2023 GHG Inventory Report

Topsil GlobalWafers A/S

Inventory Period：2023.01.01~2023.12.31

Publication date：02-07-2024

External Verification date：02-07-2024.

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Chapter 1 Introduction

The Kyoto Protocol is a legally binding treaty, that was adopted in Kyoto, Japan, on December 11 in 1997. The collective agreement of the Kyoto Protocol was to reduce greenhouse gas emissions by 5.2 % below 1990 levels by 2008 to 2012.

The "Bali Action Plan" was passed in December 2007. It further emphasized that developing countries should promote appropriate measurable, reportable, and verifiable mitigation commitments or actions, including quantified emissions limitation and reduction objectives.

The Paris Agreement proposed to keep the increase in global average temperature to well below 2 °C and to pursue efforts to limit the temperature increase to 1.5 °C. It is the first international treaty to endow the 2 °C global temperature target with legal effect.

Topsil GlobalWafers strive to commit to these Protocols, Plan and Agreements with a transparent approach and taking responsibility for the organisations influence and impact on the global environment. As such Topsil GlobalWafers are committed to create a data-based approach for the collecting, calculating, and presenting the organisations CO_2 impact.

1.1. About Topsil GlobalWafers

The organisation is a part of the GlobalWafers group and the inventory in this report is used to consolidate GHG emissions for the entire group. The GlobalWafers group have a key focus on GHG emissions with a stakeholder demands to report and reduce GHG emissions, reduce raw material consumption, energy savings and work continuously with our suppliers.

Topsil GlobalWafers was originally founded in 1959 and is headquartered in Copenhagen Cleantech Park in Denmark. The company is IATF 16949, ISO 9001, ISO 14001, ISO 45001, and ISO 50001 certified.

The organisation manufactures ultrapure Float Zone silicon in the form of ingots used in advanced and energy-efficient electrical components, that form part of different end-user applications in areas such as electricity distribution networks, production machinery, wind turbines, electric or hybrid vehicles and high-speed trains - mainly for the highest voltage segments in the power market. Topsil operate in a niche market and the product is customized and very costly.

The company offers several specialty products for the space, aviation, quantum computing, medical and consumer goods industries. Principal customers include major multinational companies in the semiconductor industry and to a lesser extent universities and other research institutions worldwide.

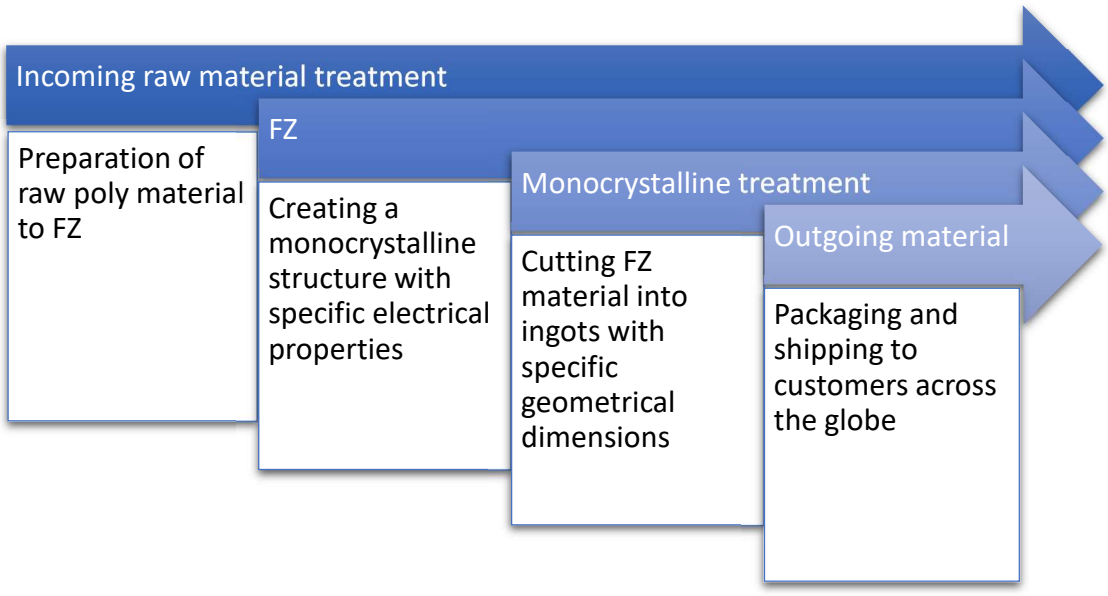
The organisation has several suppliers across the world. Our raw material suppliers are often found in EU and USA, whereas the consumption materials are locally sourced whenever possible. The organisations upstream and downstream rely on air freight due to high demand of the FZ ingots and a pressure to 'deliver yesterday' due to shortage in the electronic industry.

The product, FZ ingots, is a speciality product which is used in the global movement towards green electricity. As such, the organisation has a great interest in sustainability, reporting GHG emissions and slowly but surely execute mitigation activities, so that the organisation can be as green as the industries its products can be utilised in.

1.2. Production Process

Topsil production process is fairly simple, but it does require technical knowledge, when it comes to the FZ (Float Zone) process.
The first step is incoming inspection of raw materials and preparation of raw materials to FZ. Here all goods are controlled and prepared to enter FZ. FZ is located inside a clean room area which means that the raw material has certain requirement it needs to fulfil, before it can be released to the production.

FZ is the main process. It is where all electrical properties are produced through technical know-how and speciality designed FZ pullers. This process requires about 50% of the total energy consumption of the organisation and is considered a SEU (Significant energy unit) in the organisations Energy Management System. This means that appr. 50% of scope 2 comes from one single process step. The output of the FZ process step is a long crystal with a cone and tail end which is waste material (at this point, the product looks like a pencil).
The next process steps include cutting the FZ pulls into what is known as ingots. Ingots are cylindrical mono crystals free of any defects (voids, vacancies etc.) with specific electrical properties achieved through the FZ process. These ingots are grinded and measured before being packed and sent out to the customers, worldwide.



Chapter 2 GHG Management Framework

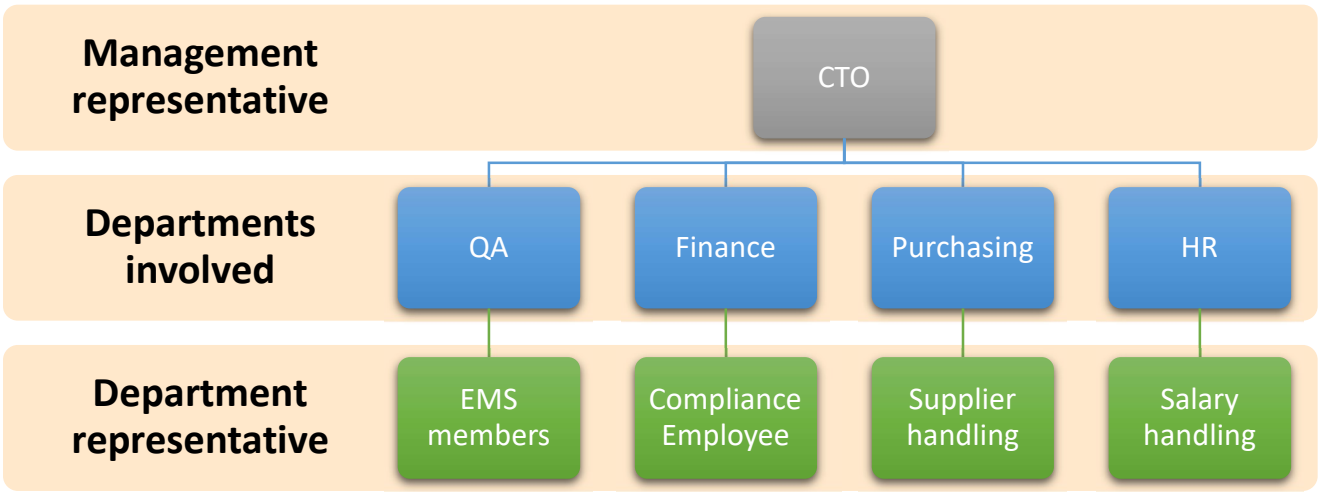
2.1 GHG Management Policy and Reduction Strategy

