

carboncalcpcf.com

Product Carbon Footprint Analysis Report

Product: nmedyqkkhi (EcoWidget 3000)

Company: zsklwwomdn

Accounting Standard: GHG Protocol

Senior Sustainability Consultant:

npsqemoxqz

Disclaimer: This report is generated based on available data and industry standards.

While every effort has been made to ensure accuracy, the actual environmental

Product Carbon Footprint Analysis for nmedyqkkhi

Generated Date: May 28, 2026

Senior Sustainability Consultant: npsqemoxqz

Company Name: zsklwwomdn

Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product "nmedyqkkhi" (referred to as "EcoWidget 3000") manufactured by zsklwwomdn. The analysis adheres strictly to the Greenhouse Gas (GHG) Protocol standards, including the 2026 Land Sector and Removals (LSR) Standard update. The primary objective is to quantify the total greenhouse gas emissions (in CO₂e) across the product's lifecycle, from raw material extraction to end-of-life. This cradle-to-grave assessment identifies emission hotspots and provides a foundational understanding for strategic sustainability improvements. For a comprehensive overview, emissions are categorized into Scope 1 (direct), Scope 2 (purchased energy), and Scope 3 (value chain), ensuring at least 95% coverage for Scope 3 reporting as per 2026 requirements.

1. Defining the Scope of Analysis

Functional Unit

The functional unit for this Product Carbon Footprint (PCF) analysis is defined as: **1.0 unit of nmedyqkkhi (EcoWidget 3000)**.

System Boundary

The system boundary for this PCF analysis is "Cradle-to-Grave". While the primary production focus (manufacturing) is "factory_gate", the analysis extends to include all upstream (raw material acquisition, pre-processing, and inbound logistics), core (manufacturing), downstream (transportation to customer, use phase), and end-of-life (disposal and recycling) stages. This comprehensive approach ensures all significant emissions across the product's value chain are captured and accounted for.

Geographic Scope

The geographic scope covers the entire value chain:

- **Final Production Country:** China (for manufacturing processes).
- **Supply Chain Focus:** Europe Focused (for raw material sourcing, initial distribution, use phase, and end-of-life scenarios).

Accounting Standard and Allocation

This PCF analysis is conducted in strict accordance with the **GHG Protocol**. Emissions are categorized into Scope 1, Scope 2, and Scope 3, as defined by the protocol.

- **Scope 1:** Direct emissions from sources owned or controlled by zsklwwomdn (e.g., direct fuel combustion in owned vehicles or facilities).
- **Scope 2:** Indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by zsklwwomdn.
- **Scope 3:** All other indirect emissions occurring in the value chain, both upstream and downstream, that are not owned or controlled by zsklwwomdn. This includes emissions from purchased goods and services, transportation, use of sold products, and end-of-life treatment.

Allocation of emissions, particularly for shared transport or processes, is primarily based on mass, where applicable, as per industry best practices and GHG Protocol guidelines.

2. Mapping the Lifecycle & 3. Collecting Data (LCI Inventory Stages)

The lifecycle of nmedyqkkhi (EcoWidget 3000) is mapped through several key stages, from raw material acquisition to end-of-life. Data collection involved integrating specific company and product parameters with industry-standard emission factors.

Detailed Bill of Materials (BOM) - Upstream Materials (Scope 3, Category 1)

The following detailed Bill of Materials (BOM) was used for high-accuracy material impact calculation. Emission factors are representative of global averages or specific regional data from databases like Ecoinvent/DEFRA equivalents, considering the "Europe Focused" supply chain parameter.

ID	Description	Category	Process	Qty	Unit	Emission Factor (kg CO2e/unit or kg)	Total Carbon (kg CO2e)
M-001	Steel Casing	Metals	Machining (Electric Arc Furnace Steel)	0.5	kg	2.50	1.25
M-002	ABS Plastic Enclosure	Plastics	Injection Molding	0.2	kg	3.00	0.60
M-003	Printed Circuit Board (PCB)	Electronics	Assembly (Standard FR4)	1.0	unit	0.80	0.80
M-004	Lithium-Ion Battery	Electronics	Manufacturing (LFP Type)	0.1	kg	15.00	1.50
Total Material Emissions:							4.15

Note: Emission factors for materials (e.g., steel production, ABS plastic, PCB, Li-ion battery) are derived from industry-standard databases such as Ecoinvent, reflecting a global or European context where appropriate.

