carboncalcpcf.com

Product Carbon Footprint Analysis Report

For Product: qslwtiqqep

Name of the Company: gtiumgfmne

Senior Sustainability Consultant: tszxywydpo

Protocol Data (Accounting Standard): GHG Protocol

Product Carbon Footprint Analysis Report

Generated Date: June 4, 2026

Senior Sustainability Consultant: tszxywydpo

Company: gtiumgfmne

Product: qslwtiqqep

Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product qslwtiqqep, manufactured by gtiumgfmne. The analysis, conducted by Senior Sustainability Consultant tszxywydpo, adheres strictly to the Greenhouse Gas (GHG) Protocol standards, including the 2026 Land Sector and Removals (LSR) Update and aims for at least 95% coverage for Scope 3 emissions. The total carbon footprint of one functional unit of qslwtiqqep is calculated across its entire life cycle, from raw material acquisition to end-of-life. This report identifies emission hotspots and provides a transparent overview of the product\'s environmental impact, informing strategic decisions for decarbonization.

---

1. Methodology and Scope Definition

The Product Carbon Footprint (PCF) analysis for qslwtiqqep follows the five-step methodology prescribed by the GHG Protocol Product Standard, ensuring a comprehensive and standardized assessment of greenhouse gas emissions across the product\'s lifecycle.

1.1. Define Scope

- **Functional Unit:** The functional unit for this PCF analysis is defined as 1.0 unit of qslwtiqqep.
- **System Boundary:** The system boundary is set as "Cradle-to-Gate" with additional "Use Phase" and "End-of-Life" considerations, specifically from raw material extraction to the factory gate, complemented by the post-factory gate stages. This includes upstream material extraction and processing, manufacturing at gtiumgfmne\'s facility, outbound transportation, product use by the consumer, and end-of-life treatment.
- **Geographic Scope:** The final production country for qslwtiqqep is China, with a supply chain focus on Europe. Use phase emissions consider average European energy mixes, and end-of-life scenarios reflect typical practices in developed markets.
- **Accounting Standard:** This analysis strictly adheres to the GHG Protocol Product Life Cycle Accounting and Reporting Standard. Emissions are categorized into Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased energy), and Scope 3 (all other indirect emissions in the value chain).
- **Allocation:** Allocation of emissions for multi-product processes is based on mass for raw materials and energy, where specific data is not available for direct allocation.

---

2. Lifecycle Mapping (LCI Inventory Stages)

The lifecycle of qslwtiqqep is mapped into the following stages for inventory collection and emission calculation:

1. **Raw Material Acquisition & Pre-processing (Upstream - Scope 3, Category 1):** This stage includes the extraction, production, and initial processing of all raw materials and components listed in the Detailed Bill of Materials (BOM).

2. **Production/Manufacturing (Operational - Scope 1 & 2):** Emissions from gtiumgfmne\'s manufacturing facility in China, including direct emissions from owned or controlled sources (Scope 1) and indirect emissions from purchased electricity (Scope 2).
3. **Transportation & Distribution (Upstream & Downstream - Scope 3, Category 4 & 9):** Emissions from transporting raw materials to the factory (upstream) and finished products to the customer, including last-mile delivery (downstream).
4. **Use Phase (Downstream - Scope 3, Category 11):** Emissions associated with the product\'s energy consumption during its lifespan by the end-user.
5. **End-of-Life (Downstream - Scope 3, Category 12):** Emissions and potential credits/avoided emissions related to the disposal and recycling of the product at the end of its functional life.

---

3. Data Collection (Primary/Secondary Data Points)

Both primary and secondary data sources were utilized for this analysis. Primary data was provided through the defined parameters, while secondary data, such as industry-average emission factors, were sourced from reputable databases like Ecoinvent and DEFRA, or similar publicly available data, where specific primary data was unavailable.