At Topsil GlobalWafers there is an awareness that the organisations activities have consequences for both of us self and for the stakeholders. As such we continuously work with minimising unwanted influences by integrating Environment, Energy and safety into activities conducted by the organisation and creating opportunities to positively influence Environment, Energy and Safety. This is done through developing our product which supports the green power conversion in the world and through influencing our local surroundings.
This requires commitment and strategy from the organisation. At Topsil we prioritise our commitment to areas where it is judged to have the greatest effect and by working methodically and mapping the reduction.
As such Topsil GlobalWafers is committed to RE100 and is expected to achieve the goal at the latest in 2026.

2.2 GHG Management Committee

Topsil GlobalWafers have taken a cross functional approach when it comes to GHG accounting and EMS related activities. As such a GHG Committee is established and handle all aspect of this GHG reporting. The Committee involves many departments, with different outlook.

Topsil GlobalWafers approach to environmental commitments is based on the IATF way of thinking. This means that risk assessment and opportunities for improvements are in the front seat, together with customer focus and satisfaction. When looking at it with GHG perspective the customer is our Environment, and the satisfaction is to fulfil the environmental requirements by doing the organisations bit to be able for the world to fulfil the Paris Agreement.



2.2.1 Responsibilities of the GHG Management Group

The EMS (Environmental Management System) members initiate the GHG reporting process at the beginning of each year. They delegate the data collection into smaller task forces with representative from Finance, Purchasing and HR.

The Management Representative has the overall responsibility for the GHG Management System and ensures that the GHG group is on track and helps to handle eventual issues that might crop during the activation of the process.

It is the EMS members that do the internal verification of the GHG report.

Chapter 3 Compilation of Inventory SOP

3.1 Accordance

This work is completed in accordance with GHG Inventory Guidelines of ISO 14064-1 and IPCC AR 6 guidelines. All exemption to this will be marked clearly in the report.

3.2 Establishment Principle

This report compiles GHG information in accordance with the principles of transparency, accuracy, comparability, consistency, and completeness to the best of the organisation's ability. Where not possible it will be clearly stated in the report and the GHG Committee will work on improving the data quality.

3.3 Inventory Period

The GHG inventory period covered in this report is from 2023. 01. 01 to 2023. 12. 31. The report works in a yearly cycle and follows the calendar year.

3.4 Purpose

We, Topsil GlobalWafers disclose information on GHG emissions in accordance with the Greenhouse Gas Inventory and Registration Guidelines of ISO 14064-1:2018 to demonstrate our commitment to greenhouse gas management.

3.5 Intended Use and Intended Users

The intended users of the GHG inventory are primarily the GW Group and other interested stakeholders, such as the organisations customers and employees. Another intended user is the organisations supply chain. The organisation intends to promote the output of the GHG inventory as improvements opportunities for the suppliers. The report will be available to all stakeholders. Initially, we intend to share the report internally and later we will possibly use it or parts of it for external communication.

3.6 Operating Procedures for GHG Inventory

We, Topsil GlobalWafers have established and maintained a documented procedure for GHG Management which at minimum covers, responsibilities, scope, review, data selection, data handling and risk assessment. This will provide the necessary tool to complete the P-D-C-A cycle necessary to have a trustworthy

inventory system. Note that as the organisation is ISO 14001 and ISO 50001 so much of the data selection and data handling will take place within the Environmental and Energy organisations present at the company. Supplier information is handled internally in the GHG management group. The GHG Management system meets the stated requirements of ISO 14064-1:2018. The inventory period covers one calendar year.

3.7 Record Keeping

GHG inventory related records, purchase documents, invoices, meter reading records, etc., will be kept as documented information following the internal procedure for document control and retention. A minimum retention time is 10 years (may vary depending on customer requirements).

Chapter 4 Organisational & Reporting Boundaries

The organisational boundaries have been concluded to be that the organisation have Operational Control over the site located in Frederikssund, Denmark. On the premises the identified source is found to be electricity. No sinks or reservoirs have been identified. The site is illustrated as below:

The GHG inventory will as far as applicable and cover scope 1,2 and 3. Scope 3 is a limited assessment using the cradle-to-gate approach, where transportation to other GW sites is included. This approach has been chosen as Topsil do have a supplier responsibility, but also acknowledge that it is a raw material supplier and as such have limited influence and knowledge of the downstream processes to get to the final product. As such, with the organisations current knowledge it is not possible to map, and data validate all categories of scope 3.
Topsil GlobalWafers inventory report is based on the approach from Iso 14064-1:2018 and is validated and verified by an independent 3rd party, with limited assurance by Bureau Veritas Denmark A/S.

4.1 Significance of Emissions

It is important to do a significance criterion, in order to cover the relevant aspects of a GHG inventory system and have proper representation.

All emissions are identified as CO_2e in the final inventory in Chapter 5 . No other GHG emissions other than CO_2 have been identified as significant. Only transportation has been evaluated for CH_4 and N_2O and categorised as not significant based on information collected from the base year, see section 5.1. The general significance criteria used in this report is 5%.

The inventory (Significance criterion) is based on a process approach. The process approach includes considerations for:

(1) Regulatory or sector-specific requirements
(2) Available data
    2.1. Quality of available activity data
(3) Available emission factors
    3.1. Quality of available emission factors
(4) Capability of monitoring and reducing GHG emissions within the organisational boundaries
(5) Employee Involvement
(6) Risk assessment based upon the knowledge gathered by Topsil GlobalWafers
(7) Supplier involvement and activities/Supplier development
(8) Scope 3 limitations (cradle-to-gate)

According to the above considerations, the company conducts the significance assessment of indirect emission sources. The assessment results can be found in the rest of Chapter 4.

4.1.1 Category 1: Direct GHG Emissions

Direct Greenhouse Gas Emissions come from sources that are owned or controlled by the reporting entity, including:

(1) use of transportation fuels

Topsil GlobalWafers have a few company cars. All other energy sources on the premises uses electricity (no diesel generators etc.).

Depending on combustion vehicle type there is CO_2, CH_4 and N_2O emissions. Bio content of biodiesel has been considered by using emission factor for diesel B7.

4.1.2 Category 2: Indirect GHG emissions from imported energy

Topsil GlobalWafers production only utilise electricity and uses a lot of it (see reasoning in section 1.2). The electricity comes from the Danish power grid. For 2023 there was no electricity production at the site. The Danish government yearly gives information on GHG emission from the grid, and it is given as CO_2, CH_4 and N_2O. Topsil GlobalWafers has not bought any RECs for this inventory period.

4.1.3 Category 3: Indirect GHG emissions from transportation

Topsil GlobalWafers have identified 4 ways for indirect emissions associated with transportation:

(1) Downstream transportation
(2) Business travel
(3) Upstream transportation
(4) Employee commuting

All mapped transportation relies on data from transport suppliers and as such is only given in CO_2e even though it is known that engine combustion produces CO_2, CH_4 and N_2O.

