

carboncalcpcf.com

Product Carbon Footprint (PCF) Analysis Report

Product: tueuwzzrpv

Company Name: fjrdwnutsi

Senior Sustainability Consultant: Ipiizpinsf

Protocol Data (Accounting Standard): GHG
Protocol

Disclaimer: This report is generated based on available data and industry standards. While efforts have been made to ensure accuracy and completeness, the dynamic nature of sustainability data and methodologies means that figures are estimates and subject to change with improved data availability.

Product Carbon Footprint (PCF) Analysis Report for tueuwzzrpv

Generated Date: June 4, 2026

1. Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product "tueuwzzrpv" manufactured by fjrdownutsi. The analysis was conducted by Ipiizpinsf, Senior Sustainability Consultant, in accordance with the GHG Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard. The objective is to quantify the greenhouse gas emissions associated with the product's entire lifecycle, from material extraction to end-of-life, identify key emission hotspots, and provide actionable insights for emission reduction. This assessment considers 2026 updates to GHG Protocol, including the Land Sector and Removals (LSR) Standard and the 95% Scope 3 coverage requirement.

2. Methodology

The Product Carbon Footprint (PCF) for "tueuwzzrpv" was calculated following the five-step methodology prescribed by the GHG Protocol. This approach ensures a comprehensive and standardized assessment of greenhouse gas emissions across the product's lifecycle.

2.1. Define Scope

- **Functional Unit:** 1.0 unit of tueuwzzrpv. This defines the quantified performance of the product for which the PCF is calculated.
- **System Boundary:** factory_gate. The system boundary includes all processes from raw material acquisition ("cradle") up to the point where the product leaves the factory gate, encompassing material production, manufacturing, and inbound logistics. Emissions from the

Confidential - Internal Use Only

use phase and end-of-life are also included as part of the full lifecycle assessment.

- **Geographic Scope:** Final Production Country: China, Supply Chain Focus: Europe Focused. This specifies the regional context for emission factors and supply chain activities.
- **Allocation:** Emissions were allocated based on mass for co-products where applicable, ensuring a fair distribution of environmental burdens.
- **Accounting Standard:** GHG Protocol. This analysis strictly adheres to the Greenhouse Gas Protocol's standards, including the Corporate Standard and the Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

2.2. Map Lifecycle (LCI Inventory Stages) & 2.3. Collect Data

The lifecycle of "tueuwzzrpv" was mapped into distinct stages, and both primary and secondary data were collected. The primary data provided were crucial for high-accuracy calculations.

2.3.1. Materials (Scope 3 - Upstream)

The Detailed Bill of Materials (BOM) for "tueuwzzrpv" provides specific data for material impact calculation.

ID	Description	Category	Process	Qty (Unit)	Emission Factor (kgCO ₂ e/ Unit)	Total Carbon (kgCO ₂ e)
M001	Aluminum Alloy Casing	Metal	Die Casting	0.8 kg	10.5	8.40
M002	Recycled Plastic Enclosure	Plastic	Injection Molding	0.5 kg	1.2	0.60
M003		Metal	Drawing	0.2 kg	3.8	0.76
Total Material Footprint:						17.91 kgCO ₂ e
Total Product Weight (approx. from BOM):						2.2 kg

ID	Description	Category	Process	Qty (Unit)	Emission Factor (kgCO ₂ e/Unit)	Total Carbon (kgCO ₂ e)
	Copper Wiring					
M004	Silicon Chipset	Semiconductor	Fabrication	0.05 kg	50.0	2.50
M005	Lithium-ion Battery Pack	Electronics	Assembly	0.3 kg	15.0	4.50
M006	Printed Circuit Board	Electronics	Manufacturing	0.15 kg	7.0	1.05
M007	Packaging (Recycled Cardboard)	Packaging	Converting	0.2 kg	0.5	0.10
Total Material Footprint:						17.91 kgCO ₂ e
Total Product Weight (approx. from BOM):						2.2 kg

2.3.2. Production Energy (Scope 2 & Scope 3 - Upstream)

- **Energy Intensity:** 15 kWh/unit [cite: PARAMETER].
- **Renewable Energy Usage:** 75% [cite: PARAMETER].
- **Geographic Location for Production:** China.
- **Emission Factor for China Grid Electricity:** 0.6205 kgCO₂e/kWh (2023 national average).
- **Emission Factor for Renewable Electricity:** 0.0 kgCO₂e/kWh (assuming certified zero-emission sources).

2.3.3. Transport (Scope 3 - Upstream & Downstream)

- **Transport Mode (Intercontinental):** Ocean Freight.
- **Transport Mode (European Inland):** Road Freight (Truck).

- **Transport Distance:** 8000 km (for intercontinental ocean freight), 500 km (for European road freight to distribution hub) [cite: PARAMETER].
- **Last-Mile Delivery Channel:** Road (Light Commercial Vehicle) [cite: PARAMETER].
- **Emission Factor - Ocean Freight (Container Ship):** 0.01 kgCO₂e/tonne-km (Ecoinvent v3.8, global average).
- **Emission Factor - Road Freight (HGV, Europe):** 0.1 kgCO₂e/tonne-km (illustrative, based on DEFRA/BEIS data for articulated HGVs).
- **Emission Factor - Last-Mile Delivery (LCV, Europe):** 0.15 kgCO₂e/tonne-km (illustrative, for light commercial vehicles).

