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Product Carbon Footprint Analysis Report

Product Name: owspitdgdp

Company Name: vgmrlsmttj

Protocol Data (Accounting Standard): GHG Protocol

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Generated Date: May 24, 2026

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Executive Summary

This report provides a high-detail Product Carbon Footprint (PCF) analysis for the product **owspitdgdp**, manufactured by **vgmrlsmttj**. The analysis adheres to the GHG Protocol accounting standard, incorporating the 2026 Land Sector and Removals (LSR) Standard update and ensuring over 95% Scope 3 coverage. The assessment covers the product\'s lifecycle from raw material acquisition and processing to end-of-life, with a system boundary set at \'factory-gate\' for primary production assessment and considering downstream impacts. The total carbon footprint for one functional unit of owspitdgdp is detailed across various lifecycle stages, identifying key emission hotspots and informing strategies for carbon reduction.

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1. Methodology and Scope Definition

The Product Carbon Footprint (PCF) analysis for owspitdgdp follows the five-step methodology recommended by the GHG Protocol Product Standard:

1. **Define Scope:** Establish the functional unit, system

3. **Collect Data:** Gather primary and secondary activity data and corresponding emission factors.
4. **Calculate Emissions:** Quantify greenhouse gas emissions for each stage using the formula: Activity Data × Emission Factor = CO2e.
5. **Review & Report:** Analyze results, identify hotspots, assess data reliability, and report findings.

1.1. Defined Scope Parameters

- **Functional Unit:** 1.0 unit of owspitdgdp
- **System Boundary:** Cradle-to-grave, with primary assessment focused on \'factory_gate\' for production, extended to include transport, use, and end-of-life.
- **Geographic Scope:** Final Production Country: China, Supply Chain Focus: Europe Focused for raw material sourcing.
- **Accounting Standard:** GHG Protocol Product Standard. Emissions are categorized into Scope 1 (direct), Scope 2 (purchased energy), and Scope 3 (value chain).
- **Allocation:** Emissions are allocated based on mass for raw materials and energy consumption per functional unit.

GHG Protocol Adherence: This report strictly adheres to the GHG Protocol, categorizing emissions into Scope 1 (direct emissions from owned or controlled sources), Scope 2 (indirect emissions from the generation of purchased electricity, steam, heating, and cooling), and Scope 3 (all other indirect emissions that occur in the value chain of the reporting company, both upstream and downstream).

2026 LSR Update: The Land Sector and Removals (LSR) Standard for land use and carbon removals has been applied where relevant. This includes accounting for land-use change impacts associated with raw material production and potential carbon removals through circular economy

with the stringent 2026 requirements of the GHG Protocol, capturing significant upstream and downstream impacts.

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2. Lifecycle Mapping and Data Collection

The lifecycle of owspitdgdp is mapped through key stages:

- **Materials Acquisition & Processing:** Extraction, processing, and manufacturing of raw materials.
- **Production/Manufacturing:** Assembly and fabrication at **vgmrlsmttj\'s** facility in China.
- **Transport:** Inbound logistics of materials (Europe to China) and outbound logistics of finished products (China to Europe, including last-mile).
- **Use Phase:** Energy consumption during the product\'s operational lifespan.
- **End-of-Life:** Disposal, recycling, and recovery processes.

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

The following table details the Bill of Materials (BOM) for owspitdgdp, including material type, quantity, and its associated carbon impact. These values are used directly for calculating the upstream material footprint.

ID	Description	Category	Process	Quantity	Unit	Emission Factor (kgCO2e/unit)	Total Carbon (kgCO2e)

2.2. Energy Inputs (Production Phase) -

- **Effective Grid Emission Factor (China):** The national grid electricity emission factor for China is approximately 0.58 kg CO2e/kWh. With 60% renewable energy usage, the effective emission factor for vgmrlsmttj\'s purchased electricity for production is reduced.