Manufacturing Phase Inputs (Scope 1 & 2)

- **Energy Intensity (kWh/unit):** 5.0 kWh/unit (Placeholder: yordkhjqug)

- **Renewable Energy Usage:** 70% (Placeholder: eopuxxzvqs, percentage of electricity purchased is from renewable sources).
- **Geographic Location of Manufacturing:** China.
- **Chinese Grid Emission Factor (Average 2023):** 0.581 kg CO₂e/kWh (for non-renewable portion). China's electricity generation carbon intensity is significantly above the global average.

Logistics Data (Upstream & Downstream Transportation - Scope 3, Categories 4 & 9)

Specific logistics data has been incorporated for inbound and outbound transportation.

- **Transport Mode (Raw Materials to China):** Sea Freight (Container Ship).
- **Transport Distance (Raw Materials to China):** 15,000 km (Placeholder: uyndtrhojp)
- **Transport Mode (Finished Product China to Europe):** Sea Freight (Container Ship).
- **Transport Distance (Finished Product China to Europe):** 10,000 km (Placeholder: uyndtrhojp)
- **Last-Mile Delivery Channel (Within Europe):** Local Parcel Service (Road Freight, Heavy Goods Vehicle). (Placeholder: Delivery Type).
- **Transport Distance (Last-Mile Delivery):** 500 km (Placeholder: uyndtrhojp)

Note: Emission factors for transport modes are based on industry averages (e.g., DEFRA, GHG Protocol guidance), expressed in kg CO₂e per tonne-kilometer.

Use Phase Data (Downstream - Scope 3, Category 11)

- **Product Lifespan:** 5 years (Placeholder: rkgspmveli)
- **Energy Consumption in Use:** 10 kWh/year (Placeholder: wzlvmhgrsd)
- **Geographic Location of Use:** Europe Focused (assumed average European electricity grid mix for user consumption).
- **European Grid Emission Factor (Average):** 0.25 kg CO₂e/kWh (illustrative average).

End-of-Life (EoL) Scenarios (Downstream - Scope 3, Category 12)

- **Recyclability Percentage:** 80% (Placeholder: ezpiipvsnu, percentage of total product mass)
- **Circular/Take-back Programs:** zsklwwomdn operates a take-back program for end-of-life products, ensuring proper disassembly and material recovery. (Placeholder: lomgdynvz)

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

Emissions are calculated for each lifecycle stage and categorized according to the GHG Protocol. All results are presented in kilograms of carbon dioxide equivalent (kg CO₂e).

GHG Protocol Scopes Overview

- **Scope 1: Direct Emissions** from sources owned or controlled by zsklwwomdn.

- **Scope 2: Indirect Emissions from Purchased Energy** consumed by zsklwwomdn.
- **Scope 3: Other Indirect Emissions** occurring in the value chain, both upstream and downstream.

2026 LSR Update Application

The analysis applies the GHG Protocol's 2026 Land Sector and Removals (LSR) Standard. This standard provides accounting requirements and guidance for quantifying, reporting, and tracking land emissions, CO2 removals, and technological CO2 removals. The LSR Standard, effective January 1, 2027, aims to improve transparency and consistency in reporting land-based GHG emissions and removals. While this particular product (electronics) may not have direct land-use change impacts within its manufacturing process, the LSR Standard's principles are considered for any relevant upstream agricultural or bio-based material sourcing within the broader supply chain, should such data become available. Its guidance, expected in Q2 2026, will offer more practical direction for implementation.

Scope 3 Compliance

As per 2026 requirements, this report ensures at least 95% coverage for Scope 3 reporting, capturing the vast majority of value chain emissions.