4.1.3.1 Category 3: Upstream Transportation

Upstream is not included in the inventory. This means that the uncertainty of transportations subcategory has increased. It is estimated by the organisation to be lower than the emissions from downstream transportation (see section 5.4 for inventory).
This is due to the fact, that the organisation utilises a high-impact transportation mode for downstream. This high-impact transportation mode is not utilised in the upstream and as such, the method should have a lower impact (if known) than downstream transportation. At current state it is not possible for the organisation to get valid data for any upstream transportation.

4.1.3.2 Category 3: Downstream transportation

Topsil GlobalWafers sends several tons each month to customers and other GW sites. The transportation suppliers differ throughout the year, but almost all transportation is with air freight delivery. For the coverage of this inventory period, 2 different suppliers have been located.
The organisation utilises the suppliers GHG emissions report. No other gasses other than CO_2 is available in the reports to Topsil GlobalWafers.
Downstream transportation is based on WtW (well-to-wheel) and TtW (tank-to-wheel). The organisation focuses on reporting WtW wherever possible, as it covers most of the transportation supply chain GHG impact. Transport suppliers use the EcoTransIT World for the calculations, factors and assumptions. It is possible to find the EcoTransIT World methodology handbook on EcoTransIT World webpage.

4.1.3.3 Category 3: Employee Commuting

Commuting is based on a survey set to represent the organisation. Commuting is founded on different vehicle types and as such GHG emissions are located to be exhaust gases from combustion engines (CO_2, N_2O, CH_4) and electricity emission (CO_2). Bio content of biodiesel has been considered by using emission factor for diesel B7. The survey was voluntary and available for all employees.

4.1.3.4 Category 3: Business travel

The organisation has a few business travels a year. All are related to supplier visit and customer visits.
It is GW company policy to minimise business travel as much as possible and only to nearby local destinations (no oversea). The emissions are only given as CO_2 and relies purely on data from supplier(supplier calculation based on BEIS/DEFRA) as most business travels are done by aircrafts (aircraft GHG calculations are complex).

4.1.4 Category 4: Indirect GHG emissions from products used by an organisation

For purchased goods, the focus has been kept on the suppliers with the highest GHG emissions. It is the GHG Management Committee who conduct the analysis of significance (see section 4.1). The analysis focus on:

(1) The delivered product/service of the supplier
(2) ESG knowledge of the supplier
(3) Importance of the supplier
(4) Other relevant subjects such as maturity of the supplier

From this analysis the GHG Management Committee located several suppliers who is to provide GHG emission data for supplied products and services:

(1) Raw material supplier 1
(2) Raw material supplier 2
(3) Gas supplier 1
(4) Packaging material supplier 1
(5) Plastic material supplier 1
(6) Waste handler 1
(7) Waste handler 2
(8) IT supplier 1
(9) IT Supplier 2

(10)IT Supplier 3

The analysis looks at all suppliers in scope 3 that is identifiable in the different subcategories (purchased goods and services, capital goods, fuel and energy related activities, waste generated during operations etc.).

4.1.4.1 Raw Supplier 1 and 2

Topsil have identified 2 raw material suppliers for the inventory period.
Raw supplier 1 and 2 is known from last years (reporting period:2022) GHG inventory to cover appr. 90% of all emissions. The most identifying factor for the high emissions is a process step, which have same energy requirements as the FZ process. The energy input can come from electricity, coal, diesel, gasoline etc. depending on the suppliers geological and political situation.
The suppliers do not give detailed information on energy mixture, and it associated GHG emissions and as such the only identifiable GHG emission is CO_2. It is known by the organisation that one supplier (supplier 1) utilises AR6 when determining the GHG emissions associated with the production of raw materials.

4.1.4.2 Gas supplier 1

The production processes at Topsil GlobalWafers requires a few different gasses. It is known from theory and IPCC guidelines that gasses can have a major impact on GHG emissions depending on the type of gas (example: GHG emission gases). As such, the GHG Management Committee have decided that Gas supplier 1 is likely to be a significant contributor to the GHG inventory.
It is not possible to get detail on all types of greenhouse gasses. Only data for CO_2 is available.

4.1.4.3 Packaging material supplier 1

Packaging materials for safe transportation is a one-time use product based on cardboard, foils, tins, pallets and so on. It is known from other institutions, that packaging material could be a significant source of emission and as such is analysed in this year's inventory to investigate its significance.
The calculation method of CO_2e is not known.

4.1.4.4 Plastic material supplier 1

Plastic material is used in a sub process to keep the material clean from contaminations. As it is an oil-based product which from reporting period Year 2022 shows to be a significant source of emission. See report from Year 2022 for further details.
The data relies on information from supplier, and it is only possible to get CO_2 data. The calculation method of CO_2e is not known.

4.1.4.5 Service supplier 1

Topsil works under cleanroom restrictions and as such require externally provided services to fulfil the requirements for a clean room. It is known that this type of services can have a great impact on the environment in the form of chemicals, water consumption and so on. So, a service supplier can be considered as a significant source of emissions until investigations shows otherwise. They have used emission factors from Energinet and ADEME.

4.1.4.6 IT supplier 1-3

As a company under constant development and expansion the need to expand and exchange IT equipment becomes significant. And when combined with cyber security threats the IT infrastructure becomes essential. It is known that all IT equipment is based on minerals, some quite rare. It is also known that it is difficult to properly extract the minerals from electronic waste. As such IT equipment has a major impact on the environment and as such also on the GHG inventory, in a limited scale. For the reporting period it has not been possible to include all purchased of IT equipment, so it is limited to purchase of laptops and monitors.
The factors vary depending on the individual product and the method to calculate the emissions is not known.

4.1.4.7 Process waste handling 1 and 2

All production facilities have a significant amount of waste and constantly work on minimising the wastes impact on the environment as in accordance with local law, political views, and eventual ISO 140001 certification. As such it is only fitting to include waste handling (disposal, treatment etc..) to fully know the entire impact waste can have on the environment. As supplier 2 does not offer any data regarding emissions, Topsil GlobalWafers can only perform the calculations limited to the categories such as general waste by using standard factors from central heating plant. Supplier 1 has delivered information regarding the emissions from waste acid. The calculation method is not known.

4.1.5 Category 5: Indirect GHG emissions associated with the use of products from the organisation

Includes the processing of sold products, the use of sold products, the final processing sold products, downstream leased assets, franchises, investments, and so on.
As Topsil GlobalWafers delivers a raw material product it is not possible to completely know the indirect emissions associated with usage of the product. It is known that other GW sites do further processing on the sold products and transforms it into wafers.

All GW sites strive towards having a GHG inventory, so any processing of FZ ingots will be a part of their inventory. It is also known that many end customers have focus on/are currently creating GHG inventories, but the progress and content of their inventories are currently unknown. It is something the entire supply chain must develop with each other's help, to truly cover cradle to end of life treatment, but the system is not yet mature enough, to give provide data valid GHG emissions.
Topsil GlobalWafers is not part of a franchisee or any investment, so they are out of scope.

4.1.6 Category 6: Indirect GHG emissions from other sources

This inventory does not include the amount of greenhouse gas removal and greenhouse gas emissions from other indirect emission sources.
It has not been possible for the organisation to identify other sources which could contribute to indirect GHG emissions.

Chapter 5 GHG emissions

5.1 Setting and Adjustment of Base-Year

Base year is set to be reporting year 2021. In reporting year 2021, only scope 1 and 2 was analysed and it is the first year where data was collected for emissions within the organisations control and fulfils the requirement stated in section 6.4 of Iso 14064-1.

