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Product Carbon Footprint Analysis Report

for nzlvrgzdwn

Company Name: usyerspylo

Senior Sustainability Consultant: khnlxehkzv

Accounting Standard: GHG Protocol

This report is generated based on available data and industry standards. While every effort has been made to ensure accuracy, the actual environmental impacts may vary depending on real-world conditions and specific supplier data.

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Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product **nzlvrgzdwn**, manufactured by **usyerspylo**. The analysis, conducted by Senior Sustainability Consultant **khnlxehkzv**, adheres to the Greenhouse Gas (GHG) Protocol standards, incorporating the latest 2026 updates, including the Land Sector and Removals (LSR) Standard and stringent Scope 3 coverage requirements. The total estimated carbon footprint for **nzlvrgzdwn** across its lifecycle, from raw material extraction to end-of-life, is approximately **54.59 kg CO2e** per functional unit. Key hotspots identified include the product\'s use phase due to energy consumption and the impact of raw materials.

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1. Define Scope

This section outlines the foundational parameters for the Product Carbon Footprint (PCF) analysis of **nzlvrgzdwn**, ensuring consistency and clarity in the assessment.

- **Functional Unit:** 1.0 unit of nzlvrgzdwn.
- **System Boundary:** factory_gate. This boundary strictly encompasses all emissions from raw material acquisition, manufacturing, and transport up to the point the finished product leaves the factory gate. However, as per specific requirements, downstream Scope 3 emissions (Use Phase

and End-of-Life) are also calculated and reported separately to reflect broader circular economy impacts and provide a comprehensive lifecycle perspective, even though they technically fall outside the strict factory_gate boundary.

- **Geographic Scope:** Final Production Country: China. Supply Chain Focus: Europe Focused. This implies that raw materials and components are primarily sourced from Europe and transported to China for final assembly.
- **Accounting Standard:** GHG Protocol Product Life Cycle Accounting and Reporting Standard. This analysis strictly adheres to the GHG Protocol\'s methodologies for categorizing and quantifying greenhouse gas emissions.
- **Allocation:** All emissions are allocated directly to the functional unit of nzlvrgzdwn, assuming no co-products or by-products requiring complex allocation rules.

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2. Map Lifecycle & 3. Collect Data

The lifecycle of **nzlvrgzdwn** is mapped across several stages, and relevant primary and secondary data points have been collected for emission calculations.

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

The provided Detailed Bill of Materials (BOM), referred to as `koeufxqw`, is critical for a high-accuracy material impact calculation. The BOM data is interpreted as follows:

ID	Description	Category	Process	Quantity	Unit	Emission Factor (kg CO2e/ Unit)	Tota Carl (kg CO2
1	Aluminum Casing	Metal	Casting	0.5	kg	7.5	3.75

ID	Description	Category	Process	Quantity	Unit	Emission Factor (kg CO2e/ Unit)	Tota Carb (kg CO2
2	Plastic Enclosure	Plastic	Injection Molding	0.3	kg	3.2	0.96
3	Circuit Board	Electronics	Assembly	0.1	unit	15.0	1.50
4	Copper Wiring	Metal	Extrusion	0.05	kg	4.0	0.20

Total Material Footprint: 6.41 kg CO2e

2.2. Production Energy Inputs (Scope 2)

Energy consumption during the production phase in China is a key factor.

- **Energy Intensity (kWh/unit):** 10 kWh/unit
- **Renewable Energy Usage:** 75%
- **Non-renewable energy consumption:** 2.5 kWh/unit (10 kWh * (1 - 0.75))
- **Emission Factor for Chinese grid electricity (non-renewable portion):** 0.58 kg CO2e/kWh. This factor is based on various recent data for China\'s power sector emissions intensity, which typically ranges from 0.53 to 0.68 kgCO2e/kWh depending on the year and methodology.

Production Energy Footprint (Scope 2): 1.45 kg CO2e

2.3. Logistics Data (Scope 3, Categories 4 & 9)

Transportation of materials to the factory (upstream) and delivery to the customer (downstream) are included.

