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Product Carbon Footprint (PCF) Analysis Report

Product: yewyzvzzgi

Company Name: feojvyzwjn

Senior Sustainability Consultant: iwpohufpsy

Accounting Standard: GHG Protocol

This report is generated based on available data and industry standards. While efforts have been made to ensure accuracy, the actual footprint may vary due to dynamic operational conditions and evolving data availability.

Product Carbon Footprint (PCF) Analysis Report for yewyzvzzgi

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Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product yewyzvzzgi, manufactured by feojvyzwjn. The analysis was conducted by iwpohufpsy, Senior Sustainability Consultant, adhering strictly to the GHG Protocol. The system boundary for this assessment is \'factory-gate\' with a detailed extension to include downstream distribution, use phase, and end-of-life scenarios to provide a comprehensive \'cradle-to-grave\' perspective where possible. The total Product Carbon Footprint for one functional unit of yewyzvzzgi is calculated to be **76.79 kgCO2e**.

Key findings highlight material acquisition and manufacturing energy as significant contributors to the overall footprint. Opportunities for reduction lie in optimizing renewable energy sourcing for production and enhancing circularity at the product\'s end-of-life. The analysis incorporates the 2026 Land Sector and Removals (LSR) Standard for land use and carbon removals, and ensures at least 95% coverage for Scope 3 emissions in line with 2026 requirements.

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1. Methodology and Scope Definition

The Product Carbon Footprint (PCF) of yewyzvzzgi was quantified following the five-step methodology recommended by the GHG Protocol Product Standard, integrated with relevant requirements from ISO 14067 and the 2026 LSR Update for land use and carbon removals. The primary goal is to provide feojvyzwjn with a robust and

transparent assessment of the product’s greenhouse gas (GHG) emissions across its lifecycle.

1.1. Functional Unit

The functional unit for this PCF analysis is defined as: **1.0 unit of yewyzvzzgi**.

1.2. System Boundary

The system boundary adopted is primarily **factory_gate** for direct production, extended to a **cradle-to-grave** perspective for a comprehensive understanding. This includes:

- Raw Material Acquisition & Pre-processing (Upstream Scope 3, Category 1)
- Manufacturing & Assembly (Scope 1 & 2)
- Transportation & Distribution (Downstream Scope 3, Category 9)
- Use Phase (Downstream Scope 3, Category 11)
- End-of-Life Treatment (Downstream Scope 3, Category 12)

1.3. Geographic Scope

The **Final Production Country is China**. The **Supply Chain Focus is Europe Focused**, implying that products are transported from China to Europe for distribution and use. Emission factors and data sources are selected to reflect these geographical contexts where possible.

1.4. Allocation

Emissions are allocated directly to the functional unit (1.0 unit of yewyzvzzgi). For multi-output processes, mass-based allocation is implicitly used where primary data for specific inputs is available, otherwise economic allocation principles are considered for shared processes, consistent with GHG Protocol guidance.

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2. Lifecycle Mapping (LCI Inventory Stages)

The lifecycle of yewyzvzzgi is mapped across the following stages, facilitating data collection and emission calculation:

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

This stage includes the extraction, processing, and refining of all raw materials and components specified in the Detailed Bill of Materials (BOM) for yewyzvzzgi. The associated emissions are accounted for as part of purchased goods and services.

2.2. Manufacturing & Assembly (Scope 1 & 2)

Covers all processes within the feojvyzwjn production facility in China, including direct emissions from owned or controlled sources (Scope 1, if applicable) and indirect emissions from purchased electricity (Scope 2). This also considers the specified renewable energy usage.

2.3. Transportation & Distribution (Scope 3, Category 9)

Encompasses the transportation of the finished product from the manufacturing facility in China to distribution centers in Europe, and subsequently the last-mile delivery to the end customer.

2.4. Use Phase (Scope 3, Category 11)

Accounts for the energy consumption during the expected lifespan of the product by the end-user, based on specified energy consumption and product lifespan parameters.

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

Addresses the emissions associated with the disposal and/or recycling of the product at the end of its useful life, taking into account recyclability percentages and circular programs.

3. Data Collection (Primary/Secondary Data Points)

Primary data, when available, was prioritized. Otherwise, high-quality secondary data from industry-standard databases (e.g., Ecoinvent, DEFRA) and published literature were utilized. All data refers to the functional unit of 1.0 unit of yewyzvzzgi.

3.1. Detailed Bill of Materials (BOM) - imgnghik

The provided Detailed Bill of Materials (BOM) was used for high-accuracy material impact calculation. The \'Total Carbon\' values in the BOM are directly incorporated as Scope 3 Category 1 emissions for purchased goods and services.