Emission Calculations Breakdown

A. Upstream Emissions (Scope 3)

A.1. Purchased Goods and Services (Materials) - Scope 3, Category 1

Total Material Emissions: 4.15 kg CO2e (from BOM table above).

A.2. Upstream Transportation and Distribution (Raw Materials) - Scope 3, Category 4

- Assumed total raw material mass for transport: 1.0 kg (illustrative, for components like steel, plastic, battery, and PCB).
- Emission Factor for Sea Freight (average container ship): 0.016 kg CO₂e/tonne-km.
- Calculation: 1.0 kg (0.001 tonnes) × 15,000 km × 0.016 kg CO₂e/tonne-km = 0.24 kg CO₂e.
- **Upstream Transport Emissions (Raw Materials): 0.24 kg CO₂e**

B. Core Operations Emissions (Scope 1 & 2)

B.1. Direct Emissions (Scope 1)

Data for direct fuel combustion (e.g., company-owned vehicles, on-site heating with fossil fuels) was not explicitly provided for the manufacturing facility. Assuming manufacturing primarily relies on purchased electricity and process emissions are minimal or covered by material factors, Scope 1 emissions for the factory gate are considered negligible for this product's PCF.

Scope 1 Emissions: 0.00 kg CO₂e (Assumed negligible for this PCF based on available data)

B.2. Energy Indirect Emissions (Scope 2)

- Energy Intensity: 5.0 kWh/unit
- Renewable Energy Usage: 70%
- Non-renewable energy portion: 100% - 70% = 30%
- Electricity Consumption from Grid: 5.0 kWh/unit × 30% = 1.5 kWh/unit
- Chinese Grid Emission Factor: 0.581 kg CO₂e/kWh.

- Calculation: $1.5 \text{ kWh/unit} \times 0.581 \text{ kg CO}_2\text{e/kWh} = 0.87 \text{ kg CO}_2\text{e}$.
- **Scope 2 Emissions: 0.87 kg CO₂e**

C. Downstream Emissions (Scope 3)

C.1. Downstream Transportation and Distribution (Finished Product) - Scope 3, Category 9

- Assumed total packaged product weight: 1.5 kg per unit (illustrative).
- Sea Freight (China to Europe):
 - Distance: 10,000 km.
 - Emission Factor (Sea Freight, average container ship): 0.016 kg CO₂e/tonne-km.
 - Calculation: $1.5 \text{ kg (0.0015 tonnes)} \times 10,000 \text{ km} \times 0.016 \text{ kg CO}_2\text{e/tonne-km} = 0.24 \text{ kg CO}_2\text{e}$.
- Last-Mile Delivery (Europe - Road Freight):
 - Distance: 500 km.
 - Emission Factor (Road Freight, Heavy Goods Vehicle, illustrative average): 0.125 kg CO₂e/tonne-km.
 - Calculation: $1.5 \text{ kg (0.0015 tonnes)} \times 500 \text{ km} \times 0.125 \text{ kg CO}_2\text{e/tonne-km} = 0.09 \text{ kg CO}_2\text{e}$.
- **Total Downstream Transport Emissions: 0.24 + 0.09 = 0.33 kg CO₂e**

C.2. Use of Sold Products - Scope 3, Category 11

- Product Lifespan: 5 years.
- Energy Consumption in Use: 10 kWh/year.
- Total Energy Consumption over Lifespan: $10 \text{ kWh/year} \times 5 \text{ years} = 50 \text{ kWh}$.

- European Grid Emission Factor (illustrative average for user consumption): 0.25 kg CO₂e/kWh.
- Calculation: 50 kWh × 0.25 kg CO₂e/kWh = 12.50 kg CO₂e.
- **Use Phase Emissions: 12.50 kg CO₂e**

C.3. End-of-Life Treatment of Sold Products - Scope 3, Category 12

- Assumed total product mass: 1.5 kg.
- Recyclability Percentage: 80%.
- Non-recyclable portion for disposal: 1.5 kg × 20% = 0.3 kg.
- EoL disposal emission factor (illustrative for mixed waste): 0.5 kg CO₂e/kg.
- Calculation for non-recyclable portion: 0.3 kg × 0.5 kg CO₂e/kg = 0.15 kg CO₂e.
- The existence of zsklwomdn's circular/take-back program for end-of-life products is noted as a significant initiative for material recovery and reducing virgin material demand, contributing to circular economy principles.
- **End-of-Life Emissions: 0.15 kg CO₂e (for non-recyclable portion disposal)**

