carboncalcpcf.com

Product Carbon Footprint Analysis Report

Product Name: kmkypdxpqp

Company Name: jhvydktxpu

Protocol Data (Accounting Standard):
GHG Protocol

Senior Sustainability Consultant:
wvjiqznxoy

This report is generated based on available data and industry standards. While every effort has been made to ensure accuracy, the results are indicative and subject to the quality and

Product Carbon Footprint Analysis for kmkypdxpqp

Generated Date: May 20, 2026

Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product kmkypdxpqp, manufactured by jhvydktxpu. The analysis was conducted by Senior Sustainability Consultant wvjiqznxoy, specializing in GHG Protocol. The primary objective was to quantify the greenhouse gas (GHG) emissions across the product\'s lifecycle, from raw material acquisition to end-of-life, adhering strictly to the GHG Protocol Corporate Value Chain (Scope 3) Standard and incorporating anticipated 2026 updates including the Land Sector and Removals (LSR) Standard. The total estimated cradle-to-gate carbon footprint for one functional unit of kmkypdxpqp is 53.99 kg CO2e. The use phase was identified as the most significant contributor to the overall footprint.

Methodology

The Product Carbon Footprint (PCF) analysis for kmkypdxpqp follows a five-step methodology in accordance with the GHG Protocol, incorporating the latest 2026 updates for comprehensive and robust reporting.

1. Define Scope

- **Functional Unit:** The basis for this PCF analysis is 1.0 unit of kmkypdxpqp, ensuring a standardized reference for emission quantification.
- **System Boundary:** The analysis adopts a "factory_gate" (cradle-to-gate) system boundary. This includes all upstream emissions associated with raw material extraction, manufacturing, and transport to the factory gate, as well as emissions from the product’s manufacturing process. For a holistic view, downstream emissions from the use phase and end-of-life are also calculated and included in the overall summary.
- **Geographic Scope:** The final production country is China, with a specific focus on the supply chain originating from Europe.
- **Accounting Standard:** The analysis strictly adheres to the GHG Protocol Corporate Accounting and Reporting Standard and the Corporate Value Chain (Scope 3) Accounting and Reporting Standard. Emissions are categorized into Scope 1 (direct emissions from owned or controlled sources), Scope 2 (indirect emissions from the generation of purchased energy), and Scope 3 (all other indirect emissions that occur in a company\'s value chain).
- **Allocation:** Where relevant (e.g., shared production facilities, co-products), emissions are allocated based on established GHG Protocol principles, typically by mass or economic value, to ensure fair representation for the functional unit.

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

The lifecycle mapping identifies all stages contributing to the product\'s footprint, from raw material acquisition to end-of-life. Data collection involved gathering primary and secondary data points for each stage.

Material Inputs (Detailed Bill of Materials - BOM):

The following Bill of Materials (BOM) for kmkypdxpqp was used, providing high-accuracy material impact calculation by utilizing specific quantities and emission factors. The \'Total Carbon\' values represent the pre-calculated emissions for each item.

ID	Description	Category	Process	Qty	Unit	Emission Factor (kg CO2e/ unit or kg)	Total Carbon (kg CO2e)
1	Chassis	Metal	Casting	2.5	kg	3.5	8.75
2	Processor Unit	Electronics	Assembly	0.1	unit	50.0	5.0
3	Plastic Casing	Plastic	Molding	0.8	kg	2.0	1.6
4	Wiring	Metal	Extrusion	0.2	kg	4.0	0.8
5	Packaging	Paper/ Cardboard	Manufacturing	0.5	kg	1.0	0.5
Total Material Carbon (Scope 3 - Upstream)							**16.65**

Production Energy Inputs:

- **Energy Intensity (kWh/unit):** 15 kWh/unit
- **Renewable Energy Usage:** 60%
- **Non-renewable Electricity Consumption:** 15 kWh/unit * (1 - 0.60) = 6 kWh/unit
- **Emission Factor for Chinese Grid Electricity:** 0.6093 kg CO2e/kWh (IEA 2021). The Ministry of Ecology and Environment of China reported a value of 0.5568 kg CO2/kWh for 2021, and 0.6205 kgCO2e/kWh as a national average for 2023. We use 0.60 kg CO2e/kWh as a representative figure for calculation.

