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# Product Carbon Footprint (PCF) Analysis Report

For Product: **vdmwnjkkzk**

Company: **Imwwuwsmt**

Accounting Standard: **GHG Protocol**

Senior Sustainability Consultant: **syfoqidveq**

Disclaimer: This report is generated based on available data and industry standards. The accuracy of the results is dependent on the completeness and reliability of the input data.

# Product Carbon Footprint Analysis

**Product:** vdmwnjkkzk

**Company:** Imwwuwsmt

**Senior Sustainability Consultant:** syfoqidveq

**Generated Date:** May 24, 2026

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## Executive Summary

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This report presents a high-detail Product Carbon Footprint (PCF) analysis for vdmwnjkkzk, manufactured by Imwwuwsmt. The analysis adheres to the Greenhouse Gas (GHG) Protocol standards, incorporating the 2026 Land Sector and Removals (LSR) update and ensuring comprehensive Scope 3 reporting. The functional unit for this study is 1.0 unit of vdmwnjkkzk, with a system boundary defined as 'factory\_gate' for the production phase and a broader cradle-to-grave perspective for the overall PCF. The geographic scope focuses on final production in China with a supply chain focus on Europe. Key emission hotspots identified include material acquisition, manufacturing energy consumption, and product use-phase electricity. Recommendations for reduction opportunities are provided based on these findings.

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## 1. Definition of Scope

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This Product Carbon Footprint (PCF) analysis of vdmwnjkkzk by Imwwuwsmt, guided by Senior Sustainability Consultant syfoqidveq, establishes the

framework for emission quantification according to the GHG Protocol.

- **Functional Unit:** The reference flow for all calculations is 1.0 unit of vdmwnjkkzk.
  - **System Boundary:** The primary system boundary for direct manufacturing emissions is 'factory\_gate', meaning emissions up to the point the product leaves the manufacturing facility. For a comprehensive PCF, a broader cradle-to-grave approach is adopted, covering material extraction, manufacturing, transport, use, and end-of-life phases.
  - **Geographic Scope:**
    - Final Production Country: China
    - Supply Chain Focus: Europe Focused
  - **Accounting Standard:** The analysis strictly adheres to the Greenhouse Gas (GHG) Protocol Corporate Standard and Product Standard, categorizing emissions into Scope 1, Scope 2, and Scope 3. Special attention is given to the 2026 Land Sector and Removals (LSR) Standard for land use impacts and ensuring at least 95% coverage for Scope 3 reporting as per 2026 requirements.
  - **Allocation:** Where necessary, emissions have been allocated based on mass for raw materials.
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## 2. & 3. Lifecycle Mapping (LCI) & Data Collection

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This section details the lifecycle stages and the primary and secondary data points collected for the Product Carbon Footprint of vdmwnjkkzk. Emission factors from industry-standard databases (simulated based on Ecoinvent/DEFRA principles) have been used.

## Detailed Bill of Materials (BOM) Analysis

The following Bill of Materials (BOM) provides a high-accuracy calculation of material impacts for vdmwnjkkzk. The 'Total Carbon' is calculated by multiplying the 'Qty' by the 'Emission Factor' for each item.

ID	Description	Category	Process	Qty (kg)	Unit	Emission Factor (kg CO2e/kg)	Total Carbon (kg CO2e)
M-001	ABS Plastic Casing	Plastic	Injection Molding	0.8	kg	3.5	2.80
M-002	Steel Internal Frame	Metal	Stamping	0.4	kg	2.2	0.88
M-003	Copper Wiring	Metal	Drawing	0.1	kg	4.0	0.40
M-004	Printed Circuit Board (PCB)	Electronics	Assembly	0.15	kg	12.0	1.80
M-005	Silicone Gaskets	Elastomer	Molding	0.05	kg	5.0	0.25
<b>Total Material Impact (Scope 3 - Upstream)</b>							<b>6.13</b>

## Production Phase Energy Inputs

The energy consumption during the manufacturing of vdmwnjkkzk in China is a significant contributor to the PCF.

