carboncalcpcf.com

Product Carbon Footprint (PCF) Analysis Report

Product: fsqyvkdpvo

Company Name: eeodimynwh

Senior Sustainability Consultant: yoofggnygk

Accounting Standard: GHG Protocol

This report is generated based on available data and industry standards. While every effort has been made to ensure accuracy and adherence to stated

Executive Summary

This high-detail Product Carbon Footprint (PCF) analysis, conducted by yoofggnygk, Senior Sustainability Consultant specializing in GHG Protocol, for eeodimynwh’s product fsqyvkdpvo, provides a comprehensive assessment of greenhouse gas (GHG) emissions across its lifecycle. Adhering to the GHG Protocol and incorporating the latest 2026 Land Sector and Removals (LSR) Standard updates, this report identifies key emission hotspots from material acquisition through end-of-life. The total cradle-to-grave carbon footprint for one functional unit of fsqyvkdpvo is calculated to be 4.01 kgCO2e. The analysis highlights the significant impact of raw material procurement and the product\'s use phase, underscoring opportunities for reduction through sustainable sourcing, energy efficiency, and circular economy initiatives.

---

1. Introduction

This report details the Product Carbon Footprint (PCF) for the product fsqyvkdpvo manufactured by eeodimynwh. The objective is to quantify the greenhouse gas (GHG) emissions associated with the product across its lifecycle, providing critical insights for sustainability performance improvement and compliance with evolving reporting standards. The analysis is conducted in accordance with the Greenhouse Gas (GHG) Protocol, the most widely used international accounting tool for quantifying GHG emissions.

As per 2026 requirements, this analysis ensures at least 95% coverage for Scope 3 emissions reporting and applies the principles of the Land Sector and Removals (LSR) Standard for relevant land use and carbon removal considerations.

---

2. Methodology

The PCF analysis follows the five-step methodology recommended by industry best practices and aligned with the GHG Protocol for product lifecycle assessments:

1. Define Scope
2. Map Lifecycle (LCI inventory stages)
3. Collect Data
4. Calculate Emissions
5. Review & Report

2.1. Define Scope

- **Functional Unit:** 1.0 unit of fsqyvkdpvo.
- **System Boundary:** The primary system boundary for the core PCF calculation is "factory_gate" (cradle-to-gate), encompassing all processes from raw material acquisition to the product leaving the manufacturing facility. However, to provide a comprehensive understanding of the product\'s environmental impact and address all specified parameters, the analysis has been extended to include downstream Use Phase and End-of-Life (EoL) scenarios, effectively adopting a cradle-to-grave perspective for a holistic assessment.
- **Geographic Scope:** Final Production Country: China. Supply Chain Focus: Europe Focused (for raw material sourcing and initial transport to China). Use and End-of-Life phases are considered for a general European context.
- **Accounting Standard:** GHG Protocol, including categorization into Scope 1 (direct emissions), Scope 2 (purchased energy emissions), and Scope 3 (value chain emissions).
- **Allocation:** All emissions are directly allocated to the functional unit of fsqyvkdpvo. For multi-functional processes, mass-based allocation is applied where appropriate, consistent with GHG Protocol guidance.

2.2. Map Lifecycle (LCI Inventory Stages)

The lifecycle of fsqyvkdpvo has been mapped into the following stages to capture all relevant emissions:

1. **Materials Acquisition & Pre-processing (Upstream – Scope 3, Category 1: Purchased Goods and Services):** Extraction and processing of raw materials and manufacturing of components detailed in the Bill of Materials (BOM).
2. **Manufacturing/Production (Scope 1 & 2):** Energy consumption and direct emissions from the eeodimynwh factory in China.
3. **Transportation (Upstream & Downstream – Scope 3, Category 4 & 9):** Transportation of raw materials/components to the factory, and distribution of the finished product to the customer.
4. **Use Phase (Downstream – Scope 3, Category 11: Use of Sold Products):** Energy consumption during the product's operational lifespan.
5. **End-of-Life (Downstream – Scope 3, Category 12: End-of-Life Treatment of Sold Products):** Emissions and potential credits associated with the disposal, recycling, or recovery of the product at the end of its life.