3.1. Detailed Bill of Materials (BOM) Analysis (Primary Data & Secondary Emission Factors)

The following detailed Bill of Materials (BOM) was used to calculate the material-related emissions for qslwtiqqep. The \'Total Carbon\' values represent the pre-calculated emissions for each material, typically encompassing extraction and processing (cradle-to-gate material emissions).

Detailed Bill of Materials (BOM) - jsejxnik

ID	Description	Category	Process	Quantity	Unit	Emission Factor (kgCO2e/unit)	Total Carbon (kgCO2e)
1	Aluminum Casing	Metal	Casting	0.5	kg	2.5	1.25
2	Plastic Enclosure	Plastic	Injection Molding	0.3	kg	3.0	0.90
3	Circuit Board	Electronics	Assembly	0.1	unit	15.0	1.50
4	Copper Wiring	Metal	Extrusion	0.05	kg	4.0	0.20
5	Packaging	Paper	Conversion	0.2	kg	1.0	0.20

Total Material Emissions (Scope 3 - Upstream): 4.05 kgCO2e

Estimated Total Product Weight: 1.25 kg (sum of quantities for transport and EoL, treating \'unit\' as \'kg\' equivalent).

3.2. Energy Inputs & Other Operational Data (Primary Data & Secondary Emission Factors)

- **Renewable Energy Usage:** qwnnlrzjsm% (60%)
- **Energy Intensity (Production):** pqisfofuhf kWh/unit (10 kWh/unit)
- **Product Lifespan:** dzmvosuqmr years (5 years)
- **Energy Consumption in Use:** nywdzrfhwd kWh (50 kWh total over lifespan)
- **Recyclability Percentage:** zwjsrxeohj% (75%)
- **Circular/Take-back Programs:** qjlfkoioiw (Company offers a take-back program for product components at end-of-life.)
- **Transport Distance:** trvjdfexfp km (2000 km for inbound/main outbound logistics)
- **Transport Mode (Main):** Select Mode (Ocean Freight (Container Ship) and Road (HGV))

- **Last-Mile Delivery Channel:** Delivery Type (Parcel Carrier (Van))

3.3. Emission Factors Used (Secondary Data - Illustrative/Industry Standard)

For calculations where primary emission factors were not provided, industry-standard values were applied:

- **China Electricity Grid Mix Emission Factor:** 0.6205 kg CO2e/kWh (National Average Electricity Carbon Footprint Factor, 2023 data)
- **Europe Electricity Grid Mix Emission Factor (for Use Phase):** 0.238 kg CO2e/kWh (EU-27, 2019 data)
- **Ocean Freight (Container Ship) Emission Factor:** 0.016 kg CO2e/tonne-km
- **Road Transport (Heavy Goods Vehicle - HGV) Emission Factor:** 0.1 kg CO2e/tonne-km (illustrative average)
- **Last-Mile Delivery (Parcel Carrier Van) Emission Factor:** 0.24934 kg CO2e/km
- **General Waste to Landfill Emission Factor:** 0.5 kg CO2e/kg (illustrative average)

---

4. Emission Calculation (Activity * Emission Factor = CO2e)

The emissions for each life cycle stage are calculated below, categorized by GHG Protocol scopes.

4.1. Upstream Emissions (Scope 3)

4.1.1. Raw Material Acquisition & Pre-processing (Scope 3, Category 1 - Purchased Goods and Services)

As per the BOM, the total carbon emissions from the acquisition and pre-processing of materials are directly summed from the provided \'Total Carbon\' values.

Calculated Emissions:

- Total Material Emissions: 4.05 kgCO2e

4.1.2. Upstream Transportation & Distribution (Scope 3, Category 4)

Assuming the 2000 km transport distance is split into 1800 km Ocean Freight and 200 km Road (HGV) to the factory in China, and using an estimated product weight of 1.25 kg.

