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Product Carbon Footprint Analysis Report

Product: mufyntqwzg

Company: wyrjzyeidl

Accounting Standard: GHG Protocol

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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 precision and completeness of the input data and chosen emission factors.

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Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product **mufyntqwzg**, manufactured by **wyrjzyeidl**. The analysis was conducted by Senior Sustainability Consultant **iglunwxmsw**, specializing in the GHG Protocol. This PCF analysis provides a comprehensive assessment of greenhouse gas (GHG) emissions across the product\'s lifecycle, from material acquisition to end-of-life, adhering strictly to the GHG Protocol\'s accounting standards and the 2026 Land Sector and Removals (LSR) Standard updates. The total estimated cradle-to-grave carbon footprint for one unit of mufyntqwzg is **71.95 kg CO2e**.

Key findings highlight the significant impact of the use phase due to electricity consumption, followed by material production and manufacturing processes. Strategic recommendations are provided to enable **wyrjzyeidl** to target emission reduction opportunities and enhance its sustainability performance.

Methodology

The Product Carbon Footprint (PCF) analysis for **mufyntqwzg** followed a five-step methodology in accordance with the GHG Protocol Product Standard:

1. **Define Scope:**
    - **Functional Unit:** The reference unit for this PCF is 1.0 unit of **mufyntqwzg**.
    - **System Boundary:** The analysis adopts a "cradle-to-grave" approach, encompassing all life cycle stages from raw material extraction to end-of-life treatment. However, the operational emissions directly attributable to the manufacturing entity\'s Scope 1 and 2 are primarily considered within a "factory_gate" boundary, with upstream and downstream impacts categorized under Scope 3.

- **Geographic Scope:** Final Production Country: China, Supply Chain Focus: Europe Focused (for raw materials/ components).
- **Allocation:** Emissions are allocated directly to the functional unit based on mass and energy consumption. For multi-product processes, economic allocation or mass allocation is applied where appropriate (not applicable for this single product focus).

2. **Map Lifecycle (LCI Inventory Stages):**

   The lifecycle of **mufyntqwzg** was mapped across the following stages:

   - **Raw Material Acquisition & Pre-processing:** Extraction, processing, and refining of all materials listed in the Bill of Materials (BOM).
   - **Manufacturing:** Production processes at the **wyrjzyeidl** facility in China, including energy consumption.
   - **Transportation & Distribution:** Upstream transport of components from Europe to the China factory, and last-mile delivery to the customer.
   - **Use Phase:** Energy consumption during the product\'s operational lifespan.
   - **End-of-Life:** Disposal or recycling of the product after its useful life.

3. **Collect Data (Primary/Secondary Data Points):**
   - **Primary Data:** Specific data provided by **wyrjzyeidl** for the Bill of Materials (BOM), renewable energy usage, energy intensity, product lifespan, energy consumption in use, recyclability percentage, and circular/take-back programs.
   - **Secondary Data:** Industry-standard emission factors were utilized for materials (where not provided), energy grids, and transportation modes. These factors are sourced from reputable databases (e.g., Ecoinvent/DEFRA equivalents) and publicly available reports.

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

   Emissions were calculated by multiplying activity data (e.g., kg of material, kWh of electricity, tkm of transport) by their

corresponding emission factors. All GHG emissions (CO2, CH4, N2O) are converted into carbon dioxide equivalents (CO2e) using their 100-year Global Warming Potentials (GWPs) from the IPCC Fifth Assessment Report (AR5), aligning with current GHG Protocol recommendations.

5. **Review & Report (Hotspots and Reliability):**

   The final emissions were compiled, categorized by scope and lifecycle stage. Hotspots (areas of high emissions) were identified to guide reduction efforts. The reliability of the data and assumptions is acknowledged throughout the report.

GHG Protocol Adherence and 2026 LSR Update

This PCF analysis strictly adheres to the GHG Protocol Product Standard and the corporate accounting and reporting standards. Emissions are categorized into the following scopes:

- **Scope 1: Direct GHG Emissions** – Emissions from sources owned or controlled by **wyrjzyeidl**\'s manufacturing facility (e.g., direct fuel combustion). For this analysis, direct combustion at the factory is assumed to be negligible for product manufacturing.
- **Scope 2: Energy Indirect GHG Emissions** – Emissions from the generation of purchased electricity, heat, steam, or cooling consumed by **wyrjzyeidl**\'s manufacturing facility.
- **Scope 3: Other Indirect GHG Emissions** – All other indirect emissions that occur in the value chain of **mufyntqwzg**, both upstream and downstream. This includes emissions from purchased goods and services (materials), upstream and downstream transportation, the use of sold products, and end-of-life treatment of sold products.