2.3. Transport Data - (Scope 3, Category 4 & 9)

- **Inbound Material Transport (Europe to China):**
  - Estimated Distance: 10,000 km (Ocean Freight) + 500 km (Road Freight in Europe/China)
  - Transport Mode: Ocean Freight (container ship) and Road Freight (heavy duty truck)
  - Assumed Average Material Mass for Transport: 3.65 kg per unit of owspitdgdp (based on total BOM mass)
- **Outbound Product Transport (China to Europe Distribution Hub):**
  - Transport Mode: Ocean Freight (Primary) and Road Freight (Secondary)
  - Transport Distance: 8000 km (Ocean) + 500 km (Road)
- **Last-Mile Delivery Channel:** Road Freight (Light Commercial Vehicle)
- **Estimated Last-Mile Distance:** 50 km (average from distribution hub to customer)

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

- **Product Lifespan:** 5 years
- **Energy Consumption in Use:** 20 kWh/year (Total: 100 kWh over 5 years)
- **Electricity Grid Mix (Global Average for Use Phase):** A common industry estimate of 0.4 kg CO2e/kWh is used for the use phase, where specific regional grid data for consumer use is not explicitly defined

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

- **Recyclability Percentage:** 70%
- **Circular/Take-back Programs:** vgmrlsmttj operates a take-back program for end-of-life products, facilitating material recovery and refurbishment.

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3. Calculation of Emissions (CO2e)

Emissions are calculated using the activity data collected and appropriate emission factors. All results are presented in kilograms of CO2 equivalent (kg CO2e) per functional unit (1.0 unit of owspitdgdp).

3.1. Total Product Mass Calculation

Based on the BOM, the total mass of raw materials for one unit of owspitdgdp is 3.65 kg.

3.2. Material Acquisition & Processing (Scope 3, Category 1)

Total carbon from raw materials is directly taken from the \'Total Carbon\' field in the BOM for each item. This sum represents the cradle-to-gate impact of materials.

Component	Category	Total Carbon (kgCO2e)
Total Material Impact (kgCO2e):		

3.3. Production/Manufacturing (Scope 2)

Calculation for purchased electricity at the factory gate:

- Effective EF = 0.58 kg CO2e/kWh * (1 - 0.60) = 0.232 kg CO2e/kWh
- **Production Energy Emissions = 15 kWh/unit * 0.232 kg CO2e/kWh = 3.48 kg CO2e**

3.4. Transport Emissions (Scope 3, Category 4 & 9)

For transport calculations, we assume the total mass of the finished product for outbound logistics is 3.65 kg (based on BOM total mass) and the total mass of inbound materials is also 3.65 kg.

- **Inbound Material Transport (Europe to China):**
  - Ocean Freight: 3.65 kg * (1 tonne / 1000 kg) * 10000 km * 0.016 kg CO2e/tonne-km = 0.584 kg CO2e
  - Road Freight (within Europe/China): 3.65 kg * (1 tonne / 1000 kg) * 500 km * 0.1 kg CO2e/tonne-km = 0.1825 kg CO2e (Common industry estimate for heavy freight)
  - **Total Inbound Transport Emissions = 0.584 + 0.1825 = 0.7665 kg CO2e**
- **Outbound Product Transport (China to Europe Distribution Hub):**
  - Ocean Freight: 3.65 kg * (1 tonne / 1000 kg) * 8000 km * 0.016 kg CO2e/tonne-km = 0.4672 kg CO2e
  - Road Freight (Secondary): 3.65 kg * (1 tonne / 1000 kg) * 500 km * 0.1 kg CO2e/tonne-km = 0.1825 kg CO2e (Common industry estimate for heavy freight)
  - **Total Outbound Primary Transport Emissions = 0.4672 + 0.1825 = 0.6497 kg CO2e**
- **Last-Mile Delivery (Road Freight - Light Commercial Vehicle):**
  - Distance: 50 km
  - Emission Factor: 0.15 kg CO2e/vehicle-km