- Ocean Freight Emissions: 1.25 kg * 1800 km * 0.016 kgCO2e/tkm = 36.00 kgCO2e
- Road (HGV) Emissions: 1.25 kg * 200 km * 0.1 kgCO2e/tkm = 25.00 kgCO2e
- **Total Upstream Transport Emissions:** 36.00 + 25.00 = 61.00 kgCO2e

4.2. Operational Emissions (Scope 1 & 2)

4.2.1. Production Phase (Scope 1 & 2)

The manufacturing process at gtiumgfmne\'s facility in China utilizes energy with a specified renewable energy usage and intensity.

- Total Energy Consumption: 10 kWh/unit
- Renewable Energy Usage: 60%
- Non-renewable Energy: 10 kWh/unit * (1 - 60/100) = 4 kWh/unit
- China Grid Emission Factor: 0.6205 kg CO2e/kWh
- **Scope 2 Emissions (Purchased Electricity):** 4 kWh/unit * 0.6205 kg CO2e/kWh = 2.482 kgCO2e/unit
- **Scope 1 Emissions (Direct):** Assuming a conservative illustrative value for on-site fuel combustion or process emissions not covered by purchased electricity, e.g., 0.1 kgCO2e/unit. Actual values would require specific operational data.
- **Total Production Emissions (Scope 1 & 2):** 2.482 + 0.1 = 2.582 kgCO2e/unit

4.3. Downstream Emissions (Scope 3)

4.3.1. Downstream Transportation & Distribution (Scope 3, Category 9)

This includes last-mile delivery to the customer. Assuming a last-mile distance of 50 km for a parcel carrier van.

- Last-Mile Distance: 50 km
- Parcel Carrier Van Emission Factor: 0.24934 kg CO2e/km
- **Last-Mile Delivery Emissions:** 50 km * 0.24934 kg CO2e/km = 12.467 kgCO2e

4.3.2. Use Phase (Scope 3, Category 11 - Use of Sold Products)

The product has a lifespan of 5 years and consumes 50 kWh total energy over its lifespan. Emissions are calculated using the average European grid mix, as the supply chain focus is Europe.

- Total Energy Consumption in Use: 50 kWh
- Europe Grid Emission Factor: 0.238 kg CO2e/kWh
- **Use Phase Emissions:** 50 kWh * 0.238 kg CO2e/kWh = 11.90 kgCO2e

4.3.3. End-of-Life (EoL) Phase (Scope 3, Category 12 - End-of-Life Treatment of Sold Products)

The recyclability percentage is 75%, with a product weight of 1.25 kg. Emissions are accounted for the non-recycled portion.

- Total Product Weight: 1.25 kg
- Recyclability Percentage: 75%
- Weight Disposed to Landfill: 1.25 kg * (1 - 75/100) = 0.3125 kg
- Illustrative Landfill Emission Factor: 0.5 kg CO2e/kg
- **Disposal Emissions:** 0.3125 kg * 0.5 kg CO2e/kg = 0.156 kgCO2e
- **Recycling Credit:** The 75% recyclability and presence of circular/take-back programs (qjlfkoioiw: "Company offers a

take-back program for product components at end-of-life.") indicate significant avoided emissions from virgin material production. While not explicitly quantified as negative emissions in this report without specific methodology for avoided emissions from recycling, this contributes positively to circularity and overall GHG reduction potential.

4.4. Summary of Emissions by Lifecycle Stage and GHG Scope

Lifecycle Stage	Emissions (kgCO2e)	GHG Protocol Scope	GHG Protocol Category
Raw Material Acquisition & Pre-processing	4.050	Scope 3 (Upstream)	Category 1: Purchased Goods and Services
Upstream Transportation & Distribution	61.000	Scope 3 (Upstream)	Category 4: Upstream Transportation and Distribution
Production (Scope 1 - Direct)	0.100	Scope 1	Direct Emissions
Production (Scope 2 - Purchased Electricity)	2.482	Scope 2	Purchased Electricity
Downstream Transportation & Distribution (Last-Mile)	12.467	Scope 3 (Downstream)	Category 9: Downstream Transportation and Distribution
Use Phase	11.900	Scope 3 (Downstream)	Category 11: Use of Sold Products
End-of-Life (Disposal)	0.156	Scope 3 (Downstream)	Category 12: End-of-Life Treatment of Sold Products
Total Product Carbon Footprint (PCF)	**92.155**		

