

carboncalcpcf.com

Product Carbon Footprint Analysis Report

Product: vmedujvrur

****Company Name:**** ejfnuyevjz

****Accounting Standard:**** GHG Protocol

****Senior Sustainability Consultant:****
vwymoqjudy

This report is generated based on available data and industry standards.
While every effort has been made to ensure accuracy, it serves as an
estimate of the product's carbon footprint.

Generated Date: May 24, 2026

Product Carbon Footprint (PCF) Analysis Report for vmedujvrur

Generated Date: May 24, 2026

Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product **vmedujvrur**, manufactured by **ejfnuyevjz**. The analysis, conducted by Senior Sustainability Consultant **vwymoqjudy**, adheres to the GHG Protocol, including the 2026 Land Sector and Removals (LSR) Standard and stringent Scope 3 compliance requirements. The total Cradle-to-Grave carbon footprint for one functional unit of vmedujvrur is estimated at **36.26 kgCO₂e**. The primary hotspots identified are the Use Phase (67.17%) due to energy consumption over the product's lifespan and the Upstream Materials (41.33%) for raw material extraction and processing. Significant efforts in renewable energy usage and circular economy programs contribute to mitigating the overall impact.

1. Methodology and Scope Definition

This analysis follows a comprehensive five-step methodology in accordance with the GHG Protocol, ensuring a robust and transparent assessment of the product's environmental impact.

1.1. Accounting Standard and Compliance

- **Accounting Standard:** GHG Protocol.
- **GHG Protocol Adherence:** Emissions are categorized into Scope 1 (direct emissions), Scope 2 (purchased energy emissions), and Scope 3 (value chain emissions).
- **2026 LSR Update:** The Land Sector and Removals (LSR) Standard has been considered for carbon removals and land use impacts, though direct land-use change emissions for this specific product are negligible within the specified boundaries.

- **Scope 3 Compliance:** All identified Scope 3 emission categories relevant to the product lifecycle have been assessed, ensuring at least 95% coverage as per 2026 requirements.

1.2. Functional Unit, System Boundaries, and Geographic Scope

- **Functional Unit:** 1.0 unit of vmedujvrur.
- **System Boundary:** Cradle-to-Grave. While the initial parameter specified 'factory_gate', the project requirements explicitly mandated the inclusion of 'Use Phase' and 'End-of-Life' scenarios, necessitating an expanded Cradle-to-Grave scope for a complete product lifecycle assessment.
- **Geographic Scope:** Final Production Country: China. Supply Chain Focus: Europe Focused (implying material sourcing, inbound logistics to China, and outbound logistics to European markets).
- **Allocation:** Emissions are directly attributed to the functional unit. Recycling benefits are accounted for using the avoided burden approach for material recovery.

2. Lifecycle Inventory (LCI) & Data Collection

The lifecycle of vmedujvrur is mapped across five key stages: Materials, Production, Transport, Use, and End-of-Life. Data was collected using a combination of primary (provided parameters) and secondary (industry-standard emission factors) sources.

2.1. Detailed Bill of Materials (BOM) - Upstream Materials (Scope 3)

The following detailed Bill of Materials (BOM) was used for high-accuracy material impact calculation. Emission factors are representative of industry averages for primary production processes.

ID	Description	Category	Process	Quantity	Unit	Emission Factor (kgCO2e/ Unit or kg)	Total Carbon (kgCO2e)
M001	Aluminum Alloy Sheet	Metal	Rolling	0.8	kg	6.5	5.20
M002	ABS Plastic Pellets	Polymer	Injection Molding	0.4	kg	2.8	1.12
M003	Copper Wire	Metal	Drawing	0.1	kg	4.2	0.42
M004	Printed Circuit Board (PCB)	Electronics	Assembly	0.05	unit	25.0	1.25
M005	Lithium-ion Battery	Energy Storage	Manufacturing	0.2	unit	35.0	7.00
Total Material Emissions (kgCO2e):							14.99

2.2. Production Phase Energy Inputs (Scope 2)

The energy consumption during the production phase in China significantly influences the footprint.

- **Energy Intensity (kWh/unit):** 7.5 kWh/unit
- **Renewable Energy Usage:** 60%
- **Non-renewable energy:** $7.5 \text{ kWh/unit} * (1 - 0.60) = 3.0 \text{ kWh/unit}$
- **Average Grid Electricity Emission Factor (China):** 0.58 kgCO2e/kWh (Based on IEA and MEE data for 2021, ranging from 0.5568 to 0.6093 kgCO2/kWh).

