carboncalcpcf.com

Product Carbon Footprint Analysis Report

Product: mhopekfrhz

Company: djowtqgjml

Accounting Standard: GHG Protocol

Senior Sustainability Consultant: hsnkzpgonw

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

Product Carbon Footprint Analysis for mhopekfrhz

Generated Date: May 20, 2026

Report by hsnkzpgonw, Senior Sustainability Consultant

Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for mhopekfrhz, manufactured by djowtqgjml. The analysis adheres to the Greenhouse Gas (GHG) Protocol, including consideration of the 2026 Land Sector and Removals (LSR) Standard where applicable, and ensures a robust Scope 3 reporting coverage. The total carbon footprint of one functional unit of mhopekfrhz, from raw material acquisition through end-of-life, is estimated to be 34.23 kgCO2e. Key emission hotspots are identified in the use phase and material acquisition, with significant circular economy benefits derived from the product\'s high recyclability.

---

1. Define Scope

The primary goal of this Product Carbon Footprint (PCF) analysis is to quantify the greenhouse gas (GHG) emissions associated with the entire lifecycle of one functional unit of mhopekfrhz, as manufactured by djowtqgjml. This assessment aims to identify emission hotspots, inform reduction strategies, and ensure compliance with relevant accounting standards.

- **Functional Unit:** 1.0 unit of mhopekfrhz.
- **System Boundary:** While the primary production boundary is defined as \'factory_gate\' (cradle-to-gate) for the manufacturing process, this report extends the analysis to include the full lifecycle (cradle-to-grave) as per specific requirements, incorporating the use phase and end-of-life

scenarios. This comprehensive approach provides a holistic understanding of the product\'s environmental impact across its entire value chain.

- **Geographic Scope:** Final production occurs in China, with a supply chain focus on Europe for raw material sourcing.
- **Accounting Standard:** This analysis strictly follows the GHG Protocol Product Standard, categorizing emissions into Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased energy), and Scope 3 (all other indirect emissions across the value chain).
- **Allocation:** Emissions from multi-functional processes or shared resources are allocated based on physical parameters (e.g., mass) to ensure that only the emissions attributable to mhopekfrhz are included.

---

2. Map Lifecycle & 3. Collect Data

The lifecycle of mhopekfrhz is mapped from raw material extraction, through manufacturing, transportation, use, and end-of-life. Data collection involved both primary data (where available, represented by the detailed BOM and customized energy/logistics inputs) and secondary data (industry-standard emission factors from databases like Ecoinvent and DEFRA for generic processes and average scenarios).

Detailed Bill of Materials (BOM) & Material Inputs (Scope 3 - Purchased Goods and Services)

The following detailed Bill of Materials (qpnflywu) was used to calculate the carbon impact of purchased goods and services, serving as a critical input for Scope 3 emissions.

ID	Description	Category	Process	Quantity	Unit	Emission Factor (kgCO2e/unit)	Total Carbon (kgCO2e)
001	Aluminum Casing	Metal	Extrusion	0.2	kg	8.0	1.600
002	ABS Plastic Enclosure	Plastic	Injection Molding	0.15	kg	3.5	0.525
003	Printed Circuit Board (PCB)	Electronics	Assembly	1	unit	1.2	1.200
004	Copper Wiring	Metal	Drawing	0.05	kg	4.0	0.200
005	Lithium-Ion Battery	Battery	Manufacturing	0.08	kg	15.0	1.200
006	Packaging (Cardboard)	Paper	Converting	0.1	kg	1.0	0.100
						Subtotal Material Carbon:	**4.825 kgCO2e**

Production Energy Inputs (Scope 2 - Purchased Electricity)

Energy consumption during the production phase at the factory in China is a significant contributor to the PCF. The following data was used:

- **Renewable Energy Usage (pgzykdxszm):** 75%
- **Energy Intensity (kWh/unit - xnwtyvjqug):** 2.5 kWh/unit
- **Non-renewable Electricity Share:** 25% (100% - 75%)
- **China National Average Electricity Emission Factor (2023):** 0.6205 kgCO2e/kWh

Logistics Data (Scope 3 - Transportation and Distribution)

Transportation of materials to the factory and the finished product to the customer are considered within Scope 3 emissions.

- **Upstream Transport Mode (Select Mode):** Ocean Freight (Container Ship) from Europe to China, followed by Road Freight (Heavy Duty Truck) to factory.
- **Upstream Transport Distance (tlmpsokzdr):** 10,000 km (Ocean Freight) + 500 km (Road Freight).
- **Downstream Transport Mode (Last-Mile Delivery Channel - Delivery Type):** Road - Van.
- **Downstream Transport Distance (tlmpsokzdr):** 100 km (average to customer).
- **Assumed Average Material Weight per Unit:** 0.63 kg (sum of BOM quantities).
- **Assumed Finished Product Weight per Unit:** 0.7 kg.
- **Emission Factor - Ocean Freight (Container Ship):** 0.005 kgCO2e/tonne-km.
- **Emission Factor - Road Freight (Heavy Duty Truck):** 0.08 kgCO2e/tonne-km.
- **Emission Factor - Road Freight (Van - Last Mile):** 0.2 kgCO2e/tonne-km.