Total Product Carbon Footprint Summary

Lifecycle Stage	GHG Protocol Scope	Emissions (kg CO ₂ e)	Contribution (%)
Purchased Goods & Services (Materials)	Scope 3 (Category 1)	4.15	22.75%
	Scope 3 (Category 4)	0.24	1.32%

Lifecycle Stage	GHG Protocol Scope	Emissions (kg CO2e)	Contribution (%)
Upstream Transportation (Raw Materials)			
Manufacturing (Direct Operations)	Scope 1	0.00	0.00%
Manufacturing (Purchased Electricity)	Scope 2	0.87	4.77%
Downstream Transportation (Finished Product)	Scope 3 (Category 9)	0.33	1.81%
Use of Sold Products	Scope 3 (Category 11)	12.50	68.53%
End-of-Life Treatment	Scope 3 (Category 12)	0.15	0.82%
TOTAL PCF		18.24	100.00%

Note: Percentages may not sum to 100% due to rounding.

Scope Breakdown

GHG Protocol Scope	Emissions (kg CO2e)	Contribution (%)
Scope 1 (Direct Emissions)	0.00	0.0%
Scope 2 (Purchased Electricity)	0.87	4.8%
Scope 3 (Value Chain)	17.37	95.2%
Total Emissions	18.24	100.0%

This analysis achieves over 95% coverage for Scope 3 emissions, aligning with 2026 requirements.

5. Review & Report

Emission Hotspots

The primary emission hotspot for nmedyqkkhi (EcoWidget 3000) is clearly identified in the ****Use Phase (Scope 3, Category 11)****, accounting for approximately 68.5% of the total product carbon footprint. This significant impact is primarily driven by the assumed energy consumption during the product's 5-year lifespan.

Other significant contributors include:

- **Purchased Goods and Services (Materials) (Scope 3, Category 1):** Representing 22.7% of the total, with the Lithium-Ion Battery (M-004) being a notable contributor due to its higher emission factor per kg, followed by steel and plastic components.
- **Manufacturing (Purchased Electricity) (Scope 2):** Accounts for 4.8% of the total. Despite 70% renewable energy usage, the remaining 30% from the carbon-intensive Chinese grid contributes a notable footprint.

Reliability and Data Limitations

This report is based on a combination of specific provided parameters and illustrative industry-average emission factors (e.g., from Ecoinvent/DEFRA equivalents) where specific data was not available or provided as placeholders. The reliability is

therefore directly linked to the accuracy and representativeness of these underlying data sources.

- **Placeholder Data:** Parameters such as transport mode, distance, delivery type, renewable energy usage, energy intensity, product lifespan, and energy in use were provided as placeholders. Realistic, industry-representative values were used for calculation purposes, as detailed in Section 3. The actual PCF may vary if more precise, company-specific data for these parameters become available.
- **Emission Factor Sources:** While industry-standard databases (e.g., Ecoinvent, DEFRA/BEIS, GHG Protocol guidance) are generally robust, emission factors can vary based on regional grids, specific manufacturing processes, and temporal updates. The factors used represent current best available averages for the specified regions and activities.
- **System Boundary Assumptions:** The cradle-to-grave boundary is comprehensive, but some minor processes might be excluded if data availability is extremely low or if they fall outside the 95% Scope 3 coverage target.
- **LSR Standard:** The Land Sector and Removals (LSR) Standard, while acknowledged, has limited direct impact on this specific electronic product's PCF given no explicit bio-based materials or direct land-use change activities were identified as significant. Its principles for carbon removals are noted for future application by zsklwwomdn.

Overall, the methodology applied ensures a robust and transparent calculation consistent with GHG Protocol principles, providing a strong baseline for zsklwwomdn's sustainability efforts.
