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Product Carbon Footprint Analysis Report

Product: eteyxefnwn

Company: nmgyvpzewq

Accounting Standard: GHG Protocol

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Product Carbon Footprint (PCF) Analysis Report for eteyxefnwn

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Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product eteyxefnwn, manufactured by nmgyvpzewq. The analysis adheres to the Greenhouse Gas (GHG) Protocol, including consideration of the 2026 updates for Scope 3 reporting and the Land Sector and Removals (LSR) Standard. The total estimated cradle-to-grave PCF for one functional unit of eteyxefnwn is 71.08 kgCO2e. The Use Phase contributes the most significant portion of the footprint, highlighting the importance of energy efficiency during product operation.

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1. Define Scope

Functional Unit

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

System Boundary

The system boundary for this analysis is **factory_gate**, extending to include downstream use and end-of-life stages (cradle-to-grave). This includes raw material acquisition, manufacturing, transportation to market, product use, and end-of-life treatment.

Geographic Scope

The final production country is **China**, with a supply chain focus on **Europe Focused**. Emission factors are selected to reflect these geographical contexts where possible.

Allocation

Emissions are allocated directly to the functional unit. For multi-functional processes, mass-based allocation is applied. Recycling benefits are accounted for as avoided emissions at the end-of-life stage.

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2. Map Lifecycle (LCI Inventory Stages)

The lifecycle of eteyxefnwn is mapped across the following stages, in accordance with the GHG Protocol:

- **Raw Material Acquisition & Pre-processing:** Extraction, processing, and manufacturing of all components listed in the Bill of Materials (BOM).
- **Production:** Manufacturing and assembly processes at nmgyvpzewq\'s facility in China, including energy consumption.
- **Transport:** Main transportation of the finished product from the factory to the market, and last-mile delivery to the customer.
- **Use Phase:** Energy consumption during the product\'s lifespan by the end-user.
- **End-of-Life (EoL):** Collection, recycling, and disposal of the product at the end of its functional life.

Detailed Breakdown of Materials (Bill of Materials - BOM)

The following Bill of Materials (BOM) was used to determine the material impact of the product eteyxefnwn. The \'Total Carbon\' values represent the upstream emissions associated with the production of each material component, as provided.

ID	Description	Category	Process	Qty	Unit	Emission Factor (kgCO2e/unit)	Total Carbon (kgCO2e)
1	Aluminum Casing	Metal	Casting	0.5	kg	7.0	3.5

ID	Description	Category	Process	Qty	Unit	Emission Factor (kgCO2e/unit)	Total Carbon (kgCO2e)
3	Circuit Board	Electronics	Manufacturing	1.0	unit	1.2	1.2
4	Lithium-ion Battery	Chemical	Production	0.2	kg	15.0	3.0
5	Copper Wiring	Metal	Extrusion	0.1	kg	5.0	0.5
6	Packaging (Cardboard)	Paper	Production	0.1	kg	1.0	0.1

Detailed Breakdown of Energy Inputs (Production Phase)

- **Energy Intensity (kWh/unit):** 15 kWh/unit
- **Renewable Energy Usage:** 40% (40% of electricity is sourced from renewable energy)
- **Non-renewable Energy Usage:** 60% (60% of electricity is sourced from the grid mix)

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3. Collect Data (Primary/Secondary Data Points)

This analysis utilizes both primary and secondary data:

- **Primary Data:** Company-specific Bill of Materials (BOM), energy intensity, renewable energy usage, product lifespan, energy consumption in use, recyclability percentage, and details on circular programs.
- **Secondary Data:** Industry-standard emission factors from reputable databases such as Ecoinvent and DEFRA are used for electricity grids, transportation modes, and end-of-life scenarios.

Specific Data Points Used:

- **Product Weight (for transport calculations, estimated):** 1.2

- **Main Transport Mode (`Select Mode`):** Heavy Duty Truck (>16t, 50% laden).
- **Main Transport Distance (`loplroxgel`):** 2,500 km.
- **Last-Mile Delivery Channel (`Delivery Type`):** Small Parcel Van.
- **Last-Mile Delivery Distance (Assumed):** 50 km.
- **Electricity Grid Emission Factor (China national average 2023):** 0.6205 kgCO2e/kWh.
- **Renewable Electricity Emission Factor:** 0.01 kgCO2e/kWh (residual emissions).
- **Road Transport Emission Factor (Heavy Duty Truck):** 0.08 kgCO2e/tkm (from DEFRA equivalents).
- **Road Transport Emission Factor (Small Parcel Van):** 0.5 kgCO2e/tkm (derived from DEFRA per-km factor assuming 0.5-tonne average load).
- **End-of-Life Emission Factor (Landfill/Incineration):** 2.5 kgCO2e/kg (generic average).
- **Recycling Benefit Factor:** -1.5 kgCO2e/kg (credit for avoided virgin material production).
- **Product Lifespan (`jumxmupukh`):** 3 years.
- **Energy Consumption in Use (`ojgxiovzvk`):** 30 kWh/year.
- **Recyclability Percentage (`llpjrtrtek`):** 60%.
- **Circular/Take-back Programs (`lovuwwhzgw`):** Company-operated take-back program for key components.

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

Emissions are calculated for each lifecycle stage and categorized according to the GHG Protocol\'s Scope 1, Scope 2, and Scope 3 definitions.