---

3. Data Collection

This analysis leverages a combination of provided primary data (through the detailed Bill of Materials and operational parameters) and secondary data (industry-standard emission factors from reputable databases like Ecoinvent and DEFRA).

3.1. Detailed Bill of Materials (BOM) - qepvdjku

The following Bill of Materials for fsqyvkdpvo was used for a high-accuracy material impact calculation:

ID	Description	Category	Process	Qty	Unit	Emission Factor (kgCO2e/ unit or kg)	Total Carbon (kgCO2e)
001	PCB Assembly	Electronics	Manufacturing	1	unit	0.85	0.85
002	ABS Plastic Casing	Plastics	Injection Molding	0.05	kg	2.50	0.125
003	Lithium-ion Battery	Battery	Manufacturing	1	unit	0.50	0.50
004	Sensor Chip	Electronics	Semiconductor	1	unit	0.30	0.30
005	Wiring & Connectors	Metals	Extrusion	0.01	kg	1.80	0.018
006	Cardboard Packaging	Paper	Pulp & Paper	0.02	kg	0.90	0.018
Total Material Carbon (Upstream):							**1.811**

Emission factors for materials are derived from industry averages for the specified processes and categories, such as those found in ecoinvent (v3.8-v3.12, reflecting updates in specific sectors like batteries, plastics, pulp and paper, and general manufacturing processes).

3.2. Operational & Logistics Data

- **Transport Mode (Upstream):** Road (Heavy Goods Vehicle - HGV)
- **Transport Distance (rvkhkikwdi - Upstream):** 2,500 km (estimated average distance for components from Europe to China factory)
- **Last-Mile Delivery Channel (Delivery Type - Downstream):** Parcel Delivery (Light Commercial Vehicle - LCV)

- **Last-Mile Delivery Distance (Estimated):** 100 km (estimated average distance from distribution center to customer in Europe)
- **Renewable Energy Usage (suowfdkqxw - Production):** 50%
- **Energy Intensity (yevpvngfjx - Production):** 1.5 kWh/unit
- **Product Lifespan (rzwmnmosyq - Use Phase):** 5 years
- **Energy Consumption in Use (rrpjpppiil - Use Phase):** 0.005 kWh/day
- **Recyclability Percentage (ludysyxfnn - End-of-Life):** 70%
- **Circular/Take-back Programs (qmkulthqer - End-of-Life):** Yes (Implemented)

3.3. Emission Factors (Secondary Data)

Where not explicitly provided in the BOM, industry-standard emission factors were applied, primarily referencing Ecoinvent and DEFRA databases for consistency and robustness:

- **Road Transport (HGV):** 0.1 kgCO2e/tkm (for >32 metric ton lorry, Euro V equivalent, representing average European journeys and load factors, aligned with Ecoinvent data)
- **Road Transport (LCV/Van, Last-Mile):** 0.2 kgCO2e/tkm (higher factor reflecting less efficient smaller vehicles and potential lower load factors for last-mile delivery).
- **Grid Electricity (China average):** 0.6 kgCO2e/kWh (approximate average for electricity generation in China, aligned with IEA data and recent Ecoinvent updates).
- **Renewable Electricity:** 0.02 kgCO2e/kWh (representing residual upstream emissions for renewable sources).
- **Grid Electricity (Europe average for Use Phase):** 0.25 kgCO2e/kWh (approximate average for electricity generation in Europe).
- **End-of-Life Recycling Credit:** A credit of 50% of the virgin material emissions for the recycled portion is applied. This reflects avoided emissions from virgin material production.
- **Scope 1 Manufacturing Direct Emissions:** 0.05 kgCO2e/unit (estimated based on typical minor direct combustion or fugitive emissions).

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

The total carbon footprint for fsqyvkdpvo is calculated by summing emissions across all lifecycle stages, categorized by GHG Protocol Scopes.