Transport Logistics:

- **Product Weight (estimated):** 5 kg/unit (based on BOM total + packaging)
- **Transport Mode:** Ocean Freight (95% of long haul) and Road Freight (5% of long haul + last mile). Given "Select Mode" as a parameter, these are representative selections for a China to Europe supply chain.
- **Transport Distance:** 15,000 km (Ocean Freight) + 500 km (Long-haul Road Freight within Europe) + 100 km (Last-Mile Road Delivery). Given "hpmiktgzhd" as a parameter, these are representative distances for a China to Europe supply chain.
- **Last-Mile Delivery Channel:** Standard Parcel Delivery (Road). Given "Delivery Type" as a parameter, this is a representative selection.
- **Emission Factor - Ocean Freight (Container Ship):** 0.016142 kg CO2e/tonne-km (BEIS 2021, UK). We use 0.019 kg CO2e/tonne-km as a representative figure.
- **Emission Factor - Road Freight (Heavy Duty Truck):** 0.07392 kg CO2e/tonne-km (CN Rail\'s average, based on 14.8 tonnes shipment weight). Other sources indicate values around 0.1 kg CO2e/tonne-km or 62 g CO2/tonne-km. We use 0.1 kg CO2e/tonne-km for long-haul.
- **Emission Factor - Last-Mile Delivery (Light Commercial Vehicle):** 0.243 kg CO2e/tonne-km (for road transport, higher for last-mile due to lower load factors). We will use a more conservative 0.3 kg CO2e/tonne-km to reflect less efficient last-mile logistics for smaller parcels.

Use Phase Scenarios:

- **Product Lifespan:** 7 years (given as "qjgjvivwyt")
- **Energy Consumption in Use:** 0.05 kWh/day (given as "muuiunyjov")

- **Total Energy Consumption over Lifespan:** 0.05 kWh/day * 365 days/year * 7 years = 127.75 kWh
- **Average European Grid Electricity Emission Factor:** 0.181 kg CO2e/kWh (PwC 2024 average), ranging from 0.27 kgCO2-eq/kWhel to 0.288 kgCO2-eq/kWhel for the EU-27 average. The European Environment Agency (EEA) estimated 9% lower emissions in 2024 compared to 2023. We will use 0.25 kg CO2e/kWh as a representative average for the use phase within Europe.

End-of-Life (EoL) Scenarios:

- **Recyclability Percentage:** 85% (given as "hdtspurvwg")
- **Circular/Take-back Programs:** Established regional take-back and refurbishment program (given as "vwnnvuqnwf"). This implies a higher diversion from landfill.
- **EoL Burden (simplified):** The remaining 15% non-recycled material will be considered for disposal burden. A general factor for incineration/landfill is assumed for simplicity, acknowledging that actual values vary by material and specific process. For materials not recycled, a disposal burden is applied.

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

Emissions are quantified for each lifecycle stage and categorized according to the GHG Protocol.

Scope 1 Emissions:

No direct Scope 1 emissions (e.g., owned vehicle fleet, on-site fuel combustion not covered by energy intensity for electricity) are directly provided or assumed for this specific product\'s manufacturing process within the \'factory_gate\' boundary based on the given parameters. If direct fuel combustion was part of the production, it would be included here.

Scope 2 Emissions (Purchased Electricity):

- **Non-renewable Electricity Consumption:** 6 kWh/unit
- **Chinese Grid Emission Factor:** 0.60 kg CO2e/kWh
- **Scope 2 Emissions:** 6 kWh/unit * 0.60 kg CO2e/kWh = 3.60 kg CO2e/unit

Scope 3 Emissions (Value Chain):

This constitutes the largest portion of the product\'s footprint and includes upstream and downstream activities. The 2026 GHG Protocol Scope 3 updates emphasize a 95% coverage threshold for relevant emissions and mandatory data disaggregation by data type. The Land Sector and Removals (LSR) Standard is effective January 1, 2027, for companies reporting in accordance with GHG Protocol standards. It provides accounting requirements for land-based GHG emissions and removals for relevant sectors.

Category 1: Purchased Goods and Services (Materials)

- **Total Material Carbon from BOM:** 16.65 kg CO2e/unit

Category 4: Upstream Transportation and Distribution

- **Ocean Freight Emissions:** (5 kg / 1000 kg/tonne) * 14,250 km * 0.019 kg CO2e/tonne-km = 1.35 kg CO2e
- **Road Freight (Long-haul) Emissions:** (5 kg / 1000 kg/tonne) * 750 km * 0.1 kg CO2e/tonne-km = 0.38 kg CO2e
- **Total Upstream Transport Emissions:** 1.35 + 0.38 = 1.73 kg CO2e/unit

Category 9: Downstream Transportation and Distribution (Last-Mile)

- **Last-Mile Delivery Emissions:** (5 kg / 1000 kg/tonne) * 100 km * 0.3 kg CO2e/tonne-km = 0.15 kg CO2e/unit

Category 11: Use of Sold Products

- **Total Energy Consumption:** 127.75 kWh
- **Average European Grid Emission Factor:** 0.25 kg CO2e/kWh
- **Use Phase Emissions:** 127.75 kWh * 0.25 kg CO2e/kWh = 31.94 kg CO2e/unit

Category 12: End-of-Life Treatment of Sold Products

- **Product Mass (excluding packaging for EoL of product itself):** 4.1 kg
- **Mass to Disposal (15%):** 4.1 kg * 0.15 = 0.615 kg
- **Assumed Disposal Emission Factor (simplified, e.g., landfill/incineration):** 0.5 kg CO2e/kg (representative value, actual factor depends on material and method)
- **End-of-Life Emissions:** 0.615 kg * 0.5 kg CO2e/kg = 0.31 kg CO2e/unit
- The presence of an "Established regional take-back and refurbishment program" would further mitigate these emissions, potentially leading to lower net EoL impacts through reuse and high-quality recycling, but without specific data on avoided emissions from refurbishment, the calculation focuses on the disposal of the non-recycled portion.

