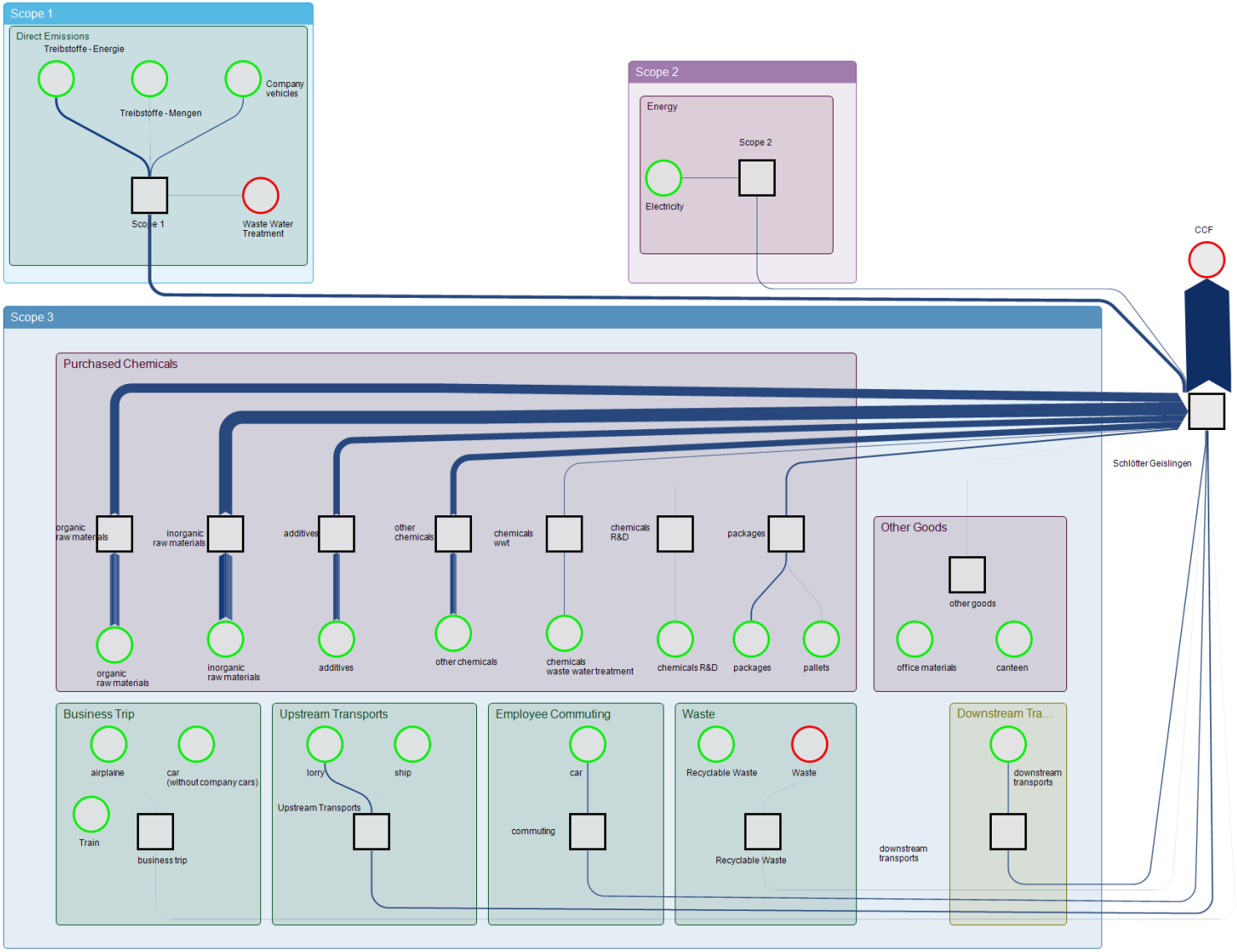

Figure 7: Sankey diagram of the Corporate Carbon Footprint illustrated and calculated with Umberto 11 software.

The pie chart and bar graph in Figure 8 show the quantity of emissions from scope 1, scope 2, and scope 3 for the reported year 2021. Scope 3 emissions are the major part with 92 %, Scope 2 are 2 %, and Scope 1 are 6 %.