- **Energy Intensity (kWh/unit):** 15.0 kWh/unit
- **Renewable Energy Usage:** 60% of the electricity used in production comes from renewable sources.
- **Non-Renewable Energy Usage:** 40% (15.0 kWh \* 0.40 = 6.0 kWh/unit)

- **Grid Emission Factor (China - average):** 0.70 kg CO<sub>2</sub>e/kWh
- **Production Energy Emissions (Scope 2):** 6.0 kWh/unit \* 0.70 kg CO<sub>2</sub>e/kWh = 4.20 kg CO<sub>2</sub>e/unit

## Logistics Data (Transport & Delivery)

Transportation of materials and finished products contributes to the overall footprint. The product weight for transport calculations is assumed to be the sum of BOM materials: 0.8 + 0.4 + 0.1 + 0.15 + 0.05 = 1.5 kg.

### Inbound Logistics (Raw Materials to Factory - Scope 3, Upstream)

Assuming materials originate predominantly from Europe and are shipped to China for final production.

- **Transport Mode:** Ocean Freight
- **Transport Distance:** 15,000 km
- **Emission Factor (Ocean Freight - average):** 0.010 kg CO<sub>2</sub>e/tonne-km
- **Inbound Transport Emissions:** (1.5 kg / 1000 kg/tonne) \* 15,000 km \* 0.010 kg CO<sub>2</sub>e/tonne-km = 0.225 kg CO<sub>2</sub>e/unit

### Outbound Logistics (Finished Product from Factory to Market - Scope 3, Downstream)

Transportation from the factory in China to the European market, followed by last-mile delivery.

- **Main Transport Mode:** Ocean Freight (China to Europe)
- **Transport Distance:** 15,000 km
- **Emission Factor (Ocean Freight - average):** 0.010 kg CO<sub>2</sub>e/tonne-km
- **Outbound Main Transport Emissions:** (1.5 kg / 1000 kg/tonne) \* 15,000 km \* 0.010 kg CO<sub>2</sub>e/tonne-km = 0.225 kg CO<sub>2</sub>e/unit

- **Last-Mile Delivery Channel:** Road Freight (LTL - Less Than Truckload)
- **Transport Distance (Last Mile):** 500 km
- **Emission Factor (Road Freight - LTL average):** 0.090 kg CO<sub>2</sub>e/tonne-km
- **Outbound Last-Mile Emissions:** (1.5 kg / 1000 kg/tonne) \* 500 km \* 0.090 kg CO<sub>2</sub>e/tonne-km = 0.0675 kg CO<sub>2</sub>e/unit
- **Total Outbound Transport Emissions (Scope 3 - Downstream):** 0.225 + 0.0675 = 0.2925 kg CO<sub>2</sub>e/unit

## Use Phase Data

The energy consumed during the product's operational lifespan significantly contributes to its total carbon footprint.

- **Product Lifespan:** 5 years
- **Energy Consumption in Use:** 20 kWh/year
- **Total Use Phase Energy:** 5 years \* 20 kWh/year = 100 kWh/unit
- **Grid Emission Factor (Europe - average):** 0.25 kg CO<sub>2</sub>e/kWh
- **Use Phase Emissions (Scope 3 - Downstream):** 100 kWh/unit \* 0.25 kg CO<sub>2</sub>e/kWh = 25.00 kg CO<sub>2</sub>e/unit

## End-of-Life (EoL) Scenarios

The end-of-life treatment of vdmwnjkkzk impacts its overall PCF, reflecting circular economy principles.

- **Recyclability Percentage:** 85%
- **Circular/Take-back Programs:** Imwwwuwmjt operates take-back programs, facilitating higher recycling rates and potentially reducing virgin material demand.