- **Total Transport Emissions = 0.7665 + 0.6497 + 7.5 = 8.9162 kg CO2e**

3.5. Use Phase Emissions (Scope 3, Category 11)

- Total Energy Consumption: 100 kWh (20 kWh/year * 5 years)
- Global Average Grid EF (Use Phase): 0.4 kg CO2e/kWh (Common industry estimate where specific regional use is not defined or is distributed)
- **Use Phase Emissions = 100 kWh * 0.4 kg CO2e/kWh = 40.0 kg CO2e**

3.6. End-of-Life (EoL) Emissions (Scope 3, Category 12)

The impact of end-of-life is calculated based on the portion of the product that is not recycled and goes to landfill. The circular/take-back programs and recyclability significantly reduce the overall EoL burden.

- Total Product Mass: 3.65 kg
- Recyclability Percentage: 70%
- Non-recycled Waste: 3.65 kg * (1 - 0.70) = 1.095 kg
- Landfill Emission Factor (Mixed Waste): 0.3 kg CO2e/kg
- **End-of-Life Emissions = 1.095 kg * 0.3 kg CO2e/kg = 0.3285 kg CO2e**

3.7. Summary of Product Carbon Footprint (PCF) for owspitdgdp

The total carbon footprint for one functional unit of owspitdgdp is summarized below:

Lifecycle Stage	GHG Scope	Emissions (kg CO2e)
Material Acquisition & Processing	Scope 3 (Category 1)	
Production/Manufacturing (Energy)	Scope 2	3.4800
Transport (Inbound Materials)	Scope 3 (Category 4)	0.7665
Transport (Outbound Product Primary)	Scope 3 (Category 9)	0.6497
Transport (Last-Mile Delivery)	Scope 3 (Category 9)	7.5000
Use Phase	Scope 3 (Category 11)	40.0000
End-of-Life	Scope 3 (Category 12)	0.3285
Total Product Carbon Footprint (kg CO2e):		

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4. Review and Reporting

4.1. Hotspot Analysis

The primary emission hotspots for owspitdgdp are identified as:

- **Use Phase:** With 40.0 kg CO2e, the energy consumption during the product\'s 5-year lifespan is the largest contributor to the overall footprint. This

transport emissions, underscoring the impact of localized logistics.
- **Material Acquisition & Processing:** The raw materials contribute substantially, especially materials with high embodied carbon (e.g., electronics, certain metals), as indicated by the \'Total Carbon\' values in the BOM.

4.2. Reliability and Limitations

This PCF analysis provides a robust estimate based on the provided parameters and industry-standard emission factors. Key considerations for reliability include:

- **Data Quality:** While primary data for BOM and energy consumption are directly used, secondary emission factors are based on recognized databases and represent averages which may not perfectly reflect specific supplier processes.
- **Assumptions:** Assumptions made for average transport distances (especially for inbound materials) and specific transport modes (e.g., ocean freight routes from Europe to China), and the generic nature of some EoL emission factors, can influence the overall footprint.
- **Dynamic Factors:** The carbon footprint can change with shifts in energy grids, material sourcing, manufacturing efficiencies, and transport logistics over time.

4.3. Recommendations for Carbon Reduction

- **Improve Energy Efficiency in Use Phase:** Investigate opportunities to reduce the product\'s energy consumption during its operational life through design optimization, hardware advancements, and software efficiencies.
- **Optimize Logistics:** Explore more efficient last-mile

inbound materials and outbound products to reduce reliance on higher-emission options.

- **Material Circularity:** Continue to strengthen circular programs (e.g., take-back) and explore design for disassembly and material selection to maximize recyclability and incorporate recycled content, aligning with the 70% recyclability target and the Land Sector and Removals Standard.
- **Supplier Engagement:** Engage with material suppliers to understand and reduce the embodied carbon of key components, encouraging renewable energy adoption in their processes and exploring low-carbon alternatives.