Scope 3 was added to reporting year 2022 as a limited assessment. Base year will be adjusted when:

(1) Major changes at the factory that will directly impact scope 2
(2) Better Quantification of data covering scope 3. Data must be relevant, complete, consistent, accurate and transparent
(3) Major changes in the supply chain that will significantly change scope 3
(4) Calculations error which has a major impact on the GHG inventory

For reporting year 2023 there will be base year adjustment, as it has been discovered that there is a calculation error in scope 2, imported energy. The factor has been corrected from 135 g CO_2/kwh to 206 g CO_2/kwh by Energinet because of the trading of certificates. The new factor is based on national mix, corrected, and fits the Danish electricity production for year 2021 (Published by Energinet). CH_4 and N_2O was also not accounted for and follow GWP100 AR6 for easy comparison across reporting periods for scope 2. We have now taken B7 into account for scope 1.

Review has been performed by GHG management group and base year is now found to be accurate.

The base year settings (year 2021) will be:

Categories	Original	Adjustment	Reasoning for change
Scope 1, Direct GHG emissions	19,40 tons CO_2e	19,80 tons CO_2e	AR6 values wasn't used, N_2O and CH_4 was not accounted for
Scope 2, Indirect GHG emissions from imported energy	685,47 tons CO_2e	1095,41 tons CO_2e	Wrong factor used

5.2 Types of Greenhouse Gases

According to greenhouse gases defined in ISO 14064, Kyoto Protocol, and Greenhouse Gas Reduction and Management Act, the inventory greenhouse gases include CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3. Note, that not all categories emit all greenhouse gases, thus the inventory will be based on quantifiable emissions.

5.3 Greenhouse Gas Emissions Calculations

5.3.1 Emission Source Identification

The emission source items identified within the boundary are listed in the table below:

Category	Subcategory	Identifier	Emission factor	Source
1. Direct emissions	Mobile	Company owned vehicles	*	European Environmental Agency, 2018*
2. Indirect emission from imported energy	Electricity	EMS data collection	162 gCO_2e/kwh 0,3 g CH_4/kwh 0,005 g N_2O/kwh	Energinet, ens.dk https://ens.dk/service/statistik-data-noegletal-og-kort/noegletal-og-internationale-indberetninger Generel el-deklaration 2022 Eldeklaration (energinet.dk)
3. Indirect emission from transportation	Downstream	Transport supplier 1	686,12 g/tonne-km 104,44 g/tonne-km	Report from supplier, ISO14083 and GLEC-compliant
		Transport supplier 2	-	Report from supplier, based on EN 16258 And Product Lifecycle Accounting and Reporting Standard, ISO14083 and GLEC-compliant
	Commuting by employees	Vehicles, employee owned, public owned	*	European Environmental Agency, 2018*
	Business trips	Business trip supplier 1	-	Report from supplier, based on BEIS/DEFRA
4. Indirect emission from products used by the organisation	Purchased goods and services	Raw supplier 1	127 $kgCO_2e$/kg	Inventory report year 2022, method unknown
		Raw supplier 2	85 $kgCO_2e$/kg	Report from supplier, based on LCIA method and IPCC AR 6
		Gas supplier 1	-	Report from supplier, method unknown
		Packaging material supplier 1	0,176 – 31,726 kg CO_2/unit	Report from supplier, dependent on item ID, method unknown

		Plastic material supplier 1	6,1 kg CO_2 / roll	Report from supplier, method unknown
		Service Provider 1	0,157 kg CO_2/ delivered CO_2	Report from supplier, method unknown
	Purchased goods and services- laptops	IT Supplier 1	208-231 kgCO_2e/product	Report from supplier, precise factor depends on the model purchased, method unknown
	Purchased goods and services- laptops	IT Supplier 2	627-187 kg CO_2e/product	Report from supplier (Precise factor depends on the model purchased)
	Purchased goods and services- laptops and monitors	IT supplier 3	296-668 kg CO_2e/product	Report from supplier (Precise factor depends on the model purchased)
	Waste generated in operations	Waste handler 1	-	Report from supplier, factor and method unknown
		Waste handler 2	88,63 kg/Mwh 10,6 GJ/ton	'Standard faktorer for brændeværdier og CO_2 emissionsfaktorer til brug for rapporteringsåret 2023' and environmental declaration for district heating (Vestforbrændingen)
5. Indirect emission associated with usage of product	Processing of sold product	Silicon wafers	N.A	Covered by other GW sites GHG report. See GlobalWafers webpage

*Some of the subcategories require several emissions factors to properly calculate them. A summary of them can be found below:

Gasoline density: 0,75 [kg/l] source is 1.A.3.b.i-iv Road Transportation 2023 p. 42 (EMEP/EEA air pollutant emission inventory guidebook 2023, published by European Environment Agency

Diesel density: 0,84 [kg/l] source is 1.A.3.b.i-iv Road Transportation 2023 p. 42 (EMEP/EEA air pollutant emission inventory guidebook 2023, published by European Environment Agency

Gasoline IPCC: 3,16 [kg/kg] source is 1.A.3.b.i-iv Road Transportation 2023 p. 129 (EMEP/EEA air pollutant emission inventory guidebook 2023, published by European Environment Agency

Diesel IPCC: 3,17 [kg/kg] source is 1.A.3.b.i-iv Road Transportation 2023 p. 129 (EMEP/EEA air pollutant emission inventory guidebook 2023, published by European Environment Agency

Diesel B7 ICTT WTW: 0.98 (WTT) [kg CO_{2e}/kg] + 2.44 (TTW) [kg CO_{2e}] = 3.42 [kg CO_{2e}/kg] source is ICTT White Paper Table A.9.

Motorcycle IPCC: 3,16 [kg/kg] source is 1.A.3.b.i-iv Road Transportation 2023 p. 129 (EMEP/EEA air pollutant emission inventory guidebook 2023, published by European Environment Agency

Bus IPCC: 3,17 [kg/kg] source is 1.A.3.b.i-iv Road Transportation 2023 p. 129 (EMEP/EEA air pollutant emission inventory guidebook 2023, published by European Environment Agency

CH_4 IPCC Gasoline: 0,000057 [kg/km] source is IPCC chapter 3, Mobile combustion, table 3,2,5 Gasoline, Euro 4, Urban, Cold

CH_4 IPCC Diesel: 0 [kg/km] source is IPCC chapter 3, Mobile combustion, table 3,2,5 Diesel, Euro 4, Urban, Cold

N_2O IPCC Diesel: 15e-6 [kg/km] source is IPCC chapter 3, Mobile combustion, table 3,2,5 Diesel, Euro 4, Urban, Cold

N_2O IPCC Gasoline: 6e-6 [kg/km] source is IPCC chapter 3, Mobile combustion, table 3,2,5 Gasoline, Euro 4, Urban, Cold

GWP CH_4: 27,9 source is .7SM.6, table 7.SM.7 page 16. 7SM is supplementary Material to The Earths Energy Budget, Climate Feedbacks and Climate Sensitivity

GWP N_2O: 273 source is .7SM.6, table 7.SM.7 page 16. 7SM is supplementary Material to The Earths Energy Budget, Climate Feedbacks and Climate Sensitivity

Note: have chosen the worst one which is the one for buses running on gasoline.

5.3.2 Selection and Management of Emission Factors

The calculation of greenhouse gas emissions is primarily based on emission factor calculation and factors provided by reports from national sources for the site-specific variables, for example emission factors for electricity production. When a national source is not possible a regional or global factor will be used. IPCC AR 6 or other regional source can be preferred for the more general factors such as the emission factors for gasoline or the GWP for a GHG since it in theory should be the same no matter where it's used. These priorities should also be expressed in the table in section 5.3.1.

5.3.3 Calculation Instructions

The measurement and calculation of GHG emissions are mainly based on the carbon emission coefficient method. The formula is as below:

E = A x EF x GWP

where: E = emissions, A = activity rate/consumption rate, EF = emission factor, and GWP is global warming potential value.