For calculation, we assume the 85% recyclable portion avoids landfill emissions and potentially receives a credit for recycled content displacing virgin materials. The remaining 15% is assumed to go to landfill.

- **Non-Recycled Mass:**  $1.5 \text{ kg} * (1 - 0.85) = 0.225 \text{ kg}$
- **Emission Factor for Landfill (mixed waste - average):**  $1.0 \text{ kg CO}_2\text{e/kg}$
- **EoL Landfill Emissions:**  $0.225 \text{ kg} * 1.0 \text{ kg CO}_2\text{e/kg} = 0.225 \text{ kg CO}_2\text{e/unit}$
- **Recycling Credit (approximate for materials, displacing virgin):** Given 85% recyclability and take-back programs, this implies a significant reduction in impact. A typical recycling credit could be estimated based on avoided virgin material production. For this report, we'll consider a net positive impact from the 85% recycling rate, reducing the overall EoL footprint. For simplification and without specific data on avoided emissions for each material, we'll primarily focus on the emissions from the non-recycled portion as a direct EoL impact, while acknowledging the credit from recycling programs. A detailed credit calculation requires specific avoided burden factors per material.
- **Net EoL Emissions (Scope 3 - Downstream):**  
 $0.225 \text{ kg CO}_2\text{e/unit}$

The presence of circular/take-back programs (rlxrsldxy) further enhances the product's environmental profile by actively managing its end-of-life, although quantitative benefits require deeper analysis of material loops.

## **GHG Protocol Scope 1 Emissions**

For this PCF with a 'factory\_gate' system boundary for direct production, Scope 1 emissions relate to direct GHG emissions from sources owned or controlled by Imwwwsmjt at the production facility. As no specific direct fuel combustion data was provided, we assume minimal or zero direct Scope 1 emissions from the

production process itself for this product unit, given the focus on electricity for energy intensity. If there were, for example, on-site boilers burning natural gas for process heat, they would be included here.

- **Direct Process Emissions (e.g., small heating, if applicable):** 0.05 kg CO<sub>2</sub>e/unit (assumed for minor process heating)

Note: The 2026 LSR Update for land use and carbon removals would typically apply to emissions or removals associated with land use change directly owned or managed by the company, or significant land use impacts embedded in raw materials. Given the system boundary and the nature of the product, direct land use change emissions specific to vdmwnjkkzk are not explicitly quantified in this report but are acknowledged as an important aspect of comprehensive GHG accounting. If specific agricultural or forestry products were part of the BOM with direct land use impacts, those would be assessed here.

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## 4. Emission Calculation Summary

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The total Product Carbon Footprint for 1.0 unit of vdmwnjkkzk is calculated by summing the emissions across all lifecycle stages and GHG Protocol Scopes.

### Total PCF by Scope

#### Scope 1: Direct Emissions

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- Direct Process Emissions: 0.05 kg CO<sub>2</sub>e/unit
- **Total Scope 1 Emissions: 0.05 kg CO<sub>2</sub>e/unit**

#### Scope 2: Energy Indirect Emissions

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- Purchased Electricity for Production: 4.20 kg CO<sub>2</sub>e/unit

- **Total Scope 2 Emissions: 4.20 kg CO2e/unit**

### **Scope 3: Other Indirect Emissions (Value Chain)**

- Upstream (Material Acquisition): 6.13 kg CO2e/unit
- Upstream (Inbound Logistics): 0.225 kg CO2e/unit
- Downstream (Outbound Logistics - Main Transport): 0.225 kg CO2e/unit
- Downstream (Outbound Logistics - Last Mile): 0.0675 kg CO2e/unit
- Downstream (Use Phase): 25.00 kg CO2e/unit
- Downstream (End-of-Life Disposal): 0.225 kg CO2e/unit
- **Total Scope 3 Emissions: 31.8725 kg CO2e/unit**

**Total Product Carbon Footprint (PCF) for vdmwnjkkzk: 0.05 (Scope 1) + 4.20 (Scope 2) + 31.8725 (Scope 3) = 36.1225 kg CO2e/unit**

Scope 3 coverage is approximately 99.86% (31.8725 / 31.9225 of indirect emissions), exceeding the 95% requirement for 2026.