2.3.4. Use Phase (Scope 3 - Downstream)

- **Product Lifespan:** 5 years [cite: PARAMETER].
- **Energy Consumption in Use:** 20 kWh/year [cite: PARAMETER].
- **Assumed User Region (for electricity mix):** Europe.
- **Emission Factor for European Grid Electricity:** 0.27 kgCO₂e/kWh (illustrative average).

2.3.5. End-of-Life (Scope 3 - Downstream)

- **Recyclability Percentage:** 80% [cite: PARAMETER].
- **Circular/Take-back Programs:** Company-run take-back scheme with high-efficiency material recovery for key components (metals, plastics, battery) [cite: PARAMETER]. This significantly influences the effective end-of-life emissions by promoting recycling and material reuse.
- **Emission Factor - Disposal (e.g., Landfill/Incineration):** 0.5 kgCO₂e/kg (illustrative).
- **Emission Factor - Recycling Credit:** -0.2 kgCO₂e/kg (illustrative, for recovered materials displacing virgin production).

2.4. Calculate Emissions (Activity * Emission Factor = CO₂e)

All calculations were performed using the collected data and industry-standard emission factors, primarily from Ecoinvent and DEFRA databases where specific data was not provided. All results are expressed in kilograms of Carbon Dioxide Equivalent (kgCO₂e).

Total Product Weight for transport and EoL: 2.2 kg (derived from BOM).

2.4.1. Scope 3 Emissions - Materials Acquisition & Processing

Calculated directly from the provided BOM "Total Carbon" column.

Total Material Emissions: 17.91 kgCO₂e

2.4.2. Scope 2 Emissions - Production (Purchased Electricity)

- Non-renewable electricity: 15 kWh/unit * (1 - 0.75) * 0.6205 kgCO₂e/kWh = 2.327 kgCO₂e
- Renewable electricity: 15 kWh/unit * 0.75 * 0.0 kgCO₂e/kWh = 0.0 kgCO₂e
- **Total Production Energy Emissions (Scope 2):** 2.33 kgCO₂e

2.4.3. Scope 3 Emissions - Transport (Upstream & Downstream Logistics)

- Ocean Freight: 2.2 kg (0.0022 tonnes) * 8000 km * 0.01 kgCO₂e/tonne-km = 0.176 kgCO₂e
- Road Freight (Europe): 2.2 kg (0.0022 tonnes) * 500 km * 0.1 kgCO₂e/tonne-km = 0.110 kgCO₂e
- Last-Mile Delivery: 2.2 kg (0.0022 tonnes) * 50 km (illustrative average) * 0.15 kgCO₂e/tonne-km = 0.0165 kgCO₂e
- **Total Transport Emissions (Scope 3):** 0.30 kgCO₂e

2.4.4. Scope 3 Emissions - Use Phase

- Energy Consumption: 20 kWh/year * 5 years = 100 kWh
- Emissions: 100 kWh * 0.27 kgCO₂e/kWh = 27.0 kgCO₂e

- **Total Use Phase Emissions (Scope 3):** 27.0 kgCO₂e

2.4.5. Scope 3 Emissions - End-of-Life (EoL)

- Non-recycled portion: $2.2 \text{ kg} * (1 - 0.80) = 0.44 \text{ kg}$
- Disposal emissions: $0.44 \text{ kg} * 0.5 \text{ kgCO}_2\text{e/kg} = 0.22 \text{ kgCO}_2\text{e}$
- Recycled portion: $2.2 \text{ kg} * 0.80 = 1.76 \text{ kg}$
- Recycling credits: $1.76 \text{ kg} * (-0.2 \text{ kgCO}_2\text{e/kg}) = -0.352 \text{ kgCO}_2\text{e}$
- **Total End-of-Life Emissions (Scope 3):** $0.22 - 0.35 = -0.13 \text{ kgCO}_2\text{e}$
(Net Credit due to high recyclability and circular programs)

2.5. Review & Report

The calculated emissions were reviewed for consistency and completeness. Hotspots in the product's lifecycle were identified to guide reduction efforts.

3. GHG Protocol Adherence and 2026 Updates

This PCF analysis is meticulously aligned with the GHG Protocol's framework, ensuring robust and transparent reporting of emissions across all relevant scopes.

3.1. Categorization of Emissions

- **Scope 1 (Direct Emissions):** None directly attributable at the product level for this "factory_gate" system boundary and product type (assuming no direct fossil fuel combustion for manufacturing processes owned by fjrdownutsi at the China production site).
- **Scope 2 (Purchased Energy Emissions):** Includes emissions from purchased electricity used in the manufacturing of "tueuwzzrpv" in China.
- **Scope 3 (Value Chain Emissions):** Encompasses all other indirect emissions throughout the product's lifecycle, including:
 - Category 1: Purchased goods and services (materials acquisition and processing). Confidential - Internal Use Only

- Category 4: Upstream transportation and distribution.
- Category 9: Downstream transportation and distribution (last-mile delivery).
- Category 11: Use of sold products.
- Category 12: End-of-life treatment of sold products.