- **Total BOM Weight (for transport calculation):** 0.95 kg (0.00095 tonnes)
- **Upstream Transport Mode:** Road freight (heavy goods vehicle)
- **Upstream Transport Distance (Europe to China):** 2500 km
- **Upstream Transport Emission Factor (HGV):** 0.08 kg CO2e/tkm. This is an illustrative factor for road freight, acknowledging that specific vehicle types and load factors would refine this.
- **Last-Mile Delivery Channel:** Commercial Van Delivery
- **Last-Mile Delivery Distance:** 50 km
- **Last-Mile Delivery Emission Factor (Van):** 0.25 kg CO2e/km. This is a representative factor for a commercial delivery van. For per-unit calculation, an assumption of 10 units per van trip is used.

Upstream Transport Footprint: 0.19 kg CO2e

Downstream Last-Mile Delivery Footprint: 1.25 kg CO2e

2.4. Use Phase Data (Scope 3, Category 11)

The energy consumed during the product\'s lifespan is a significant component of its footprint.

- **Product Lifespan:** 5 years
- **Energy Consumption in Use:** 20 kWh/year
- **Total energy over lifespan:** 100 kWh

- **Emission Factor for user electricity (global average):** 0.45 kg CO2e/kWh. This assumes a global average grid mix for the user\'s electricity consumption.

Use Phase Footprint: 45.0 kg CO2e

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

Impacts at the end of the product\'s life are considered to reflect circular economy principles.

- **Recyclability Percentage:** 80%
- **Non-recycled portion:** 0.19 kg (20% of 0.95 kg total product weight)
- **Circular/Take-back Programs:** Yes, company-run take-back program for material recovery and recycling.
- **Emission Factor for non-recycled disposal (landfill/incineration, illustrative):** 1.5 kg CO2e/kg. This is a representative factor for the disposal of mixed waste.

End-of-Life Footprint: 0.285 kg CO2e

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4. Calculate Emissions

Emissions are calculated by multiplying activity data by relevant emission factors. The results are categorized according to the GHG Protocol. Illustrative emission factors are used where specific, verifiable data from Ecoinvent/DEFRA was not directly accessible, with the understanding that precise, database-linked factors would be utilized in a full external audit.

4.1. GHG Protocol Categorization

- **Scope 1 (Direct Emissions):** No direct combustion emissions from company-owned or controlled sources at the manufacturing facility have been identified or

provided for this specific product\'s production process. If any existed (e.g., fuel for boilers), they would be reported here. For this PCF, Scope 1 emissions are assumed to be negligible or indirect through purchased electricity.

- **Scope 2 (Energy Indirect Emissions):** Emissions from the generation of purchased electricity consumed by **usyerspylo** for manufacturing **nzlvrgzdwn**.
- **Scope 3 (Other Indirect Emissions - Value Chain):** Covers emissions from upstream (materials, component transport) and downstream (product transport, use phase, end-of-life) activities not owned or controlled by **usyerspylo**.

4.2. Emission Calculation Summary

Lifecycle Stage	GHG Scope	Calculated Emissions (kg CO2e)
Materials Acquisition & Pre-processing	Scope 3 (Category 1: Purchased goods and services)	6.41
Production (Purchased Electricity)	Scope 2	1.45
Upstream Transportation (Components to Factory)	Scope 3 (Category 4: Upstream transportation and distribution)	0.19
Downstream Transportation (Last-Mile Delivery)	Scope 3 (Category 9: Downstream transportation and distribution)	1.25
Use Phase	Scope 3 (Category 11: Use of sold products)	45.00
End-of-Life Treatment	Scope 3 (Category 12: End-of-life treatment of sold products)	0.285

Lifecycle Stage	GHG Scope	Calculated Emissions (kg CO2e)
TOTAL PRODUCT CARBON FOOTPRINT		**54.585**

Overall Total Product Carbon Footprint for nzlvrgzdwn: 54.59 kg CO2e per unit

4.3. Emissions by Scope

GHG Scope	Emissions (kg CO2e)	Percentage of Total PCF
Scope 1	0.00	0.00%
Scope 2	1.45	2.66%
Scope 3	53.135	97.34%
Total	**54.585**	**100.00%**

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5. Review & Report

5.1. Hotspot Identification

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

- **Use Phase (45.00 kg CO2e - 82.44% of total):** The energy consumed by the product during its 5-year lifespan is by far the most significant contributor to its carbon footprint. This highlights the importance of energy efficiency in product design and user behavior for reducing overall impact.
- **Materials Acquisition (6.41 kg CO2e - 11.74% of total):** The production of raw materials, especially aluminum and the circuit board, represents a substantial portion of the upstream emissions.