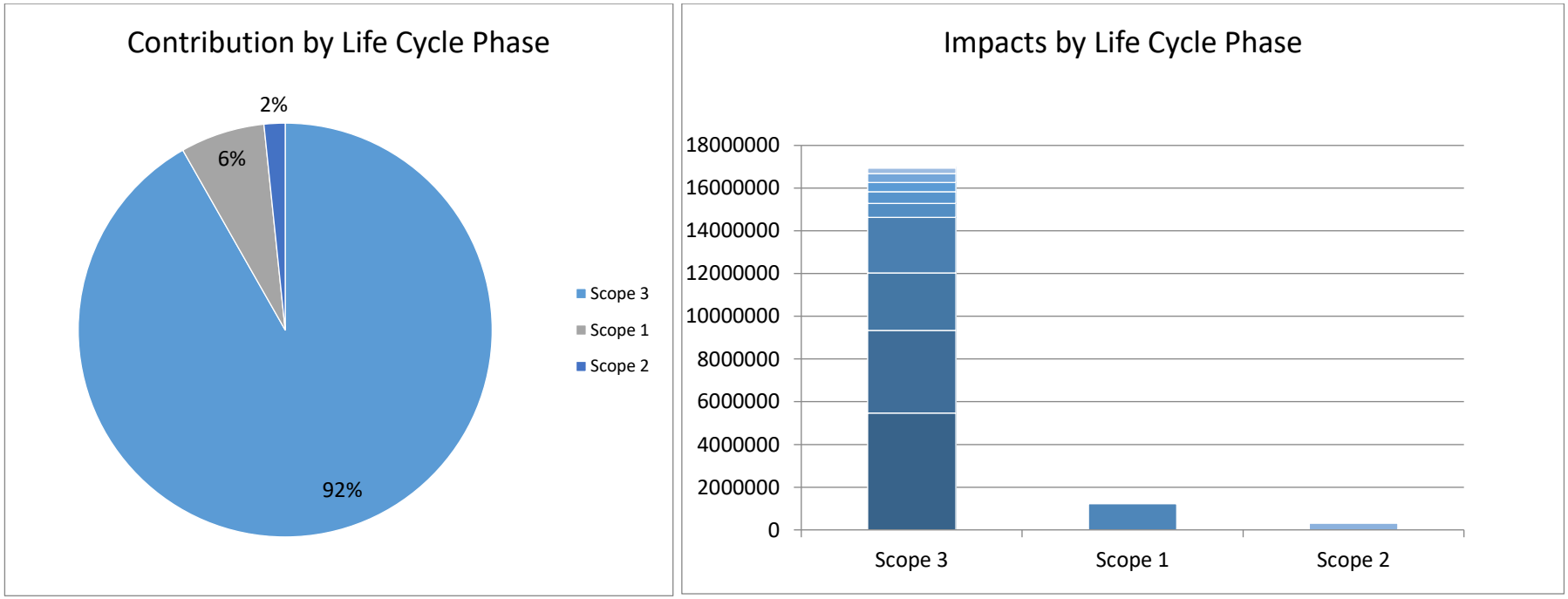

Figure 8: Charts for contribution of different scopes.

4.3 Comparison of Years

Table 8: Comparison of CO_2 emissions of the years 2020 and 2021.

EMISSIONS	2020 CO_2e [t/a]	2021 CO_2e [t/a]	Difference [t/a]	Difference [%]
1. Scope 1: Direct GHG emissions	1,047.3	1,221.5	174.1	14.3
1.1 Direct emissions from stationary combustion	737.8	821.1	83.3	14.3
1.2 Direct emissions from mobile combustion	286.3	369.4	83.1	22.5
1.3 Direct process emissions	23.2	30.9	7.7	24.9
2. Scope 2: Indirect GHG emissions from imported energy	258.2	304.2	46.0	15.1
2.1 Indirect emissions from imported electricity	258.2	304.2	46.0	15.1
3. Scope 3: Indirect GHG emissions from up- and downstream activities	14,684.6	17,000.8	2,316.1	13.6
3.1 Indirect emissions from purchased goods and services	13,427.3	15,551.1	2,123.8	13.7
3.2 Indirect emissions from upstream transport and distribution	430.8	551.9	121.1	21.9
3.3 Indirect emissions from the disposal of solid and liquid waste	78.3	28.5	-49.8	-174.7
3.4 Indirect emissions from business travel	15.6	19.8	4.2	21.2
3.5 Indirect emissions from employee commuting	365.2	417.3	52.1	12.5
3.6 Indirect emissions from downstream transport and distribution	367.5	342.2	64.7	15.0
In total	15,990.2	**18,526.5**	**2,536.2**	**13.7**