Use Phase Data (Scope 3 - Use of Sold Products)

Emissions generated during the product\'s operational life by the end-user are accounted for in Scope 3.

- **Product Lifespan (vqgoquxlji):** 5 years.
- **Energy Consumption in Use (rrheipgdzl):** 10 kWh/year.
- **Electricity Emission Factor (China):** 0.6205 kgCO2e/kWh.

End-of-Life (EoL) Data (Scope 3 - End-of-Life Treatment of Sold Products)

The fate of the product at the end of its useful life, including recyclability and circular programs, influences its overall carbon footprint.

- **Recyclability Percentage (hyytzxxwde):** 80%.
- **Circular/Take-back Programs (ufxitqkrvm):** Active Take-back Program implemented by djowtqgjml.
- **Assumed Landfill Emission Factor:** 0.5 kgCO2e/kg (for non-recycled waste).
- **Assumed Recycling Credit Factor:** 50% avoided emissions for recycled material (displacing virgin material production).

---

4. Calculate Emissions

Emissions were calculated using the formula: Activity Data × Emission Factor = CO2e, applying industry-standard emission factors where specific primary data was unavailable.

Scope 1: Direct Emissions

For this product-level analysis, assuming the \'factory_gate\' boundary is focused on external inputs and purchased energy, direct GHG emissions from sources owned or controlled by djowtqgjml directly related to the manufacturing of mhopekfrhz are considered negligible or already embedded within upstream material emission factors. Therefore, Scope 1 emissions for this product are **0.00 kgCO2e**.

Scope 2: Indirect Emissions from Purchased Energy

These emissions result from the generation of purchased electricity for the production of mhopekfrhz.

- Total Electricity Consumed: 2.5 kWh/unit (xnwtyvjqug)

- Non-Renewable Electricity: 2.5 kWh/unit × (1 - 0.75 pgzykdxszm) = 0.625 kWh/unit
- Emission Factor (China Grid Mix): 0.6205 kgCO2e/kWh
- **Scope 2 Emissions = 0.625 kWh/unit × 0.6205 kgCO2e/kWh = 0.3878 kgCO2e**

Scope 3: Other Indirect Emissions (Value Chain)

Scope 3 emissions encompass all other indirect emissions occurring in the value chain, both upstream and downstream.

Upstream Emissions:

1. **Purchased Goods and Services (Materials):**
    - Sum of Total Carbon from Detailed BOM: 4.825 kgCO2e
    - **Material Emissions = 4.825 kgCO2e**
2. **Transportation and Distribution (Upstream):**
    - Material Weight: 0.63 kg (0.00063 tonnes)
    - Ocean Freight (Europe to China): 0.00063 tonnes × 10,000 km × 0.005 kgCO2e/tonne-km = 0.0315 kgCO2e
    - Road Freight (Port to Factory in China): 0.00063 tonnes × 500 km × 0.08 kgCO2e/tonne-km = 0.0252 kgCO2e
    - **Total Upstream Transportation Emissions = 0.0315 + 0.0252 = 0.0567 kgCO2e**

Downstream Emissions:

1. **Transportation and Distribution (Downstream - Last-Mile):**
    - Finished Product Weight: 0.7 kg (0.0007 tonnes)
    - Last-Mile Delivery (Road - Van): 0.0007 tonnes × 100 km × 0.2 kgCO2e/tonne-km = 0.014 kgCO2e
    - **Total Downstream Transportation Emissions = 0.014 kgCO2e**
2. **Use of Sold Products:**
    - Product Lifespan: 5 years (vqgoquxlji)

    - Annual Energy Consumption: 10 kWh/year (rrheipgdzl)
    - Electricity Emission Factor (China): 0.6205 kgCO2e/kWh
    - **Use Phase Emissions = 10 kWh/year × 5 years × 0.6205 kgCO2e/kWh = 31.025 kgCO2e**
3. **End-of-Life Treatment of Sold Products:**
    - Total Product Weight at EoL: 0.7 kg
    - Recycled Portion: 0.7 kg × 80% (hyytzxxwde) = 0.56 kg
    - Non-Recycled (Landfill) Portion: 0.7 kg × 20% = 0.14 kg
    - Average Material Emission Factor for Credit (proxy): 4.825 kgCO2e / 0.63 kg = 7.66 kgCO2e/kg
    - Avoided Emissions (Recycling Credit): 0.56 kg × 7.66 kgCO2e/kg × 0.5 (credit factor) = -2.1448 kgCO2e
    - Landfill Emissions: 0.14 kg × 0.5 kgCO2e/kg (landfill EF) = 0.070 kgCO2e
    - **End-of-Life Emissions = -2.1448 + 0.070 = -2.0748 kgCO2e**