Total Product Carbon Footprint (PCF) for one functional unit of qslwtiqqep: 92.155 kgCO2e

4.5. 2026 LSR Update & Scope 3 Compliance

The Land Sector and Removals (LSR) Standard (2026 Update) emphasizes accounting for land use and carbon removals. While specific primary data for land-use change and removals within the supply chain for qslwtiqqep were not provided, this analysis acknowledges the importance of the LSR standard and recommends detailed assessment of land-related emissions and sequestration potential in future iterations, especially concerning biomass-derived materials or manufacturing processes. Future data collection should aim to integrate these aspects more deeply.

Scope 3 Compliance: This analysis endeavors to ensure at least 95% coverage for Scope 3 reporting, as per 2026 requirements. The detailed breakdown across upstream and downstream categories, including materials, transportation, use, and end-of-life, aims to capture the majority of value chain emissions. Specific unquantified Scope 3 categories would include capital goods, business travel, and employee commuting for the manufacturing entity, which are typically less significant for a single product\'s footprint but are captured at a corporate level. Based on the comprehensiveness of included categories, the 95% coverage target for product-level Scope 3 is deemed achievable.

---

5. Review & Report

5.1. Hotspots and Reliability

The primary emission hotspots for qslwtiqqep are identified as:

- **Upstream Transportation & Distribution (61.000 kgCO2e):** This constitutes the largest portion of the PCF, highlighting the significant impact of global supply chain logistics, particularly the long-distance ocean and road freight from material sources to the manufacturing facility in China.

This is typical for products with geographically dispersed supply chains.
- **Use Phase (11.900 kgCO2e):** The energy consumption during the product\'s lifespan contributes substantially, emphasizing the importance of energy-efficient product design and promoting renewable energy adoption by end-users.
- **Raw Material Acquisition & Pre-processing (4.050 kgCO2e):** Material choices and their associated manufacturing processes are also a significant contributor, necessitating exploration of lower-carbon materials and optimized production techniques.

The reliability of this report is high for the quantified stages, relying on provided primary data and recognized secondary emission factors. The limitations lie in the illustrative nature of some secondary emission factors and the assumptions made for transport distances and last-mile delivery. Further improvements would involve collecting more granular, supplier-specific primary data for Scope 3 emissions, particularly for transportation routes and modal splits, and precise energy mix data for the use phase tailored to specific end-user geographies within Europe.

5.2. Recommendations for Emission Reduction

- **Optimize Logistics:** Explore opportunities for modal shifts to lower-carbon transport (e.g., rail over road where feasible), optimize shipping routes, increase freight efficiency (higher load factors), and explore local sourcing of materials to reduce transport distances.
- **Enhance Energy Efficiency & Renewables in Production:** Continue to increase renewable energy penetration in manufacturing operations beyond the current qwnnlrzjsm% (60%) and invest in energy-efficient production technologies in China.
- **Improve Product Energy Efficiency:** Design qslwtiqqep for even lower energy consumption during its use phase to minimize downstream emissions, coupled with promoting renewable energy sources for end-users.

- **Circular Economy Strategies:** Strengthen existing circular/take-back programs (qjlfkoioiw) and explore design-for-disassembly and material recovery to maximize the benefits of the zwjsrxeohj% (75%) recyclability and further reduce end-of-life impacts.
- **Supplier Engagement:** Collaborate with upstream suppliers to identify and reduce emissions from raw material extraction and processing, focusing on Scope 3, Category 1 improvements.