The organisation has applied GWP values provided in IPCC 2021 AR 6 to calculate. (CO_2: 1, CH_4: 27.9, N_2O: 273). Information on AR6 values can be found in 7SM (Supplementary Material to The Earths Energy Budget, Climate Feedbacks and Climate Sensitivity page 16).

During calculation SI-units are considered and the conversion between them to end up with either a tCO_2e or $kgCO_2e$.
Not all the categories require the organisation to calculate the final GHG emissions. In some cases, the supplier informs Topsil GlobalWafers the GHG emissions for purchased goods and services (category 4) and transportation (category 3).

5.3.3.1 Category 1: Direct emission by company owned vehicles, Methodology for calculation of emissions

The organisation has a few company-owned vehicles utilised by the top management. The organisation implemented an automatic calculation methodology for all vehicles either owned by the organisation or by the employees. See 5.3.3.3 and Appendix A for full details on methodology.

5.3.3.2 Category 2: Imported energy electricity, Methodology for calculation of emission

All production activities are covered by the importation of energy from the public electrical grid. The methodology is based on using a modified factor as Topsil GlobalWafers do not purchase any REC and is based on location-based electricity.
Topsil GlobalWafers measures electricity consumption monthly as part of the Environmental management system and uses this collected data for the calculation. The calculation is based on the standard calculation instruction mentioned in section 5.3.3.

5.3.3.3 Category 3: Employee Commuting, Methodology for calculation of emission

The organisation implemented an automatic calculation based on input from employees. As soon as the employee have entered relevant data a Macro start up and gives the employee direct information on their Carbon footprint. This visualises their impact and bring awareness to the employees.
Details regarding the macro can be found in Appendix A.

When data has been gathered the result is calculated for the entire organization by multiplying the result with the average number of employees for 2023.

$$totalCO_2e = \frac{CO_2e}{answer\ rate} * avg.FT.employee$$

5.3.3.4 Category 4: Indirect emission from purchased products used by the organisation, methodology for calculation of emissions

Based on the table presented in section 5.3.1, not all suppliers will handover information on how data is achieved or if the data is complete and valid. In those cases, no further calculations take place.

However, some suppliers have given more details which triggers calculations for Topsil GlobalWafers. The general triggers can be summed up to be:

1) When data from supplier do not match the activity data
2) Supplier data is based on per purchased item
3) The data is not collected through suppliers

The following sections will contain the methodology when calculations by Topsil GlobalWafers is triggered.

5.3.3.4.1 Raw material suppliers

Raw material suppliers are to be calculated according to the activity data for Topsil GlobalWafers. Topsil GlobalWafers buys more raw material than what it consumes in a year, and to properly represent the selected inventory period calculations are needed to account for activity for each supplier and the ratio between them. See section 5.3.3.

5.3.3.4.2 Packaging material supplier 1

This supplier has provided CO_2 per item identification and the purchase amount. As such the methodology is slightly modified to be:

$$E = D*PA* GWP$$

where: E = emissions, D= data provided by supplier by each item, PA = Purchase amount for each item, and GWP is global warming potential value.

5.3.3.4.3 Plastic material supplier 1

Have not been able to provide data for inventory year 2023, so GHG emission calculations are based previous inventory year where the supplier could deliver partial data that is only valid for one product type.

As it is only valid for one product type, the organisation will have to exclude a major part of the consumption and extract data for only 1 item and base the calculations on that. As such it follows the generic calculation methodology as described in section 5.3.3.

5.3.3.4.4 IT supplier 1-3

To calculate the limited inclusion of IT equipment, each calculation is to be based on the specific model of IT equipment purchased. This makes the methodology similar to section 5.3.3.4.2, where purchase amount of each item is considered.

5.3.3.4.5 Waste Supplier 2

Waste supplier 2 cannot deliver any reporting. So Topsil GlobalWafers have taken on the task to calculate one waste stream (incineration) to get an understanding of the worst form of waste handling utilised by the organisation. The emissions from the other waste streams e.g. cardboard and silicon dust are as of now unknown and therefore not included. The categories not accounted for is appr. 46% which is equivalent to 21 waste categories. Topsil GlobalWafers have in total 24 waste categories.
The methodology is based on emission factors given by the Danish government 'Energistyrelsen'. As the waste is used for district heating the methodology encompassed energy conversions.

$$E = BV * C * U * GWP$$

BV=Burning value, U=emission factor based on energy C=waste generated by the organisation and GWP is global warming potential value.

5.4 Greenhouse Gas Emissions for the reporting period 2023

Our total GHG emissions in 2023 are 31.159,9 tons of CO_2e, and the emissions for each category are listed in the table below. All emissions are given with 1 decimal point.

Category	Subcategory	Identifier	Emission (tCO_2e)	Percentage (%)
1. Direct emissions	Mobile	Company owned vehicles	3	0,0 %
2. Indirect emission from imported energy	Electricity	EMS data collection	1105	3,5 %
3. Indirect emission from transportation	Downstream	Transport supplier 1	1586,4	5,1 %
		Transport supplier 2	6	0,0 %
	Commuting by employees	Vehicles, employee owned, public owned	196	0,6
	Business trips	Business trip supplier 1	94	0,3 %
4. Indirect emission from products used by the organisation	Purchased goods and services	Raw supplier 1	21552	69,2 %
		Raw supplier 2	6197	19,9 %
		Gas supplier 1	321	1,0 %
		Packaging material supplier 1	28,7	0,1 %
		Plastic material supplier 1	0,6	0,0 %
		Service Provider 1	0,2	0,0 %
	Purchased goods and services-laptops	IT Supplier 1	3,7	0,0 %
	Purchased goods and services-laptops	IT Supplier 2	6,9	0,0 %
	Purchased goods and services-laptops and monitors	IT supplier 3	26,9	0,1 %
	Waste generated in operations	Waster handler 1	24	0,1 %
		Waste handler 2	8,5	0,0 %
5. Total			**31.159,9**	**100%**

5.4.1 Direct GHG Emissions (Category 1)

It is known that cars emit CO_2, CH_4 and N_2O but this is only valid for combustion engines running on gasoline or diesel.
The company owned vehicles registered for 2023 are primarily electric cars. Electric cars follow the reasoning from category 2, meaning that the national factor for electricity is applied. The national electricity factor only contains CO_2 but by utilising the Electricity Declaration it is possible to take CH_4 and N_2O into account.

The total impact of scope 1 is insignificant as it is below 5%, but the reporting will not be complete if an entire scope is missing from the inventory. It is also a requirement from ISO 14064-1 that all scopes must be represented.