- **Downstream Transportation (Last-Mile) (1.25 kg CO2e - 2.29% of total):** While smaller than the use phase, this is a notable downstream impact.

5.2. Reliability and Data Quality

This analysis utilizes a mix of specific operational data (e.g., energy intensity, renewable usage, BOM-derived total carbon) and illustrative industry-average emission factors where specific supplier or country-specific data was not provided. The reliability of the PCF is enhanced by using the provided detailed BOM and customizing energy and logistics parameters. For future iterations, incorporating more primary data from suppliers, especially for upstream material processes and detailed transport routes, would further improve accuracy.

GHG Protocol Compliance and 2026 Updates

This Product Carbon Footprint analysis for **nzlvrgzdwn** adheres to the Greenhouse Gas (GHG) Protocol Product Life Cycle Accounting and Reporting Standard. Key aspects of compliance and incorporation of the latest 2026 updates are detailed below:

- **Categorization into Scope 1, Scope 2, and Scope 3:** Emissions are distinctly categorized to provide transparency and alignment with the GHG Protocol\'s framework. Scope 1 (direct), Scope 2 (purchased electricity), and Scope 3 (value chain) emissions are identified and quantified where applicable.
- **2026 Land Sector and Removals (LSR) Standard Update:** The GHG Protocol released its Land Sector and Removals (LSR) Standard v1.0 on January 30, 2026, which becomes effective January 1, 2027. This standard provides requirements for accounting for land-based GHG emissions and carbon dioxide removals. While the product

nzlvrgzdwn\'s Bill of Materials (BOM) does not directly indicate significant land-based or bio-based material components whose carbon impacts would be extensively governed by the LSR Standard, **usyerspylo** acknowledges the importance of this standard. Future analyses of products with relevant agricultural or land-use inputs will incorporate the LSR Standard fully. The accompanying LSR Guidance is expected in Q2 2026 to provide further implementation details.

- **Scope 3 Compliance (95% Coverage):** In line with the GHG Protocol\'s March 2026 progress update on Scope 3 Standard revisions, this report aims for at least 95% coverage for required Scope 3 emissions. The analysis for **nzlvrgzdwn** comprehensively covers major Scope 3 categories: purchased goods and services (materials), upstream and downstream transportation, the use of sold products, and their end-of-life treatment. These categories typically represent the most material Scope 3 emissions for manufactured products, thereby ensuring a high level of coverage. Any exclusions are considered minor and fall well within the proposed 5% threshold. Future reporting will further disaggregate Scope 3 emissions by data type to enhance transparency and comparability as per 2026 requirements.

Conclusion and Recommendations

The Product Carbon Footprint for **nzlvrgzdwn** stands at approximately 54.59 kg CO2e per unit. The use phase is the dominant contributor, followed by material acquisition.

Recommendations:

1. **Enhance Use Phase Efficiency:** Focus on R&D to significantly reduce the product\'s energy consumption during its use phase. This could involve more energy-efficient components, smart power management features, or alternative power sources.

2. **Optimize Material Sourcing and Design:** Investigate lower-carbon alternatives for high-impact materials like aluminum and plastics. Explore design for disassembly and material efficiency to reduce overall material input. Engage with suppliers to obtain primary, verified emission data for materials.
3. **Strengthen Circular Economy Initiatives:** Expand and promote the existing company-run take-back programs to maximize material recovery and recycling rates beyond the current 80%, potentially exploring closed-loop systems.
4. **Refine Logistics:** Explore more carbon-efficient transport modes or optimize logistics networks, especially for last-mile delivery, to reduce emissions from transportation.
5. **Continue Data Improvement:** Systematically collect more primary data across the value chain, particularly from suppliers, to enhance the accuracy and robustness of future PCF analyses. This aligns with the GHG Protocol\'s emphasis on data quality and disaggregation.