3.2. 2026 Land Sector and Removals (LSR) Standard Update

The GHG Protocol finalized its Land Sector and Removals Standard (LSRS) on January 30, 2026, with an effective date of January 1, 2027. This is the first comprehensive framework for accounting for forest, land, and agriculture (FLAG) emissions and carbon removals. While the LSRS is highly relevant for companies with significant land sector activities, or those that grow, source, process, or sell agricultural products, detailed FLAG emissions are not explicitly applicable or quantifiable for "tueuwzzrpv" based on the provided parameters, which focus on industrial manufacturing and generic materials. However, fjrdwnutsi should be aware of its requirements for any future product lines or raw material sourcing that involve land-based activities. The accompanying Guidance document for the LSRS is expected in Q2 2026. Forest carbon accounting is explicitly *not* included in this version of the LSRS.

3.3. Scope 3 Compliance (95% Coverage)

As per the proposed 2026 requirements, companies reporting in conformance with the Scope 3 Standard must report at least 95% of total required Scope 3 emissions. This analysis has diligently aimed for comprehensive coverage of all material Scope 3 categories identified for "tueuwzzrpv." All significant upstream (materials, inbound transport) and downstream (outbound transport, use phase, end-of-life) activities have been included. Any minor exclusions would be quantified, disclosed, and justified to maintain transparency and meet the 95% inclusion threshold, focusing on required rather than optional Scope 3 categories. This aligns with the intent to enhance completeness, consistency, transparency, and comparability of inventories.

4. Product Carbon Footprint Summary

The total Product Carbon Footprint for one functional unit of "tueuwzzrpv" is summarized below.

Lifecycle Stage	GHG Scope	Emissions (kgCO ₂ e)	Percentage of Total
Materials Acquisition & Processing	Scope 3 (Category 1)	17.91	39.11%
Production (Purchased Electricity)	Scope 2	2.33	5.09%
Transport (Upstream & Downstream)	Scope 3 (Category 4 & 9)	0.30	0.66%
Use Phase	Scope 3 (Category 11)	27.00	58.98%
End-of-Life Treatment	Scope 3 (Category 12)	-0.13	-0.28%
Total Product Carbon Footprint (PCF):		47.41 kgCO ₂ e	100.00%

5. Hotspot Analysis and Recommendations

The analysis reveals critical hotspots and opportunities for emission reduction for "tueuwzzrpv":

- **Use Phase Dominance:** The Use Phase (58.98%) is the most significant contributor to the PCF, primarily due to the product's energy consumption over its lifespan.
 - **Recommendation:** Invest in R&D for energy efficiency improvements (e.g., lower power components, optimized software, smart energy management features). Consider integrating more efficient power supply units or offering renewable energy charging solutions. Educate users on energy-saving modes.

- **Materials Impact:** Materials Acquisition & Processing (39.11%) represents the second largest hotspot. Aluminum alloy casing and silicon chipset contribute significantly here.
 - **Recommendation:** Explore alternative lower-carbon materials for the casing (e.g., recycled aluminum with lower virgin content, bio-based composites). Collaborate with suppliers to source silicon and other high-impact materials from manufacturers using renewable energy or more efficient processes. Increase the use of post-consumer recycled content in all applicable components.
- **Production Energy:** While lower than other stages, the 5.09% from production energy indicates an opportunity for direct operational improvements.
 - **Recommendation:** Continue to increase renewable energy procurement at the production facility. Explore on-site renewable energy generation where feasible. Implement energy efficiency measures in manufacturing processes.
- **Transportation Efficiency:** Transportation emissions are relatively low (0.66%), but continuous optimization is beneficial.
 - **Recommendation:** Optimize logistics routes and consolidate shipments. Prioritize modes with lower emissions (e.g., rail over road for longer distances within Europe). Work with carriers committed to fleet electrification or alternative fuels.
- **End-of-Life Benefits:** The negative emissions in the End-of-Life stage (-0.28%) highlight the success of the high recyclability percentage and circular/take-back programs.
 - **Recommendation:** Continue to strengthen and expand existing circular/take-back programs. Promote product longevity through design for repairability and modularity to extend product lifespan and delay EoL. Invest in advanced recycling technologies for difficult-to-recycle components.

6. Conclusion

This high-detail PCF analysis provides fjrdwnutsi with a clear understanding of the environmental impact of "tueuwzzrpv" across its lifecycle. The identified hotspots in the Use Phase and Materials Acquisition offer the most significant opportunities for emission reduction.

By strategically addressing these areas through design innovation, supply chain engagement, and consumer education, fjrdownutsi can significantly reduce its product\'s carbon footprint and demonstrate leadership in sustainability, aligning with evolving GHG Protocol requirements for 2026 and beyond.