5.4.2 Indirect GHG Emissions from Imported Energy (Category 2)

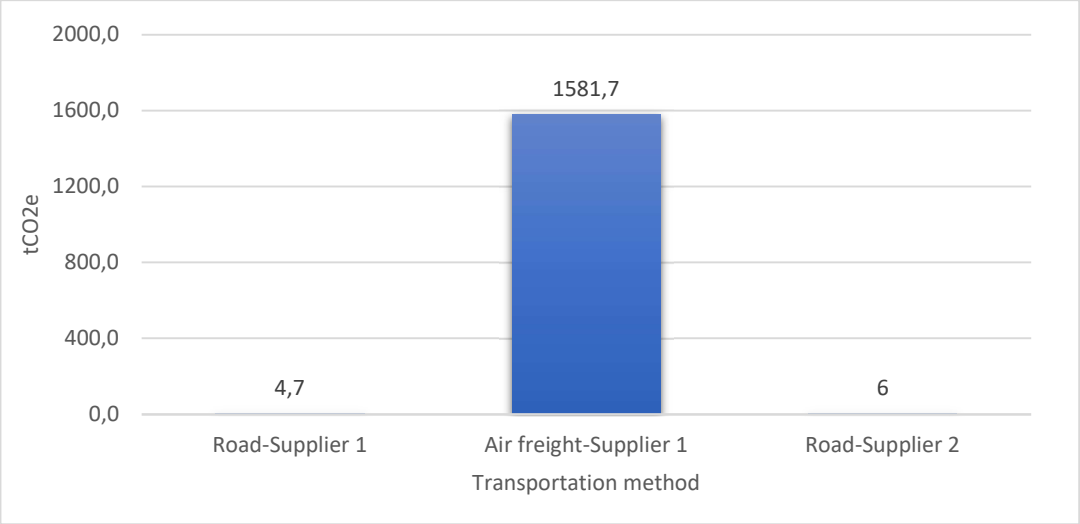
The energy that Topsil GlobalWafers utilise is a mixture of renewable energy (water, wind, sun), biomass, natural gas, nuclear power, oil, and coal. Topsil GlobalWafers policy is to consider water, wind and sun as true renewable energy sources and biomass, natural gas, nuclear power as a greener alternative (even though Danish politicians consider some of the mentioned sources green and renewable).
It is noteworthy that when looking at the significance of scope 2, the entire scope can almost be considered negligible and insignificant even though the entire sites energy consumption used to produce products is within this category. This is because the total category represents less than 5 % of the entire GHG inventory. See section 5.4.

It means that any mitigation activities taking place in this category may do a positive thing for the company itself and within category 2 (scope 2). It will allow the company to attract investors, customers, and employees by advertising as a green company, but it will not have a major impact, as the majority of the emissions are located in scope 3.
This does not by any means mean that Topsil GlobalWafers should not do anything to reduce emissions inside the organisational control and boundaries. It only means that many reduction strategies should be bound to scope 3. For details on mitigation activities, go to Chapter 6

5.4.3 Indirect GHG Emissions from Category 3~6

What is notable is the difference between the different suppliers and their belonging category (transportation and purchased goods and services).
When looking at the distribution of emissions the most significant source is raw supplier 1 and 2, who stands for more than 80% of the total emissions. This is in-line with Topsil GlobalWafers expectations as raw material production requires a significant amount of energy and when political, geological and composition of electricity is considered the results seem trustworthy. For raw materials there is also a clear link to the strategic politics the suppliers have and execute.

For transport suppliers, the method of transport is dominant (air, sea, road) and it is distributed as below:



All transport is only given as tCO_2e as it has not been possible to extract other GHG emission gasses from the provided report and there is not enough data to give Topsil GlobalWafers the opportunity to calculate other emissions ourselves.

When looking at the other categories none of them can truly be called significant as most of them are below 5%.

5.4.3.1.1 Subcategory: Commuting by employees

Topsil GlobalWafers conducted an employee survey to gather information on how employees pendle to work. The answering rate is appr. 33% and represent Topsil GlobalWafers employees. When looking at the other emission gasses (see section 4.1.3.3) from vehicles the distribution is as below:

	tCO_2	**tCH_4**	**tN_2O**	**Total tCO_2e**
Equivalent Emissions	192*	1	3	196
Percentage (%)	98%	<1%	1%	100%

*Note that it is simplified to no decimals.

Based on the results, the organisation have a low impact of other exhaust gasses for the employee commuting and has a lower than average pendle CO_2 when compared to the municipal (source: https://www.moviatrafik.dk/baeredygtig-pendling/). This is likely based on many locals to the area work at Topsil GlobalWafers and as such has less than 10 km to pendle each day.
When comparing N_2O and CH_4 to the total GHG emissions in section 5.4 the impact these two gasses have on the environmental is negligible and insignificant.

Currently the transportation by employees do not appear to be significant as it is less than the significance criteria on 5% according to section 5.4. However, electrical vehicles usage is growing due to adopted green policies by the world (see Paris Agreement and CSRD). As such it is expected that more personnel will use electrical cars and the significance of the subcategory will change.

5.4.4 Emissions from Biomass Combustion

According to the requirement stated in ISO 14064-1:2018 (paragraph 9.3.1) there is a need to quantify the biomass combustions and their emissions.
Topsil Globalwafers have no biomass combustion inside the reporting boundaries.

Type of GHG emission	tons/year
CO_2 Emissions from Biomass Combustion	0
CH_4 Emissions from Biomass Combustion	0
N_2O Emissions from Biomass Combustion	0
Total Emissions	0

This is because the factory is a newer building and was built to not rely on any other sources other than electricity. This is also the reasoning behind scope 1, category 1 which only contains company vehicles. See section 4.1.1.

5.5 Uncertainty Assessment

All inventories have a limited suitability for expressing the 'true' inventory. It is up to the GHG Management Committee to determine the suitability eg. how well does the inventory represent the 'true' inventory. This is done through an uncertainty assessment where uncertainties are identified, calculated, and described. This will give the organisation an opportunity to better allocate Topsil GlobalWafers resources, to eliminate uncertainties or implement mitigation actions (decision-making abilities).

But how is the inventory not 'true' one might ask. The inventory system relies on a measurement system. Each measurement system has several inputs such as gage, tools, personnel, environment etc.
Measurement System for an inventory is extremely complicated. For example: When calculating road transport vehicle type, load, location (ex: urban), driver, engine type, route, and weather are all a part of the measurement system to give out the 'true' value for tCO_2e for 1 road trip. This makes the calculations extremely difficult and as not everything about the trip is known and as such uncertainties are introduced for each and every input required. Furthermore, when calculating tCO_2e, estimation is often used (example for fuel consumption) and are often based on a national average. Statistical analysis says that an average can represent the road trip, but only to a limited amount. Therefore, the suitability of the measurement system for the road trip is often given as confidence interval of 95%, eg. How well does the value from the measurement system represent the 'true' value.

There are two ways to approach an uncertainty assessment:

(1) Scientific approach and base it on statistical calculation with 95% confidence interval
    1) This require that all inputs to the methodologies are completely known and its belonging uncertainties to each input required to calculate the GHG emissions
(2) Risk Assessment by competent/expert people in the field and that can represent all aspects of the inventory
    1) This is not a statistical approach but instead another type of scientific approach where expert opinion and knowledge is applied

5.5.1 Data Quality Assessment

It is important to determine the quality and the uncertainty to the inventory. One approach is to use a data quality Assessment conducted by experts. This is essential when the empirical data is lacking, or data does not fully represent all causes of uncertainties. As such a statistical approach cannot be used.
With the current data for the inventory and collected knowledge of suppliers approaches, it is not possible to use statistical tools to find the uncertainty (as the causes for uncertainty cannot be determined and mapped). Instead, an expert approach will be used. See IPCC:2006 Volume 1, Chapter 3, section 3.2.1.3 and section 3.2.2.3 for details on expert approach.

The experts selected is the GHG Management Committee at Topsil GlobalWafers which have the necessary knowledge of suppliers, green procurement, GHG methodologies, process knowledge, technology knowledge, and ISO knowledge.