Table 8 shows the carbon dioxide emissions of Schlötter of the years 2020 and 2021. In total the GHG emissions of 2021 are 14 % higher than in 2020.
Reduced emissions in 2020 due to the corona pandemic is the reason of the higher emissions in 2021. The start of this pandemic in spring 2020 brought an uncertainty and customers ordered less. The consequences were less productions followed by less purchased raw materials and also followed by short time working for many co-workers. These factors lead to the reduced emissions of 2020.
Both years should show a small difference of emissions in the quantity of used gas. To guarantee a minimum distance between every co-worker, an old building was reactivated. This had to be heated during winter 2020 and 2021. Therefore, half of the heating period of 2020 and the whole heating period of 2021 more gas was needed. That is also included in the higher emissions of 2021.

The above-mentioned reasons show that the emissions of 2021 are representative as a corporate carbon footprint. Therefore, the report and its included carbon footprint is chosen as base year.

4.4 Data Safety

The data accuracy is assessed by two criteria; the accuracy of purchased amount and the accuracy of the emission factors used. Each criterion is rated on a scale 1 – 4 as described in Table 9 below.

Table 9: Description of scoring the data.

	Amount	Emission Factors
1	Exact	Values through supplier
2	Calculated	Values from database
3	Estimated	Calculated values based on database
4	Not known	Values for substance classes or similar substances from database

The total assessment is calculated through the average of scored amount and emission factor.

Table 10: Percentual distributin of scoring.

	Amount	Emission Factors	In Total
1	91.0 %	2.5 %	2.5 %
1,5	-	-	21.6 %
2	8.2 %	24.6 %	15.3 %
2,5	-	-	54.8 %
3	0.8 %	12.8 %	5.7%
3,5	-	-	0.2 %
4	0.0 %	60.1 %	0.0 %

Table 10 shows clearly that used amounts are well known for the calculation, but only a small number of values for emission factors have been received through the suppliers and so values from a database are used instead. The database used was Ecoinvent, which is one of the leading databases for Life-cycle-analysis, wherefore the datasets used are scored with a good accuracy. In the case of many special chemicals which are used (more than 50 %), datasets for substance classes or similar chemicals have to be used.

In this scoring all datasets are treated equally. The problem is that the equal weight of data doesn't show the relation to the quantity of emissions.

Therefore, a new evaluation for only entries with high emissions should show the distribution of accuracy of data with high emissions. All entries, their yearly emissions, and their scoring are

summarized in a table. All entries with the highest emissions, including their scoring, are summarized to result in 50 %, 70 % and 80 % of the yearly emissions. The distribution is shown in Table 11.

Table 11: Accuracy of data.

	100 %	**80 %**	**70 %**	**50 %**
1	2.5 %	10.7 %	13.9 %	17.6 %
1.5	21.6 %	23.2 %	25.0 %	11.8 %
2	15.3 %	17.9 %	25.0 %	41.2 %
2.5	54.8 %	42.9 %	30.6 %	23.5 %
3	5.7 %	3.6 %	2.8 %	5.9 %
3.5	0.2 %	1.8 %	2.8 %	
4				

Table 11 shows that the quality of data from high emissions has a higher accuracy than the data of all datasets.

Overall, no data is estimated, the biggest part of data shows a good to moderate accuracy.

5 GHG reduction initiative and internal performance tracking

This corporate carbon footprint report should result in reduction targets.
Therefore, the position of a climate change officer has been established. An internal system to evaluate, monitor, and reduce greenhouse gases will be developed.
In addition, a climate team will be established to support the climate change officer. The climate change team will be multi-disciplinary with co-workers from all departments of the company involved to locate reduction targets, discuss solutions, and implement these in projects.