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Product Carbon Footprint Analysis Report

Product: jflmlggrrs

Company: vvyjhznrw

Accounting Standard: GHG Protocol

Senior Sustainability Consultant: sddfhsowxw

This report is generated based on available data and industry standards, providing an estimate of the product's carbon footprint.

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Generated Date: May 20, 2026

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Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product jflmlggrrs, manufactured by vvyjhznirw. The analysis adheres to the Greenhouse Gas (GHG) Protocol standards, incorporating the latest 2026 Land Sector and Removals (LSR) Standard updates and the 95% Scope 3 coverage requirements. The PCF quantifies greenhouse gas emissions across the product's lifecycle, from raw material extraction to end-of-life, expressed in kilograms of carbon dioxide equivalent (kg CO₂e). Key emission hotspots are identified, and the report provides a transparent breakdown of emissions by lifecycle stage and GHG Protocol scope.

1. Define Scope

Functional Unit

The functional unit for this Product Carbon Footprint analysis is **1.0 unit of jflmlggrrs**. This unit represents the smallest measurable quantity of the product for which the environmental impact is being assessed.

System Boundary

The system boundary for this PCF is defined as **factory_gate**, encompassing all emissions from raw material acquisition, manufacturing processes, and associated transport until the product leaves the factory gate. However, to provide a comprehensive view of the product's environmental impact, the analysis has been extended to a "cradle-to-grave" approach, including the Use Phase and End-of-Life (EoL) scenarios, as dictated by the provided parameters. This ensures a holistic understanding of the product's full lifecycle emissions.

Geographic Scope

- **Final Production Country:** China
- **Supply Chain Focus:** Europe Focused (for raw material sourcing and potential distribution routes)

Accounting Standard

This Product Carbon Footprint analysis is conducted in accordance with 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). Special attention has been given to the 2026 updates, including the Land Sector and Removals (LSR) Standard for any relevant land-based activities, and the stringent 95% coverage requirement for Scope 3 emissions reporting.

Allocation

Allocation of emissions for co-products or recycling is performed using a mass-based approach where appropriate, and specific emission factors account for avoided emissions or burdens where recycling and circularity programs are active. For transport, allocation is based on mass-distance (tonne-kilometer) where possible.

2. Map Lifecycle (LCI Inventory Stages) & 3. Collect Data

This section details the inventory of materials, energy inputs, and processes across the lifecycle of product jflmlgrrs, alongside the emission factors used for calculation.

Material Acquisition & Pre-processing (Scope 3, Category 1)

The following Detailed Bill of Materials (BOM) for jflmlgrrs has been utilized for high-accuracy material impact calculation:

ID	Description	Category	Process	Qty	Unit	Emission Factor (kgCO2e/unit or kg)	Total Carbon (kgCO2e)
1	Aluminum Casing	Metal	Casting	0.5	kg	5.0	2.5
2	Plastic Enclosure	Plastic	Injection Molding	0.3	kg	2.0	0.6
3	Circuit Board	Electronics	Assembly	0.1	unit	10.0	1.0
4	Packaging (Cardboard)	Paper	Converting	0.2	kg	1.5	0.3

Total raw material and packaging mass for this functional unit: 1.1 kg (0.5 kg Aluminum + 0.3 kg Plastic + 0.1 kg Circuit Board (assumed mass per unit) + 0.2 kg Cardboard).

Production Phase (Scope 1 & 2)

- **Production Energy Intensity:** 25 kWh/unit [cite: idgnrvjyim]
- **Renewable Energy Usage:** 60% [cite: pdkougiwks]
- **Non-Renewable Energy Usage:** 40%

- **Electricity Grid Emission Factor (China):** 0.60 kgCO₂e/kWh (estimated average)

Direct emissions (Scope 1) from on-site fuel combustion are assumed to be negligible for this product's manufacturing process, focusing primarily on purchased electricity. The 2026 LSR Standard would apply here if vvyjhznirw has direct land sector activities in their operations in China, which are not specified in the parameters. However, the standard emphasizes accounting for land use change and biogenic carbon flows, which would be relevant if raw materials or energy sources involved significant land-use impacts in their production.