The data quality assessment of inventory activities is based on a grading system where the following as a minimum is considered:

(1) Measurability and precision of collected data
    a. This includes calibration of gages
(2) Direct measurements controlled by the organisation
(3) Direct or indirect measurements controlled by the suppliers
(4) Emission factors applied
    a. National factors are the best
    b. IPCC follows national factors
    c. Other factors/method for determining the emission factor (more difficult for GHG Management Committee to determine their validity)
(5) Calculation methodologies
    a. This includes getting information from the suppliers' calculation method and validity of data
(6) Self-estimation (from suppliers or within the organisation) of quantity of GHG impact
(7) Trustworthiness of supplier feedback. Does the feedback seem reasonable
    a. This includes relationship with the supplier and eventual political, geological etc. considerations

The GHG Management Committee takes all this into consideration and classifies the different subcategories (see section 5.4) into scores A, B, C, D. The scoring system can be found in the table below:

Classification	
A	Best possible data. Data is trustworthy, reliable, measurable
B	Acceptable data level, but data is collected indirectly
C	Slightly less acceptable data level. It is not possible to get the necessary information to make a reasonable judgement on data quality
D	Data is unreliable as it is not possible to get an understanding of how the data has emerged and if it is valid for the subcategory

Based on the scoring system the GHG Management Committee discussed the data and its associated risks. From that the following output emerged for all identified subcategories in the inventory.

Category	Subcategory	Identifier	Data quality score
1. Direct emissions	Mobile	Company owned vehicles	B
2. Indirect emission from imported energy	Electricity	-	A
3. Indirect emission from transportation	Downstream	Transport supplier 1	C
		Transport supplier 2	C
	Commuting by employees	Vehicles, employee owned, public owned	C
	Business trips	Business trip supplier 1	C
4. Indirect emission from products used by the organisation	Purchased goods and services	Raw supplier 1	C
		Raw supplier 2	B
		Gas supplier 1	C
		Packaging material supplier 1	B
		Plastic material supplier 1	D
		Service provider 1	C
		IT Supplier 1	C
		IT Supplier 2	C
		IT Supplier 3	C
	Waste generated in operations	Waster handler 1	C
		Waste handler 2	D
5. Total Average			B-C

Most of the collected data falls into categories B and C. It means that there needs to be more transparency in the supply chain to fully know if data is relevant, complete, consistent, accurate and transparent (see ISO 14064-1:2018, section 4). Until this have been achieved there will be major uncertainties in the quality of data that cannot truly be mapped with a statistical approach.

However, the new CSRD requirement coming into place for EU will help with this issue as Topsil GlobalWafers is part of EU and so is many of its major suppliers mentioned in this inventory.

The categories that Topsil directly control the data collection will be explained in more details below:

- Direct emissions and indirect emissions from transportation (employees)
    - This is based on a questionnaire/survey. The answering rate is 100% for company owned vehicles and appr. 33% for the rest of the organisation.
    - There is some uncertainty in this survey. A lot of the data is based on the employees' estimation/memory of ex. L/100km or distance to work. This will surely not be 100% correct. Furthermore, AR5 had been used in the macro which has resulted in some complications in the calculations since the macro doesn't allow to change the calculations. Topsil GlobalWafers have tried to work around it to the best of the organisation's ability. Following has been changed in the calculations:
        - The GWP factors for N_2O and CH_4 have been changed from the AR5 to the AR6-values after the data had been collected and calculated the first time.
        - The organisation has tried to take the mandatory 7% of biomass in normal diesel in Europe into account. As it was only possible to find the factor for CO_2-equivalents per amount of fuel, the diesel-caused N_2O and CH_4-emission calculations has been done with the emission factors for standard diesel.
        - For EVs we have added N_2O and CH_4 to the calculations.
    - The amount of survey respondents has been changed and full-time employees in total has been changed (a few employees answered late and as such was not included in the first revision)

- Indirect emissions from imported energy
    - Here the score is very good, since it is based on the national average from the grid and the collected data is compared to electricity bills and other information from Energinet

5.6 Comparison with selected base year

To keep track of Topsil GlobalWafers impact on the environment across the years, the organisation constantly compare itself to the selected base year (see section 5.1) and track increases or decreases in tCO_2e. As the selected base year only contain information on scope 1 and 2 means that the comparison is only valid for scope 1 and 2.

Emission category	Reporting period 2021 (Base Year) **tCO_2e**	Reporting Period 2022 **tCO_2e**	Reporting period 2023 **tCO_2e**	GHG reduction **tCo_2e**
Scope 1, Category 1, Company Cars	19,8	13	3	**2022:** -6,8 **2023:-**16,8
Scope 2, Category 2, Electricity	1095	1303	1105	**2022:** 208 **2023**: 10

Total CO2e	1115	1316	1108	**2022:** 200,8 **2023:** -7,2

When comparing the selected base year with this reporting period there have in total been a 16 tons CO_2e reduction from scope 1. This is due to the selected mitigation activities the organisation has been slowly implementing over the last 2 years. See Chapter 6

When doing the same comparison with scope 2, the signals become more mixed. 2022 saw an increase in tCO_2e as the organisation used more electricity as production ramped up. Again, in 2023 the organisation saw an increase in electricity consumption due to the factory expansion and new machinery that require an immense amount of electricity. However the effect of the increased power consumption is not clearly shown as the national electricity grid is slowly developing to be more green power based, and when the national factor is applied to the calculations (see section 5.3.3.2) the impact of the increased electricity consumption becomes negligent and instead it is 'greener to use more electricity' up to a certain limit as there have been a slight increase in scope 2 for a total of 10 tCO_2e which is a ridiculously small increase compared to the increase in electricity consumption (>1 million kWh).
This appears to be a bit of a conundrum when doing comparisons as the factor change affect more than any mitigation activities completed by the organisation. The factor effect does not mean that the organisation should not do any mitigation activities, it only means that the effect of a mitigation activity cannot be seen without noise interference from the factor effect.

Chapter 6 Mitigation activities

Topsil GlobalWafers continuously strive towards exploring options and solutions that can mitigate or eliminate our GHG emissions from the inventory in section 5.4. As such the organisation works with mitigations activities that can be split up into three different sections.

1) Internal mitigation activities
2) Working with suppliers for scope 3 reductions
3) Expectations and collaboration with our customers

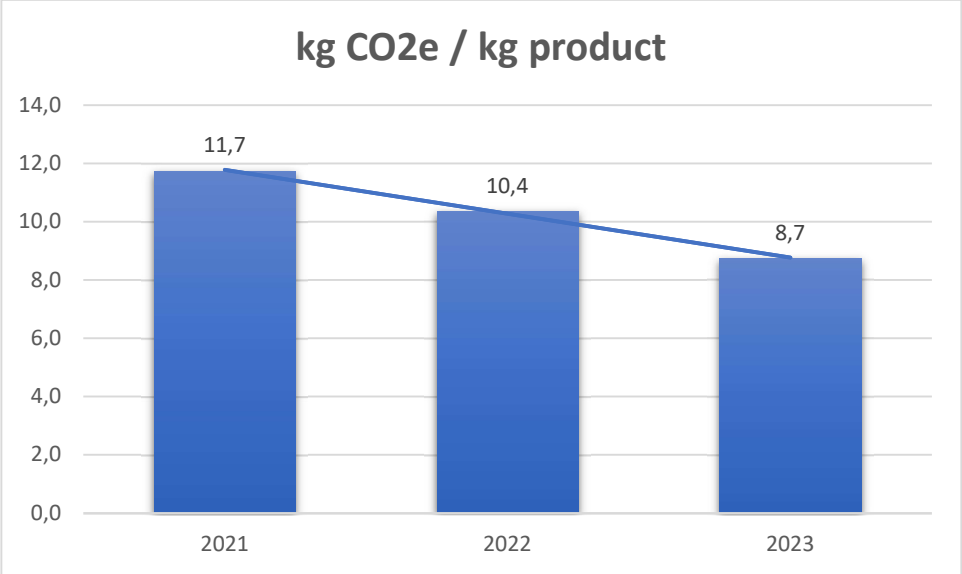
6.1. Internal mitigation activities

The internal mitigation opportunities identified as completely within the organisations control are directly linked to scope 1 and scope 2.