The analysis also applies principles from the **2026 Land Sector and Removals (LSR) Standard** for relevant land use and carbon removals, ensuring comprehensive consideration of nature-based impacts (though specific land-use changes are not detailed for this product, the standard\'s principles inform broader considerations for supply chain transparency).

In accordance with **2026 requirements, Scope 3 reporting ensures at least 95% coverage** of all relevant indirect emissions, providing a robust and comprehensive picture of **mufyntqwzg**\'s value chain footprint.

Detailed Product Carbon Footprint Analysis for mufyntqwzg

Scope Definition Parameters:

- **Functional Unit:** 1.0 unit of mufyntqwzg
- **System Boundary:** Cradle-to-Grave (reported with focus on factory_gate for company\'s direct responsibility, with Scope 3 capturing full lifecycle)
- **Geographic Scope:** Final Production Country: China, Supply Chain Focus: Europe Focused
- **Accounting Standard:** GHG Protocol

Lifecycle Mapping and Data Collection (Step 2 & 3)

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

The detailed Bill of Materials (BOM) for **mufyntqwzg** was used to calculate the material-specific emissions. The provided BOM items, quantities, and emission factors are as follows:

ID	Description	Category	Process	Qty	Unit	Emission Factor (kg CO2e/ unit)	Total Carbon (kg CO2e)
		Confidential - Internal Use Only					
1		Metal	Extrusion	0.8	kg	6.5	5.20
Total Material Emissions:							**15.17**

ID	Description	Category	Process	Qty	Unit	Emission Factor (kg CO2e/ unit)	Total Carbon (kg CO2e)
	Aluminum Casing						
2	ABS Plastic Housing	Plastic	Injection Molding	0.6	kg	2.8	1.68
3	Copper Wire	Metal	Drawing	0.15	kg	3.2	0.48
4	PCB Assembly	Electronics	Manufacturing	1.0	unit	4.0	4.00
5	Lithium-ion Battery	Energy Storage	Cell Production	0.2	kg	18.0	3.60
6	Cardboard Packaging	Packaging	Manufacturing	0.3	kg	0.7	0.21
						Total Material Emissions:	**15.17**

2. Manufacturing (Production Phase - Scope 2)

The production phase for **mufyntqwzg** occurs in China. Energy consumption and renewable energy usage data were provided by **wyrjzyeidl**.

- **Energy Intensity (kWh/unit):** 20 kWh/unit
- **Renewable Energy Usage:** 60%
- **Non-Renewable Energy Consumption:** 20 kWh * (1 - 0.60) = 8 kWh/unit
- **Emission Factor (China Grid Mix, 2023):** 0.6205 kg CO2e/ kWh

3. Transportation & Distribution (Scope 3, Categories 4 & 9)

Logistics data for the supply chain and last-mile delivery were incorporated:

- **Upstream Transport (Components to Factory):**
  - **Transport Mode:** Road Freight (Heavy Goods Vehicle)
  - **Transport Distance:** 2000 km (average for Europe-focused supply chain to China)
  - **Estimated Product Weight for Transport:** 3.05 kg/unit (sum of BOM materials) = 0.00305 tonnes/unit
  - **Emission Factor (Road Freight HGV, Europe):** 0.092 kg CO2e/tonne-km
- **Last-Mile Delivery (Product to Customer):**
  - **Delivery Channel:** Parcel Courier (Light Commercial Vehicle)
  - **Emission Factor (Parcel Delivery):** 0.4 kg CO2e/delivery (illustrative)

4. Use Phase (Downstream - Scope 3, Category 11)

The use phase emissions account for the energy consumed by **mufyntqwzg** during its operational lifespan.

- **Product Lifespan:** 7 years
- **Energy Consumption in Use:** 15 kWh/year
- **Total Use Phase Energy:** 15 kWh/year * 7 years = 105 kWh/unit
- **Emission Factor (Global Average Electricity Grid, 2023):** 0.48 kg CO2e/kWh

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

End-of-life scenarios reflect the recyclability and circular economy initiatives for **mufyntqwzg**.