4.1. Lifecycle Emission Breakdown

4.1.1. Materials Acquisition & Pre-processing (Scope 3, Category 1)

Emissions from the extraction and production of raw materials and components, as per the detailed BOM (qepvdjku):

- Total Material Carbon: 1.811 kgCO2e

4.1.2. Manufacturing/Production (Factory in China)

- **Electricity Consumption:** 1.5 kWh/unit (yevpvngfjx)
- **Renewable Energy Usage:** 50% (suowfdkqxw)
- **Non-Renewable Electricity:** 1.5 kWh * (1 - 0.50) = 0.75 kWh
- **Renewable Electricity:** 1.5 kWh * 0.50 = 0.75 kWh
- **Emissions from Non-Renewable Electricity (Scope 2):** 0.75 kWh * 0.6 kgCO2e/kWh = 0.45 kgCO2e
- **Emissions from Renewable Electricity (Scope 2, residual):** 0.75 kWh * 0.02 kgCO2e/kWh = 0.015 kgCO2e
- **Total Manufacturing Energy Emissions (Scope 2):** 0.45 + 0.015 = 0.465 kgCO2e
- **Direct Emissions from Factory Operations (Scope 1):** 0.05 kgCO2e/unit (estimated)
- **Total Manufacturing Emissions (Scope 1 + Scope 2):** 0.05 + 0.465 = 0.515 kgCO2e

4.1.3. Transport (Scope 3, Category 4: Upstream & Category 9: Downstream)

Assumed product weight for transport: 0.15 kg.

- **Upstream Transport (Components to Factory - Europe to China):**
    - Distance: 2,500 km (rvkhkikwdi)
    - Mode: Road (HGV)
    - Product Weight: 0.15 kg = 0.00015 tonnes
    - Emissions: 0.00015 tonnes * 2500 km * 0.1 kgCO2e/tkm = 0.0375 kgCO2e
- **Last-Mile Delivery (Factory to Customer - Downstream):**
    - Distance: 100 km (estimated)
    - Mode: Parcel Delivery (LCV)
    - Product Weight: 0.15 kg = 0.00015 tonnes
    - Emissions: 0.00015 tonnes * 100 km * 0.2 kgCO2e/tkm = 0.003 kgCO2e
- **Total Transport Emissions (Scope 3):** 0.0375 + 0.003 = 0.0405 kgCO2e

4.1.4. Use Phase (Scope 3, Category 11)

- **Product Lifespan:** 5 years (rzwmnmosyq) = 1825 days
- **Energy Consumption in Use:** 0.005 kWh/day (rrpjpppiil)
- **Total Energy Consumption:** 0.005 kWh/day * 1825 days = 9.125 kWh
- **Emissions from Use Phase (Europe grid mix):** 9.125 kWh * 0.25 kgCO2e/kWh = 2.28125 kgCO2e

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

- **Recyclability Percentage:** 70% (ludysyxfnn)
- **Circular/Take-back Programs:** Yes (qmkulthqer)
- **Total Material Carbon (for credit calculation):** 1.811 kgCO2e
- **Recycling Credit (70% recycled * 50% avoided virgin emissions):** 1.811 kgCO2e * 0.70 * 0.50 = -0.63385 kgCO2e

4.2. Summary of Product Carbon Footprint (PCF)

The table below summarizes the GHG emissions by lifecycle stage and GHG Protocol Scope for one functional unit of fsqyvkdpvo.

Lifecycle Stage	GHG Protocol Scope	Emissions (kgCO2e)
Materials Acquisition & Pre-processing	Scope 3 (Category 1)	1.811
Manufacturing (Direct Operations)	Scope 1	0.050
Manufacturing (Purchased Electricity)	Scope 2	0.465
Upstream Transport to Factory	Scope 3 (Category 4)	0.0375
Downstream Transport (Last-Mile)	Scope 3 (Category 9)	0.003
Use Phase	Scope 3 (Category 11)	2.28125
End-of-Life Treatment (Net Credit)	Scope 3 (Category 12)	-0.63385
TOTAL PRODUCT CARBON FOOTPRINT (Cradle-to-Grave)		**4.0139**

5. Compliance with GHG Protocol Standards (2026 Updates)

5.1. Scope 3 Compliance (95% Coverage)

This PCF analysis for fsqyvkdpvo addresses the 2026 requirement for at least 95% coverage of total required Scope 3 emissions. By quantifying emissions from Purchased Goods and Services (materials), Upstream Transportation, Downstream Transportation, Use of Sold Products, and End-of-Life Treatment of Sold Products, the most significant categories relevant to this product\'s value chain have been included. These categories typically represent the vast majority of a product\'s value chain emissions for consumer goods.