1) Company cars that are driven by combustion engines are being replaced with electric cars
2) Optimization of production process eg. energy efficiency by optimization of the FZ process
    a. It is known that this process is the main consumer of electricity usage and as such is the biggest contributor to GHG emission in scope 2. See section 1.2 for details on production processes
3) RE 100
    a. Topsil GlobalWafers owner have declared that all GW sites are to become RE 100 by year 2050. At Topsil, we are more ambitious and are currently planning to be RE 100 by 2025 by building a solar park adjacent to the factory. The solar park project had its early beginnings in 2022, the contract was signed in 2023 and the contraction starts April 2024 and finishes November 2024 and is expected to be functional start of December 2024

Topsil GlobalWafers have tracked these internal mitigation activities since 2021 and have currently reduced the impact per kg produced by appr. 25%.

If the downwards trend continues it is possible to reach 7 kg CO_2e/kg product in 2024. However, it does require some activities from Topsil GlobalWafers. Most of the above-mentioned activities are directly linked to mission, vision and politics of the company and is driven by the top management.
The largest part in reducing the kgCO_2e/kg product is the establishment of a solar cell park. It is expected that the solar park at a minimum will cover 100% of the expected electricity consumption. It is projected in such a way that the park will ensure RE100 status for a few years until the expected electricity consumption is higher that the capacity of the panels.



As part of Topsil GlobalWafers ISO 50001 certification there is a requirement for energy optimisation/energy reduction plans. As such this will be controlled by the EnMs organisation as part of working and implementing continuous improvement under ISO 50001. The primary focus is to be on process optimisation of the high energy process FZ (see section 1.2), but other energy projects may emerge during year 2024. This will be tracked by an internal KPI for power consumption rate, which have a target of 2% reduction per year (as minimum). This is in-line with GW EMS (Environmental group in Global Wafers) group goals for energy reduction rate and greenhouse gas absolute emission reduction (scope 1 and 2).

Most of the company cars have been replaced with electric cars and this process will continue as part of contract renewals with the service provider of the cars. Topsil GlobalWafers offer its employee to charge their car at the parking lot and when the solar park is completed, the company cars will have an extremely limited GHG footprint. This will of course also influence employee commuting where a rise in electrical car purchase is noticeable (in-line with political/governmental direction for Denmark).

6.2. Working with suppliers

As it has been observed all the way back in section 5.4, the major contributors to the inventory is located in scope 3. This means that it is necessary to work with the supply chain.

The most beneficial way is to work on developing suppliers through green procurement and help mapping the gaps. Some of it will be conducted through the supplier handling at Topsil GlobalWafers, but most of it will be the responsibility of the EMS GW Group (Environmental group in Global Wafers).
By choosing to develop the supplier through the global GW network it is possible to encourage suppliers, dedicate more resources to the tasks, and setting requirements for the major suppliers. The primary focus from the GW group is its poly suppliers as these are the suppliers with most GHG emissions and as such will have the greatest impact on

GHG reduction emissions strategies. This will likely take place through SBTI, ISO 14064-1 requirements and similar tools for taking responsibility. By starting to develop these suppliers first it is expected to slowly reduce their kg CO_2e/kg raw material, in a similar way Topsil GlobalWafers conducts itself. When a solid system is in place it is expected that the suppliers will reduce by 2% each year.

Note, much of supplier development also depend on national politics, geological limitations, technology limitations and monetary limitations.

6.3. Expectations and collaborations with customers

Some of Topsil GlobalWafers customers and stakeholders have an increased interest in GHG Management and its belonging associations. As such, customer requirement for a GHG Management System is slowly emerging. Currently, it mostly comes from European Customers where CSRD requirements are obligatory within the next few years.

The top customer requirements are mapping of an inventory and understanding one's influence on the environment. Topsil GlobalWafers have done it through establishing ISO 14001, ISO 50001, ISO 45001, and ISO 14064-1 management systems and slowly establishing measurable KPIs.

However, there is only so much Topsil GlobalWafers itself can do. When looking at the inventory (section 5.4) it is observed that some emissions are customer dependent. It is of course, the transportation mode utilised (downstream transportation).

Transportation is primarily conducted by a heavy combustion engine in the form of an aircraft (see section 5.4.3 for distribution between transportation modes). This is due to lead times. Customer requires their ordered product to be at their warehouse as quickly as possible, and when customers put in their orders late/keep changing the order then the only viable option for transportation is by aircraft.

If it was possible for customers to implement an improved forecast, then it would be possible to change the transportation chain to a longer route (meaning less GHG emissions into the atmosphere). This requires collaborations between the customers and Topsil GlobalWafers to set-up a solid system, so that a change in transportation route will have no or limited effect on Topsil GlobalWafers and its customers. At current point in time, it is not possible, as the demand for FZ material is higher than the production rate and the expectations that the product needed to be at the customers facility 'yesterday'.

Chapter 7 GHG Validation and Verification

7.1. Internal Verification

The internal verification of the greenhouse gas of the greenhouse gas inventory results was executed 25-03-2024, and the report was revised after the internal (first party) verification. The internal verification body is the Quality Department at Topsil GlobalWafers.

7.2. External Verification and Statement

This greenhouse gas report is verified by a third-party verification agency **02-07-2024** The external verification is carried out in accordance with ISO 14064-1:2018 and ISO 14064-3:2018.
There will be statement of verification based on the agreement between the two parties.

Chapter 8 GHG Reporting

1. This report is edited in accordance with the requirements of the ISO14064-1:2018 standard.
2. The approval process before publishing this report is implemented in accordance with our company's GHG inventory procedures.
3. This report is an internal document, which is only used for internal GHG management, third-party verification, registration, publication, and preservation in accordance with our company's GHG inventory procedures.
4. This report is effective after publication and will be valid when it is revised or repealed.
5. This report is edited by Nadia Arp, a member of the GHG Management Committee.

Chapter 9 Reference

1. Greenhouse gases − Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals, 2021.
2. 2006 IPCC guidelines for National Greenhouse Gas Inventories.
3. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
4. IPCC Fourth Assessment Report: Climate Change 2007.
5. IPPC Sixth Assessment Report: Climate Change 2021
6. ISO 14064-1:2018 Corporate Value Chain (Scope 3) Accounting and Reporting Standard.
7. ICCT Global Vehicle LCA – White Paper 2021
8. 2021: The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity Supplementary Material

Chapter 10 Abbreviations

1) **CIP**: Carriage and insurance paid to, means that seller (the organisation) is responsible for delivery, delivery cost and insurance of cost
2) **CSRD:** Corporate Sustainability Reporting Directive
3) **DAP**: Delivered at place, means that seller (the organisation) covers cost and risk of transporting the product to the buyer
4) **EMS**: Environmental Management System
5) **EnMs**: Energy Management System
6) **EURO 4**: EU classification of cars and on how much pollution they produce. EURO 4 are cars are after 1/1/2006
7) **FZ:** Float Zone, a process which melts a polycrystalline structure and transforms it to a monocrystal with specific electrical properties
8) **GHG**: Greenhouse gas
9) **GW:** GlobalWafers
10) **IPCC**: Intergovernmental Panel on Climate Change
11) **KPI:** Key performance indicator
12) **LTA**: Long term agreements
13) **REC**: Renewable Energy Certificate
14) **RE100**: Renewable energy 100%
15) **SBTI**: Science based targets Initiative
16) **SEU**: Significant energy use. Defined by ISO 50001:2018
17) **SI-unit**: International system of units
18) **WtW**: Well-to-wheels
19) **EMS:** Environmental Management system