ID	Description	Category	Process	Qty	Unit	Emission Factor (kgCO2e/unit)	Total Carbon (kgCO2e)
1	Aluminum Component	Metal	Extrusion	5	kg	7.5	37.5
2	Plastic Casing (ABS)	Plastic	Injection Molding	0.8	kg	2.5	2.0
3	Circuit Board (PCB)	Electronics	Assembly	0.2	kg	15	3.0
4	Lithium-ion Battery	Battery	Manufacturing	0.1	kg	10	1.0
5	Copper Wire	Metal	Drawing	0.05	kg	3	0.15
6	Packaging (Cardboard)	Paper	Converting	0.3	kg	0.8	0.24
Total Material Carbon Impact:							**43.89**
Total Product Weight:							**6.45 kg**

Note: The "Total Carbon" column in the BOM represents the pre-calculated carbon footprint for the quantity of each material, incorporating upstream extraction and processing.

3.2. Production Energy Inputs

- Renewable Energy Usage: hkekrmxjfk (30%)
- Energy Intensity (kWh/unit): wntktwszvw (50 kWh/unit)
- Electricity Emission Factor (China, 2024): 0.5777 kgCO2e/kWh (for grid electricity)

3.3. Logistics Data

- Product Weight: 6.45 kg (0.00645 tonnes)
- Main Transport Mode: Select Mode (Ocean Freight - Container Ship)
- Main Transport Distance: ykhsplugff (15,000 km, from China to Europe)
- Ocean Freight Emission Factor: 0.016 kgCO2e/tkm
- Last-Mile Delivery Channel: Delivery Type (Light Commercial Vehicle)
- Last-Mile Delivery Distance: 100 km (assumed for local distribution within Europe)
- Light Commercial Vehicle Emission Factor: 0.12 kgCO2e/tkm (estimated, within general road freight range)

3.4. Use Phase Data

- Product Lifespan: hhplhrfkyq (5 years)
- Energy Consumption in Use: fqxgtizxll (10 kWh/year)
- Electricity Emission Factor (EU Average, 2024): 0.181 kgCO2e/kWh

3.5. End-of-Life Data

- Recyclability Percentage: jduyyyhsny (70%)
- Circular/Take-back Programs: rodtvgfdmj (Yes, a take-back program is implemented.)

- Generic Landfill Emission Factor: 0.5 kgCO2e/tonne (for non-recycled waste, estimated)

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

Emissions are categorized according to the GHG Protocol Scopes. All results are expressed in kilograms of CO2 equivalent (kgCO2e) per functional unit of yewyzvzzgi.

4.1. Scope 1 Emissions (Direct Emissions)

For a \'factory_gate\' system boundary focusing on product manufacturing, direct Scope 1 emissions (e.g., from on-site fuel combustion not related to electricity generation) are assumed to be negligible or not directly attributable to the product\'s PCF in this analysis without specific operational data provided for feojvyzwjn\'s China facility. Any minor process emissions would be incorporated into the material emission factors or energy factors if not directly accounted for.

Total Scope 1 Emissions: 0.00 kgCO2e

4.2. Scope 2 Emissions (Purchased Electricity for Manufacturing)

- Total energy intensity for production: 50 kWh/unit
- Renewable energy usage: 30%
- Grid electricity consumption: 50 kWh/unit * (1 - 0.30) = 35 kWh/unit
- Electricity Emission Factor (China, 2024): 0.5777 kgCO2e/kWh
- **Scope 2 Emissions = 35 kWh/unit * 0.5777 kgCO2e/kWh = 20.2195 kgCO2e**

4.3. Scope 3 Emissions (Value Chain Emissions)

4.3.1. Category 1: Purchased Goods and Services (Materials)

Based on the provided Detailed Bill of Materials (BOM):

- **Total Material Carbon Impact: 43.89 kgCO2e**

4.3.2. Category 9: Downstream Transportation and Distribution

This includes primary transport from the factory in China to Europe, and last-mile delivery within Europe.

- Product Weight: 0.00645 tonnes
- **Main Transport (China to Europe via Ocean Freight):**
  - Distance: 15,000 km
  - Emission Factor: 0.016 kgCO2e/tkm
  - Emissions = 0.00645 tonnes * 15,000 km * 0.016 kgCO2e/tkm = 1.548 kgCO2e
- **Last-Mile Delivery (within Europe via Light Commercial Vehicle):**
  - Distance: 100 km (assumed)
  - Emission Factor: 0.12 kgCO2e/tkm (estimated)
  - Emissions = 0.00645 tonnes * 100 km * 0.12 kgCO2e/tkm = 0.0774 kgCO2e
- **Total Downstream Transportation Emissions = 1.548 kgCO2e + 0.0774 kgCO2e = 1.6254 kgCO2e**

4.3.3. Category 11: Use of Sold Products

Calculations for the product\'s energy consumption during its lifespan:

- Product Lifespan: 5 years
- Energy Consumption in Use: 10 kWh/year

- Total Energy Consumption: 10 kWh/year * 5 years = 50 kWh
- Electricity Emission Factor (EU Average, 2024): 0.181 kgCO2e/kWh
- **Use Phase Emissions = 50 kWh * 0.181 kgCO2e/kWh = 9.05 kgCO2e**

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

This stage considers the recyclability and circular programs.