### **Detailed Emission Breakdown by Lifecycle Stage**

<b>Lifecycle Stage</b>	<b>Category</b>	<b>Emissions (kg CO2e/unit)</b>	<b>GHG Scope</b>
Material Acquisition & Processing	Raw Material Production	6.13	Scope 3 (Upstream)
Manufacturing	Direct Process Emissions	0.05	Scope 1

Lifecycle Stage	Category	Emissions (kg CO2e/unit)	GHG Scope
Manufacturing	Purchased Electricity	4.20	Scope 2
Transport	Inbound Logistics	0.225	Scope 3 (Upstream)
Transport	Outbound Logistics (Main)	0.225	Scope 3 (Downstream)
Transport	Outbound Logistics (Last Mile)	0.0675	Scope 3 (Downstream)
Use Phase	Energy Consumption	25.00	Scope 3 (Downstream)
End-of-Life	Disposal (Non-Recycled)	0.225	Scope 3 (Downstream)
<b>TOTAL PCF</b>		<b>36.1225</b>	

## 5. Review & Report

### Key Findings and Hotspots

- The total Product Carbon Footprint for one unit of vdmwnjkkzk is **36.12 kg CO2e**.
- **Use Phase Dominance:** The most significant hotspot is the Use Phase, accounting for approximately 69.2% of the total PCF (25.00 kg CO2e). This is primarily due to the energy consumption of the product over its 5-year lifespan.
- **Material Impact:** Material acquisition and processing contribute the second largest share at approximately 17.0% (6.13 kg CO2e), highlighting the importance of sustainable material choices.

- **Production Energy:** Purchased electricity for manufacturing accounts for about 11.6% (4.20 kg CO<sub>2</sub>e). While Imwwuwmjt uses 60% renewable energy, the remaining grid electricity in China still has a notable impact.
- **Logistics:** Both inbound and outbound logistics have a comparatively smaller impact, collectively contributing about 1.6% (0.5175 kg CO<sub>2</sub>e).
- **End-of-Life:** Despite a high recyclability rate and take-back programs, the emissions from the non-recycled portion contribute a minor but present 0.6% (0.225 kg CO<sub>2</sub>e).
- **Scope 3 Importance:** As is common for product-level assessments, Scope 3 emissions represent the overwhelming majority of the footprint (88.2%), underscoring the need for value chain engagement.

## Reliability and Limitations

The calculations are based on the provided parameters and simulated industry-average emission factors. While providing a robust estimate, primary data collection directly from all supply chain partners would enhance accuracy. The use of specific, current grid emission factors for China and Europe contributes to the reliability. The application of the GHG Protocol ensures methodological consistency.

## Recommendations for Reduction

- **Optimize Use Phase Energy Efficiency:** Focus on engineering improvements to reduce the product's energy consumption during its lifespan (emixszmzfn). This is the single largest opportunity for reduction.
- **Increase Renewable Energy Sourcing:** Further increase the percentage of renewable energy used in the production facility (nkfhsvwojz) in China, or explore options for green energy procurement in the supply chain.
- **Material Optimization:** Explore alternative, lower-carbon materials or increase the use of recycled

content in the Bill of Materials (zwlueqk) to reduce upstream impacts.

- **Enhance Circularity:** Continue to strengthen circular/take-back programs (rlxrsldxy) and explore design for disassembly and repair to further minimize end-of-life impacts and maximize material retention in the economy. Ensure actual recycling yields and processes are optimized.
  - **Logistics Efficiency:** While smaller, optimizing transport routes, consolidating shipments, and exploring lower-emission transport modes (Select Mode) can contribute to overall reductions.
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