2.3. Transport Logistics (Scope 3)

Transportation impacts cover both inbound logistics (implied for raw materials) and outbound logistics (finished product delivery).

- **Total Product Weight (estimated for transport):** 1.6 kg (sum of material quantities and assumed weights for PCB and battery)
- **Primary Transport Mode:** Ocean Freight and Road Freight (from China to Europe)
- **Primary Transport Distance:** 15,000 km (Ocean), 500 km (Road)
- **Ocean Freight Emission Factor:** 0.016 kgCO2e/tonne-km

- **Road Freight Emission Factor (Heavy Truck):** 0.10 kgCO₂e/tonne-km
- **Last-Mile Delivery Channel:** Parcel Van Delivery
- **Last-Mile Delivery Distance (assumed):** 50 km
- **Parcel Van Delivery Emission Factor:** 0.25 kgCO₂e/km (per vehicle-km, assuming shared load and a per-unit allocation of 0.0025 kgCO₂e/package-km over 50km distance, based on industry averages)

2.4. Use Phase Data (Scope 3)

The product's energy consumption during its active use contributes significantly to its overall footprint.

- **Product Lifespan:** 7 years
- **Energy Consumption in Use:** 12 kWh/year
- **Total Energy Consumption over Lifespan:** 12 kWh/year * 7 years = 84 kWh
- **Average Grid Electricity Emission Factor (Europe - for use phase):** 0.29 kgCO₂e/kWh (Based on EU-27 average, considering variations across member states)

2.5. End-of-Life (EoL) Scenarios (Scope 3)

End-of-Life impacts reflect circular economy initiatives and waste management.

- **Recyclability Percentage:** 85%
 - **Circular/Take-back Programs:** Yes, with material recovery and refurbishment initiatives, leading to high-value material recovery.
 - **Material Mass for EoL (estimated):** 1.6 kg
 - **Recycled Portion:** 1.6 kg * 0.85 = 1.36 kg
 - **Disposed Portion:** 1.6 kg * 0.15 = 0.24 kg
 - **Avoided Emissions Factor for Recycling:** A credit of 4.0 kgCO₂e/kg is applied for recycled material, representing avoided primary production emissions.
 - **Disposal Emission Factor (Landfill/Incineration):** 0.1 kgCO₂e/kg (for mixed waste disposal, reflecting fossil carbon emissions)
-

3. Calculation of Emissions (CO2e)

Emissions are calculated using the formula: Activity Data × Emission Factor = CO2e, and categorized according to the GHG Protocol Scopes.

3.1. Scope 1 Emissions

For this Product Carbon Footprint (PCF) analysis, direct emissions (Scope 1) from the manufacturing facility are assumed to be 0 kgCO2e, as the company ejfnuyevjz is presumed to utilize contract manufacturers and not directly operate the production plant for vmedujvrur.

Emission Category	Activity Data	Emission Factor	Total CO2e (kg)	GHG Scope
Direct Operations (e.g., combustion on-site)	N/A	N/A	0.00	Scope 1

3.2. Scope 2 Emissions: Purchased Energy

Emissions from purchased electricity for the manufacturing process.

Emission Category	Activity Data	Emission Factor	Total CO2e (kg)	GHG Scope
Electricity for Production (non-renewable share)	3.0 kWh/unit	0.58 kgCO2e/kWh	1.74	Scope 2

3.3. Scope 3 Emissions: Value Chain

This section details the most significant portion of the product's carbon footprint, encompassing upstream and downstream activities.

Emission Category	Activity Data	Emission Factor	Total CO2e (kg)	GHG Scope (Category)
Upstream Emissions				
			14.99	
Total Scope 3 Emissions (kgCO2e):				34.523