5.2. 2026 LSR Update (Land Sector and Removals Standard)

The Land Sector and Removals (LSR) Standard, effective January 1, 2027, provides enhanced requirements for accounting for land use and carbon removals. While the primary focus of fsqyvkdpvo\'s PCF is not land-intensive activities directly, the principles of the LSR Standard for transparent reporting of removals have been considered in the End-of-Life phase by explicitly crediting for recycling. For products with significant agricultural or forestry components, detailed land use change emissions and removals would be quantified separately under this standard.

---

6. Review & Report: Hotspots and Reliability

6.1. Emission Hotspots

The analysis identifies the following primary emission hotspots for fsqyvkdpvo:

- **Materials Acquisition & Pre-processing (Scope 3, Category 1):** Accounting for approximately 45% of gross emissions (before EoL credit). This highlights the importance of sustainable material choices, lightweighting, and engaging with suppliers to reduce their upstream impacts.
- **Use Phase (Scope 3, Category 11):** Representing about 57% of gross emissions. This indicates that product energy efficiency during its operational lifespan is a critical factor for reducing the overall footprint. Strategies here include designing for lower energy consumption and promoting renewable energy use by consumers.
- **Manufacturing (Scope 1 & 2):** While important, direct and energy-related manufacturing emissions at the China facility constitute a smaller percentage of the total footprint (approx. 13% of gross emissions), especially with 50% renewable energy usage. Further increasing renewable energy adoption would continue to reduce this portion.

6.2. Data Reliability and Limitations

The calculations are based on the provided specific parameters (BOM, energy usage, lifespan, etc.) and industry-average secondary emission factors (Ecoinvent, DEFRA). While this provides a robust estimation, certain limitations should be noted:

- **Secondary Data:** Reliance on average emission factors for certain processes and regions may not perfectly reflect the specific nuances of eeodimynwh\'s supply chain or manufacturing unique to fsqyvkdpvo beyond the provided BOM details. Primary data from all suppliers would enhance accuracy.

- **Assumptions:** Assumptions were made for generic elements like product weight for transport, average last-mile delivery distance, and the grid mix for the use phase (Europe average).
- **Dynamic EFs:** Emission factors, especially for electricity grids, are dynamic. This report uses the most representative current data available from reputable databases at the time of analysis.
- **LSR Standard Application:** While acknowledged, a full, detailed implementation of the LSR Standard would require specific land use change data related to raw material cultivation (if applicable) which was not provided.

---

7. Recommendations for Emission Reduction

Based on this PCF analysis, eeodimynwh can focus on the following areas to reduce the carbon footprint of fsqyvkdpvo:

- **Sustainable Sourcing:** Explore suppliers for PCB, batteries, and plastics with lower inherent carbon footprints or certified sustainable production processes.
- **Design for Energy Efficiency:** Further optimize the product\'s design to reduce energy consumption during its 5-year lifespan, potentially by integrating more efficient components or power management features.
- **Circular Economy Integration:** Continue to strengthen take-back programs (qmkulthqer) and explore design for disassembly and material recovery beyond the current 70% recyclability (ludysyxfnn) to maximize circularity benefits.
- **Renewable Energy Expansion:** Increase the percentage of renewable energy (suowfdkqxw) used in the manufacturing facility in China to further reduce Scope 2 emissions.
- **Logistics Optimization:** Investigate opportunities for more efficient transport modes or optimized routes for both upstream and downstream logistics, especially given the international supply chain.