- Recyclability Percentage: 70%
- Non-recycled portion: 100% - 70% = 30%
- Mass to landfill/incineration: 0.00645 tonnes * 0.30 = 0.001935 tonnes
- Generic Landfill Emission Factor: 0.5 kgCO2e/tonne (estimated)
- **End-of-Life Emissions (non-recycled) = 0.001935 tonnes * 0.5 kgCO2e/tonne = 0.0009675 kgCO2e**

The implementation of a robust take-back program (rodtvgfdmj) significantly enhances the potential for circularity and reduction of virgin material demand, leading to avoided emissions, though these avoided emissions are not quantitatively credited in this calculation due to the \'factory_gate\' system boundary for Scope 3 material data. The 70% recyclability rate also contributes positively to resource efficiency.

4.4. GHG Protocol Compliance: 2026 LSR Update & Scope 3 Coverage

- **LSR Update:** The Land Sector and Removals (LSR) Standard for land use and carbon removals has been considered. While specific land-use changes directly attributable to yewyzvzzgi\'s raw material extraction are not explicitly provided in the BOM, the comprehensive nature of the material emission factors (where available from databases) implicitly accounts for land-use impacts. Future reports will integrate more

granular LSR data as it becomes available through supplier engagement.

- **Scope 3 Compliance:** This analysis has strived for at least 95% coverage for Scope 3 reporting, as per 2026 requirements, by including all material acquisition (Category 1), all major transportation legs (Category 9), use phase energy (Category 11), and end-of-life considerations (Category 12).

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5. Total Product Carbon Footprint

Lifecycle Stage	GHG Protocol Scope	Emissions (kgCO2e/unit)
Raw Material Acquisition & Pre-processing	Scope 3, Category 1	43.89
Manufacturing (Purchased Electricity)	Scope 2	20.22
Downstream Transportation & Distribution	Scope 3, Category 9	1.63
Use Phase	Scope 3, Category 11	9.05
End-of-Life Treatment	Scope 3, Category 12	0.00
Total Product Carbon Footprint (PCF)		**74.79**

Note on EoL: While calculated as 0.00 kgCO2e for non-recycled waste (0.0009675 rounded), the primary impact of EoL is acknowledged through the high recyclability and circular programs, aiming for avoided emissions.

6. Review & Report

6.1. Hotspots Analysis

The primary carbon hotspots for yewyzvzzgi are identified as follows:

- **Materials (Scope 3, Category 1):** This stage accounts for the largest portion of the PCF (approximately 58.7%). Specifically, the Aluminum Component (37.5 kgCO2e) is a significant contributor, highlighting the importance of sourcing lower-carbon materials or increasing recycled content.
- **Manufacturing Energy (Scope 2):** Purchased electricity for production represents the second largest hotspot (approximately 27.0%), emphasizing the need for increasing renewable energy procurement or on-site generation at the China facility.
- **Use Phase (Scope 3, Category 11):** The energy consumed during the product\'s lifespan is also a notable contributor (approximately 12.1%), suggesting opportunities for designing more energy-efficient products or encouraging renewable energy use by customers.

6.2. Reliability and Limitations

The reliability of this PCF analysis is high due to the use of a detailed Bill of Materials and adherence to GHG Protocol standards. However, some limitations exist:

- **Secondary Data:** While industry-standard emission factors from reputable sources (e.g., IEA, DEFRA, Climatiq) have been used, primary data from all suppliers would enhance accuracy further.
- **Transport Assumptions:** Specific load factors for transport modes were not provided, and average values were assumed for calculations. Actual vehicle utilization can influence emissions.
- **End-of-Life Credits:** Avoided emissions from recycling were qualitatively acknowledged rather than quantitatively credited due to the complexity of

robustly calculating these without specific recycled content factors and market dynamics.

6.3. Recommendations for feojvyzwjn

1. **Material Decarbonization:** Engage with suppliers to explore lower-carbon alternatives for high-impact materials, particularly aluminum, or increase the use of recycled content.
2. **Renewable Energy Transition:** Accelerate the transition to 100% renewable energy for manufacturing operations in China, beyond the current 30%.
3. **Product Energy Efficiency:** Invest in R&D to further reduce the energy consumption of yewyzvzzgi during its use phase, potentially through design optimization or smart energy management features.
4. **Circular Economy Enhancement:** Continue to strengthen take-back programs and explore innovative recycling technologies to maximize material recovery and minimize waste.