Emission Category	Activity Data	Emission Factor	Total CO2e (kg)	GHG Scope (Category)
Materials (from BOM)	Varied (kg/unit)	Varied (kgCO2e/kg or unit)		Scope 3 (Category 1: Purchased Goods & Services)
Ocean Freight (Outbound)	0.0016 tonnes * 15000 km	0.016 kgCO2e/tonne-km	0.384	Scope 3 (Category 4: Upstream Transportation & Distribution)
Road Freight (Outbound)	0.0016 tonnes * 500 km	0.10 kgCO2e/tonne-km	0.080	Scope 3 (Category 4: Upstream Transportation & Distribution)
Downstream Emissions				
Last-Mile Delivery (Parcel Van)	50 km	0.0025 kgCO2e/package-km (allocated from 0.25 kgCO2e/km)	0.125	Scope 3 (Category 9: Downstream Transportation & Distribution)
Product Use Phase (Electricity)	84 kWh	0.29 kgCO2e/kWh	24.36	Scope 3 (Category 11: Use of Sold Products)
End-of-Life (Recycling Credit)	1.36 kg (recycled)	-4.0 kgCO2e/kg (avoided emissions)	-5.44	Scope 3 (Category 12: End-of-Life Treatment of Sold Products)
End-of-Life (Disposal Emissions)	0.24 kg (disposed)	0.1 kgCO2e/kg	0.024	Scope 3 (Category 12: End-of-Life Treatment of Sold Products)
Total Scope 3 Emissions (kgCO2e):				34.523

3.4. Summary of Product Carbon Footprint by GHG Scope

GHG Scope	Total CO2e (kg)	Percentage of Total PCF
Scope 1	0.00	0.00%
Scope 2	1.74	4.80%
Scope 3	34.523	95.20%
Total Product Carbon Footprint (PCF)	36.263	100.00%

Note on Scope 3 Coverage: The calculated Scope 3 emissions account for 95.20% of the total PCF, meeting the 95% coverage requirement for 2026.

4. Review & Report: Hotspots and Reliability

4.1. Emission Hotspots

The analysis reveals the following major emission hotspots for vmedujvrur:

- **Use Phase (24.36 kgCO2e / 67.17%):** The most significant contributor to the PCF is the energy consumption during the product's 7-year lifespan. This highlights the importance of energy efficiency in product design and user behavior.
- **Upstream Materials (14.99 kgCO2e / 41.33%):** The extraction and processing of raw materials, particularly the lithium-ion battery and aluminum, are substantial contributors.
- **Production Energy (1.74 kgCO2e / 4.80%):** While considerable, the 60% renewable energy usage significantly mitigates emissions in this phase.
- **End-of-Life (EoL) (-5.416 kgCO2e / -14.94%):** Circular economy initiatives, specifically the high recyclability and take-back programs, provide a notable net carbon credit, demonstrating the positive impact of these strategies.
- **Transport (0.589 kgCO2e / 1.62%):** Transportation, while a necessary component, represents a smaller percentage of the total PCF compared to use and materials.

4.2. Data Reliability and Assumptions

The calculations are based on a combination of specific operational data provided and industry-standard emission factors from reputable sources such as Ecoinvent and DEFRA.

- Specific parameters for BOM, energy usage, transport distances, product lifespan, and recyclability were directly incorporated.
- Emission factors for grid electricity, freight modes, and waste treatment are based on published averages for the specified regions and modes.
- Assumptions were made regarding average payload for last-mile delivery allocation and the avoided emissions factor for recycled materials to quantify circular economy benefits. These assumptions are grounded in general industry practice but could be refined with more granular, product-specific primary data.

5. Key Findings and Recommendations

5.1. Key Findings

- The total Cradle-to-Grave PCF for vmedujvrur is **36.26 kgCO₂e** per functional unit.
- The Use Phase and Upstream Materials are the dominant emission contributors.
- High renewable energy usage (60%) in production and robust circular economy programs (85% recyclability) significantly reduce the overall footprint.
- Scope 3 emissions account for over 95% of the total PCF, emphasizing the importance of a comprehensive value chain approach.

5.2. Recommendations for Emission Reduction

- **Enhance Use Phase Efficiency:** Focus on improving the energy efficiency of vmedujvrur during its operational lifespan. Explore low-power modes, smarter energy management features, or alternative energy sources for users.
- **Sustainable Material Sourcing:** Invest in materials with lower embodied carbon, such as recycled content, bio-based alternatives, or materials produced with renewable energy. Collaborate with

suppliers to reduce their footprint (e.g., through greener manufacturing processes).

- **Increase Renewable Energy in Production:** While 60% is commendable, further increasing the share of renewable energy at manufacturing facilities can directly reduce Scope 2 emissions.
 - **Optimize Logistics:** Continuously evaluate and optimize transport routes and modes to reduce distances and utilize lower-emission options (e.g., rail over road where feasible, or electric/biofuel vehicles).
 - **Strengthen Circularity:** Continue to invest in and expand take-back and refurbishment programs. Explore design-for-disassembly and modular design to facilitate even higher recycling rates and component reuse.
-
-