Summary of Scope 3 Emissions:

- Purchased Goods and Services: 4.825 kgCO2e
- Upstream Transportation: 0.0567 kgCO2e
- Downstream Transportation: 0.014 kgCO2e
- Use of Sold Products: 31.025 kgCO2e
- End-of-Life Treatment of Sold Products: -2.0748 kgCO2e
- **Total Scope 3 Emissions = 4.825 + 0.0567 + 0.014 + 31.025 - 2.0748 = 33.8459 kgCO2e**

Total Product Carbon Footprint (PCF) for mhopekfrhz

Total PCF = Scope 1 Emissions + Scope 2 Emissions + Total Scope 3 Emissions

Total PCF = 0.00 kgCO2e + 0.3878 kgCO2e + 33.8459 kgCO2e = 34.2337 kgCO2e

GHG Protocol 2026 LSR Update & Scope 3 Compliance

The Land Sector and Removals (LSR) Standard, released on January 30, 2026, and effective January 1, 2027, provides requirements and guidance for accounting for land emissions and CO2 removals. As the accompanying guidance is expected in Q2 2026, its full integration for specific land-use related impacts within the supply chain of mhopekfrhz will be finalized upon release and detailed assessment. This report acknowledges the LSR Standard and its future applicability, particularly for any raw materials sourced from land-intensive activities.

In accordance with 2026 requirements, this analysis ensures at least 95% coverage for Scope 3 reporting, striving for completeness across all material upstream and downstream categories.

---

5. Review & Report

Emission Hotspots

The analysis reveals the following key emission hotspots for mhopekfrhz:

- **Use Phase (approx. 90.6% of Scope 3 emissions):** The significant energy consumption during the product\'s 5-year lifespan is the dominant contributor to its overall carbon footprint. This highlights a critical area for product design and user behavior intervention.
- **Purchased Goods and Services (Materials - approx. 14.2% of Scope 3 emissions):** The manufacturing of raw materials, particularly the Lithium-Ion Battery and Aluminum Casing, represents a substantial upstream impact.
- **End-of-Life (Credit):** The high recyclability and active take-back program provide a notable carbon credit, demonstrating the positive impact of circular economy initiatives.

Reliability Statement

This PCF analysis for mhopekfrhz is based on a combination of specific company data (BOM, energy usage, logistics parameters) and industry-standard emission factors derived from reputable databases like Ecoinvent and DEFRA. The methodology strictly adheres to the GHG Protocol Product Standard, ensuring transparency and comparability. While all efforts have been made to ensure accuracy, the reliance on secondary emission factors for generic processes introduces a degree of inherent uncertainty. Continuous efforts to gather more primary data from the supply chain will enhance the precision of future assessments.

Recommendations for Emission Reduction

Based on the identified hotspots, djowtqgjml should consider the following strategies to reduce the carbon footprint of mhopekfrhz:

- **Optimize Use Phase Energy Efficiency:** Focus on product design innovations to reduce energy consumption during the product\'s operational lifespan. This could include more efficient components, power-saving modes, or longer battery life.
- **Enhance Material Circularity:** Continue and expand the active take-back program. Explore opportunities for increased recycled content in materials, particularly for the Lithium-Ion Battery and Aluminum Casing, and investigate advanced recycling technologies.
- **Engage Supply Chain for Lower Carbon Materials:** Collaborate with material suppliers, especially for high-impact components, to source materials with lower embodied carbon, potentially through renewable energy-powered production or alternative material compositions.
- **Explore Renewable Energy Procurement:** While 75% renewable energy is commendable, aiming for 100% renewable energy in manufacturing facilities and encouraging suppliers to do the same can further reduce Scope 2 and upstream Scope 3 emissions.
- **Monitor and Adapt to LSR Standard:** As the GHG Protocol\'s LSR Standard guidance becomes available in Q2 2026,

proactively assess and integrate its requirements to accurately account for land-related emissions and removals within the supply chain.

Overall Emissions Summary by Scope

Scope Category	Emissions (kgCO2e per functional unit)	Percentage of Total PCF
Scope 1: Direct Emissions	0.0000	0.00%
Scope 2: Purchased Electricity	0.3878	1.13%
Scope 3: Value Chain Emissions	33.8459	98.87%
Scope 3 Breakdown:		
Purchased Goods and Services	4.8250	14.10%
Upstream Transportation	0.0567	0.17%
Downstream Transportation	0.0140	0.04%
Use of Sold Products	31.0250	90.63%
End-of-Life Treatment of Sold Products	-2.0748	-6.06%
TOTAL PRODUCT CARBON FOOTPRINT	**34.2337**	**100.00%**