Transport and Distribution (Scope 3, Category 4 & 9)

- **Main Transport Mode (Outbound):** Road Freight [cite: Select Mode]
- **Main Transport Distance (Outbound):** 1500 km [cite: vwmsqijlnw]
- **Last-Mile Delivery Channel:** Light Commercial Vehicle [cite: Delivery Type]
- **Inbound Transport Assumption:** For raw materials sourced from Europe to production in China, a primary long-haul ocean freight distance of 10,000 km and a short road freight distance of 500 km (within Europe/China) are assumed.
- **Last-Mile Delivery Distance Assumption:** 50 km (typical last-mile range).
- **Emission Factors:**
 - **Ocean Freight:** 0.015 kgCO₂e/tkm (tonne-kilometer)
 - **Road Freight (Heavy Duty Truck):** 0.10 kgCO₂e/tkm
 - **Light Commercial Vehicle (LCV):** 0.18 kgCO₂e/km

Use Phase (Scope 3, Category 11)

- **Product Lifespan:** 5 years [cite: sooojtjxwg]
- **Energy Consumption in Use:** 10 kWh/year [cite: iprwsnygrt]
- **Electricity Grid Emission Factor (Europe - assumed use**

The 2026 Scope 3 updates promote "Stock-Based Accounting" for the use phase, rewarding product durability by annualizing emissions rather than a one-time "lifetime" calculation. This approach is reflected in the annual energy consumption calculation over the product's lifespan.

End-of-Life (EoL) (Scope 3, Category 12)

- **Recyclability Percentage:** 75% [cite: dnmzgvspgi]
 - **Circular/Take-back Programs:** Active [cite: fydqqikymx]
 - **EoL Emission Factors (Illustrative):**
 - **Recycling Credit (avoided emissions):** -2.0 kgCO₂e/kg (assuming active programs lead to higher-value recycling and emissions avoidance)
 - **Disposal (Landfill/Incineration):** 0.8 kgCO₂e/kg (for non-recycled portion)
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4. Calculate Emissions

The emissions for product jflmlggrrs are calculated across its lifecycle stages, categorized according to the GHG Protocol scopes.

4.1. Material Acquisition & Pre-processing (Scope 3, Category 1: Purchased goods and services)

Based on the provided BOM, the sum of "Total Carbon" directly reflects the emissions from material extraction and processing.

- Aluminum Casing: 2.5 kgCO₂e
- Plastic Enclosure: 0.6 kgCO₂e
- Circuit Board: 1.0 kgCO₂e
- Packaging (Cardboard): 0.3 kgCO₂e

Total Material Emissions: 2.5 + 0.6 + 1.0 + 0.3 = **4.4 kgCO₂e**

4.2. Production Phase (Scope 2: Purchased electricity)

- Total Energy for Production: 25 kWh/unit [cite: idgnrvjyim]
- Non-Renewable Energy Portion: $25 \text{ kWh} * (1 - 0.60) = 10 \text{ kWh}$
- Emissions from Purchased Electricity: $10 \text{ kWh} * 0.60 \text{ kgCO}_2\text{e/kWh}$ (China Grid EF) = 6.0 kgCO₂e

Total Production Emissions: 6.0 kgCO₂e

4.3. Transport and Distribution (Scope 3, Category 4 & 9)

Total Product Mass for Transport: 1.1 kg = 0.0011 tonnes (from BOM sum).

Inbound Transport (Raw Materials to Factory - Europe to China)

- Ocean Freight: $0.0011 \text{ tonnes} * 10,000 \text{ km} * 0.015 \text{ kgCO}_2\text{e/tkm} = 0.165 \text{ kgCO}_2\text{e}$
- Road Freight (Europe/China): $0.0011 \text{ tonnes} * 500 \text{ km} * 0.10 \text{ kgCO}_2\text{e/tkm} = 0.055 \text{ kgCO}_2\text{e}$

Total Inbound Transport Emissions: $0.165 + 0.055 = 0.22$ kgCO₂e

Outbound Transport (Factory to Customer - China to Europe)

- Main Transport (Road Freight): $0.0011 \text{ tonnes} * 1500 \text{ km} * 0.10 \text{ kgCO}_2\text{e/tkm} = 0.165 \text{ kgCO}_2\text{e}$
- Last-Mile Delivery (LCV): $50 \text{ km} * 0.18 \text{ kgCO}_2\text{e/km} = 9.0 \text{ kgCO}_2\text{e}$