Total Product Carbon Footprint (PCF): 71.08 kgCO2e

Emission Breakdown by Lifecycle Stage:

Lifecycle Stage	GHG Scope	Emissions (kgCO2e)
Raw Materials (Upstream)	Scope 3 (Category 1)	9.20
Production Energy	Scope 2	5.64
Transport (Upstream)	Scope 3 (Category 4)	0.24
Transport (Downstream, Last-Mile)	Scope 3 (Category 9)	0.03
Use Phase	Scope 3 (Category 11)	55.85
End-of-Life	Scope 3 (Category 12)	0.12
Total PCF		**71.08**

Detailed Scope-wise Emissions:

- **Scope 1 (Direct Emissions):** 0.00 kgCO2e (Assuming no direct fuel combustion at nmgyvpzewq\'s facility for this product based on provided energy data)
- **Scope 2 (Purchased Energy):** 5.64 kgCO2e
    - Production Energy: 15 kWh * (1 - 0.40) * 0.6205 kgCO2e/kWh (China grid) + 15 kWh * 0.40 * 0.01 kgCO2e/kWh (renewable) = 5.5845 + 0.06 = 5.64 kgCO2e.
- **Scope 3 (Value Chain Emissions):** 65.44 kgCO2e
    - **Category 1: Purchased goods and services (Materials):** 9.20 kgCO2e (Sum of "Total Carbon" from BOM)
    - **Category 4: Upstream transportation and distribution:** 0.24 kgCO2e
        - Main Transport: 1.3 kg product (0.0013 tonnes) * 2500 km * 0.08 kgCO2e/tkm = 0.26 kgCO2e. (Using 1.3kg total product weight for transport, including

- **Category 9: Downstream transportation and distribution (Last-Mile):** 0.03 kgCO2e
    - Last-Mile Delivery: 1.2 kg product (0.0012 tonnes) * 50 km * 0.5 kgCO2e/tkm = 0.03 kgCO2e.
- **Category 11: Use of sold products:** 55.85 kgCO2e
    - Total Energy in Use: 30 kWh/year * 3 years = 90 kWh.
    - Emissions: 90 kWh * 0.6205 kgCO2e/kWh = 55.85 kgCO2e.
- **Category 12: End-of-life treatment of sold products:** 0.12 kgCO2e
    - Unrecyclable (40%): 1.2 kg * 0.40 = 0.48 kg. Emissions: 0.48 kg * 2.5 kgCO2e/kg = 1.20 kgCO2e.
    - Recyclable (60%): 1.2 kg * 0.60 = 0.72 kg. Benefit: 0.72 kg * -1.5 kgCO2e/kg = -1.08 kgCO2e.
    - Net EoL Emissions: 1.20 - 1.08 = 0.12 kgCO2e.

Compliance with 2026 GHG Protocol Updates:

- **GHG Protocol Scope 3 Coverage (95% rule):** The analysis for eteyxefnwn explicitly covers all material Scope 3 categories: purchased goods and services, transportation (upstream and downstream), use of sold products, and end-of-life treatment. This comprehensive approach ensures that the report meets or exceeds the proposed 95% coverage threshold for required Scope 3 emissions as outlined in the GHG Protocol\'s March 2026 Phase 1 Progress Update.
- **Land Sector and Removals (LSR) Standard:** The GHG Protocol\'s LSR Standard was released on January 30, 2026, and is effective from January 1, 2027. This standard provides requirements for land-related GHG emissions and CO2 removals. Given the nature of product eteyxefnwn, which does not involve direct land-use change, agriculture, or forestry, the direct impact of the LSR Standard on this specific PCF calculation is limited. However, for companies with significant land-based activities in their supply chain, adherence to the LSR Standard and its accompanying guidance (expected in Q2 2026) would be crucial for comprehensive reporting.

5. Review & Report

Hotspots Identification

The primary emissions hotspot for eteyxefnwn is clearly identified in the **Use Phase**, contributing 55.85 kgCO2e (approximately 78.6% of the total PCF). This is largely due to the energy consumption of the product over its 3-year lifespan and the electricity grid mix of the usage region. The second largest contributor is the **Raw Materials** stage at 9.20 kgCO2e, followed by **Production Energy** at 5.64 kgCO2e.

Reliability and Recommendations

The reliability of this PCF analysis is considered high for the stages where primary data (BOM, energy intensity, renewable usage) was provided. For other stages, industry-standard emission factors from recognized databases (Ecoinvent/DEFRA equivalents) have been used, providing a robust estimate. However, the assumptions made for \'Select Mode\' and \'Delivery Type\' for transport, and generic EoL factors, introduce some uncertainty.

Recommendations:

- **Use Phase Optimization:** Prioritize efforts to reduce energy consumption during the product\'s use phase. This could involve design improvements for energy efficiency, promoting the use of renewable energy by end-users (e.g., through product compatibility with smart grids or renewable energy systems), or exploring lower-carbon electricity sources in key markets.
- **Material Decarbonization:** Investigate opportunities for sourcing lower-carbon alternatives for significant material contributors (e.g., aluminum, lithium-ion batteries). Engage with suppliers to obtain more specific, primary emission data for these components.
- **Circular Economy Integration:** Strengthen existing "Company-operated take-back program for key components" (`lovuwwhzgw`) to maximize the recycling rate beyond 60% and explore opportunities for material reuse or remanufacturing to further reduce end-of-life impacts and generate greater circularity benefits.
- **Supply Chain Engagement:** Work with transport providers to

- **Data Refinement:** Continuously seek primary data for all lifecycle stages to enhance the accuracy and robustness of future PCF assessments.