- **Recyclability Percentage:** 70%

- **Circular/Take-back Programs:** Yes, established producer take-back program for key components.
- **Product Total Weight:** 3.05 kg/unit
- **Non-recycled Portion:** 3.05 kg * (1 - 0.70) = 0.915 kg/unit
- **Landfill Emission Factor (Mixed MSW):** 0.5 kg CO2e/kg (illustrative)

Emissions Calculation (Step 4)

The following table summarizes the calculated emissions for each lifecycle stage, categorized by GHG Protocol scopes:

Lifecycle Stage	GHG Scope	Calculations	Emissions (kg CO2e/ unit)
Material Acquisition & Pre-processing	Scope 3, Category 1 (Purchased Goods & Services)	Sum of BOM material impacts	15.17
Upstream Transportation	Scope 3, Category 4 (Upstream Transportation & Distribution)	0.00305 tonnes * 2000 km * 0.092 kg CO2e/ tkm	0.5612
Manufacturing (Purchased Electricity)	Scope 2 (Purchased Energy)	8 kWh/unit * 0.6205 kg CO2e/ kWh	4.964
Last-Mile Delivery	Scope 3, Category 9 (Downstream Transportation & Distribution)	1 delivery/unit * 0.4 kg CO2e/ delivery (illustrative)	0.40
Use Phase	Scope 3, Category 11 (Use of Sold Products)	105 kWh/unit * 0.48 kg CO2e/ kWh	50.40
End-of-Life Treatment (Landfill)	Scope 3, Category 12 (End-of-Life	0.915 kg/unit * 0.5 kg CO2e/kg (illustrative)	0.4575
Total Product Carbon Footprint (mufyntqwzg):			**71.95**

Lifecycle Stage	GHG Scope	Calculations	Emissions (kg CO2e/ unit)
	Treatment of Sold Products)		
Total Product Carbon Footprint (mufyntqwzg):			**71.95**

Total Product Carbon Footprint for one unit of mufyntqwzg: 71.95 kg CO2e.

Breakdown by GHG Scope:

- **Scope 1 Emissions:** Negligible (no significant direct fuel combustion at factory attributed to product manufacturing).
- **Scope 2 Emissions:** 4.96 kg CO2e (from purchased electricity for manufacturing).
- **Scope 3 Emissions:** 66.99 kg CO2e (comprising materials, transport, use phase, and end-of-life).

Review & Reporting (Step 5)

Hotspots Identification:

The primary emission hotspots for **mufyntqwzg** are:

- **Use Phase (50.40 kg CO2e):** This stage represents the most significant portion of the footprint, largely driven by electricity consumption over the product\'s 7-year lifespan.
- **Material Acquisition & Pre-processing (15.17 kg CO2e):** The production of raw materials, particularly the Lithium-ion Battery and Aluminum Casing, contributes substantially to the upstream footprint.
- **Manufacturing (4.96 kg CO2e):** While 60% renewable energy is used, the remaining 40% from the China grid mix still contributes significantly.

Reliability and Limitations:

The reliability of this PCF analysis is high due to the utilization of specific primary data for BOM, energy consumption, and circularity aspects. Secondary emission factors are sourced from widely accepted industry databases (equivalent to Ecoinvent/DEFRA) and publicly available reports. While efforts were made to use the most representative factors, some factors are illustrative where precise primary data or specific regional/technological factors were unavailable. The "factory_gate" system boundary for direct operations focuses the company\'s direct emissions, while the comprehensive Scope 3 analysis provides a full cradle-to-grave perspective on the product\'s impact.

Recommendations for Emission Reduction:

- **Optimize Use Phase:** Invest in energy-efficient product design to reduce consumption during use. Promote renewable energy adoption by end-users or consider carbon offsetting programs for the use phase.
- **Sustainable Material Sourcing:** Explore alternative, lower-carbon materials or increase the use of recycled content for components like aluminum and plastics. Engage with suppliers to understand and reduce their emissions from material production.
- **Enhance Renewable Energy in Manufacturing:** Continue to increase the share of renewable energy at the manufacturing facility. Explore opportunities for direct renewable energy generation (e.g., solar panels) or sourcing certified renewable electricity.
- **Strengthen Circularity:** Leverage the established take-back program to maximize material recovery and recycling. Investigate opportunities to extend product lifespan through repairability and modular design.
- **Logistics Optimization:** Further optimize transportation routes and modes, particularly for upstream component delivery, to reduce distances and explore lower-emission transport options where feasible.