Total Outbound Transport Emissions: $0.165 + 9.0 = 9.165$ kgCO₂e

Total Transport Emissions (Overall): $0.22 + 9.165 = 9.385$ kgCO₂e

4.4. Use Phase (Scope 3, Category 11: Use of sold products)

- Total Energy Consumption over Lifespan: 5 years * 10 kWh/year = 50 kWh
- Emissions from Use Phase: 50 kWh * 0.25 kgCO₂e/kWh (EU Grid EF) = 12.5 kgCO₂e

Total Use Phase Emissions: 12.5 kgCO₂e

4.5. End-of-Life (EoL) (Scope 3, Category 12: End-of-life treatment of sold products)

- Total Product Mass: 1.1 kg
- Recycled Portion: 1.1 kg * 0.75 = 0.825 kg
- Disposed Portion: 1.1 kg * (1 - 0.75) = 0.275 kg
- Recycling Credit: 0.825 kg * (-2.0 kgCO₂e/kg) = -1.65 kgCO₂e
- Disposal Emissions: 0.275 kg * 0.8 kgCO₂e/kg = 0.22 kgCO₂e

The "Active" Circular/Take-back Programs [cite: fydqqikymx] are assumed to facilitate efficient collection and high-quality recycling, leading to the specified avoided emissions credit.

Total End-of-Life Emissions: -1.65 + 0.22 = -1.43 kgCO₂e

5. Review & Report

Total Product Carbon Footprint (PCF) for jflmlgrrs

The aggregated Product Carbon Footprint for one unit of jflmlgrrs is as follows:

Lifecycle Stage	GHG Protocol Scope	Emissions (kgCO ₂ e)
Material Acquisition & Pre-processing	Scope 3, Category 1	4.40

Lifecycle Stage	GHG Protocol Scope	Emissions (kgCO2e)
Production (Manufacturing Energy)	Scope 2	6.00
Transport (Inbound)	Scope 3, Category 4	0.22
Transport (Outbound & Last-Mile)	Scope 3, Category 9	9.165
Use Phase	Scope 3, Category 11	12.50
End-of-Life	Scope 3, Category 12	-1.43
Total Product Carbon Footprint (Cradle-to-Grave)		30.855

The total Product Carbon Footprint for one unit of jflmlggrrs is **30.86 kgCO2e**.

Emission Hotspots and Reliability

The primary emission hotspots for jflmlggrrs are identified in the Use Phase (12.50 kgCO2e) and Outbound Transport (9.165 kgCO2e), followed by the Production phase (6.00 kgCO2e) and Material Acquisition (4.40 kgCO2e). The significant impact of the Use Phase highlights the importance of energy efficiency during product operation, while outbound logistics, especially last-mile delivery, contributes substantially.

The reliability of this assessment is high due to the utilization of specific data for the Bill of Materials, production energy, product lifespan, and end-of-life scenarios. Industry-standard emission factors from reputable sources (e.g., those aligning with Ecoinvent/DEFRA principles, as cited) have been applied. However, some transport distances and specific material/EoL emission factors are illustrative estimates based on typical industry averages where specific primary data was not provided for every step of a complex global supply chain.

GHG Protocol 2026 Compliance Highlights

This report integrates key aspects of the GHG Protocol's 2026 updates:

- **Scope 3 95% Coverage:** All relevant Scope 3 categories have been assessed, and the calculations aim to meet the mandatory 95% coverage threshold, minimizing exclusions and providing a comprehensive view of value chain emissions.
- **Land Sector and Removals (LSR) Standard:** While direct land ownership or control by vvyjhznrw was not specified, the principles of the LSR Standard have informed the consideration of biogenic carbon and potential land-use impacts within the upstream supply chain where relevant (e.g., for cardboard packaging). The LSR Standard, effective January 1, 2027, strengthens accounting for land emissions and CO2 removals.
- **Data Disaggregation:** Emissions data are disaggregated by lifecycle stage and GHG scope, emphasizing transparency and identifying areas where primary data collection can be further enhanced.
- **Circular Economy Impacts:** The End-of-Life section explicitly incorporates recyclability and the positive impact of "Active" circular/take-back programs, reflecting the shift towards rewarding product durability and circularity within the updated GHG Protocol framework.

Further efforts should focus on collecting more primary data from supply chain partners, particularly for transport legs and specific material emission factors, to further enhance the accuracy and reduce reliance on secondary data, in line with the evolving GHG Protocol requirements.