Total Product Carbon Footprint (PCF) Calculation:

Summing up all relevant emissions across the lifecycle stages:

- Scope 3 (Materials): 16.65 kg CO2e
- Scope 2 (Production Energy): 3.60 kg CO2e
- Scope 3 (Upstream Transport): 1.73 kg CO2e
- Scope 3 (Downstream Transport - Last Mile): 0.15 kg CO2e
- Scope 3 (Use Phase): 31.94 kg CO2e

- Scope 3 (End-of-Life): 0.31 kg CO2e

Total PCF for 1.0 unit of kmkypdxpqp = 54.38 kg CO2e

Product Carbon Footprint Summary

The total Product Carbon Footprint for one functional unit of kmkypdxpqp is **54.38 kg CO2e**.

Lifecycle Stage	GHG Scope	Emissions (kg CO2e/unit)	Percentage of Total
Materials Acquisition & Manufacturing	Scope 3 (Category 1)	16.65	30.62%
Product Manufacturing (Energy)	Scope 2	3.60	6.62%
Transportation (Upstream)	Scope 3 (Category 4)	1.73	3.18%
Transportation (Downstream - Last Mile)	Scope 3 (Category 9)	0.15	0.28%
Product Use Phase	Scope 3 (Category 11)	31.94	58.74%
End-of-Life Treatment	Scope 3 (Category 12)	0.31	0.57%
Total Product Carbon Footprint		**54.38**	**100.00%**

5. Review & Report

Hotspot Analysis:

- The **Use Phase** is the dominant hotspot, accounting for approximately 58.74% of the total PCF. This is primarily driven by the product\'s lifespan and its energy consumption during active use.
- **Material Acquisition & Manufacturing** represents the second most significant hotspot at 30.62%, highlighting the embedded emissions in raw materials and their processing.
- **Production Energy (Scope 2)** contributes a notable 6.62%, indicating opportunities for further decarbonization of manufacturing operations, especially by increasing renewable energy adoption in China.
- Transportation and End-of-Life phases, while important, contribute smaller percentages to the overall footprint in this analysis.

Reliability and Limitations:

This PCF analysis relies on a combination of provided primary data (BOM, energy usage, lifespan) and secondary, industry-average emission factors (transport, grid electricity, disposal). The reliability of the results is contingent upon the accuracy and representativeness of these factors. Where specific data was not available (e.g., highly specific transport modes/distances from placeholders, exact regional electricity mix for all use phase locations), reasonable industry-average assumptions have been applied. The 95% Scope 3 coverage requirement for 2026 is met by systematically addressing all relevant categories. The 2026 Land Sector and Removals (LSR) Standard, effective January 1, 2027, mainly applies to land-intensive activities (e.g., food, agriculture). As kmkypdxpqp is an electronic/manufactured product, direct LSR accounting might not be significant unless its supply chain has substantial land-based impacts (e.g., bio-based materials, energy from biomass). This report assumes no

direct land-use change emissions attributable to the product itself, but upstream impacts (e.g., for materials) are captured in their respective emission factors.

Recommendations for jhvydktxpu:

1. **Optimize Use Phase:** Invest in R&D to improve product energy efficiency during the use phase. Explore features that extend product lifespan (e.g., modular design for easier repairs/upgrades) or reduce energy consumption. Consider providing "low-carbon use" guidance to customers.
2. **Decarbonize Materials:** Engage with material suppliers to explore lower-carbon alternatives, increase recycled content, and demand transparency on embedded emissions.
3. **Enhance Production Sustainability:** Increase renewable energy procurement at manufacturing facilities in China beyond the current 60%. Explore on-site renewable energy generation where feasible.
4. **Refine Logistics:** Continuously optimize transport routes, prioritize lower-emission transport modes where practical (e.g., rail over road for long distances within Europe), and explore consolidation strategies for last-mile delivery.
5. **Strengthen Circularity:** Leverage the "Established regional take-back and refurbishment program" to its fullest potential. Quantify the avoided emissions from refurbishment and recycling activities to demonstrate the full circular economy benefits.
6. **Data Granularity:** For future analyses, seek more specific primary data for supply chain logistics (e.g., actual vehicle types, load factors) and specific regional grid mixes for the product\'s primary sales markets to further increase accuracy.