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Product Carbon Footprint Analysis

okhemzeqyn

Company Name: tppsvmkzjr

Protocol Data (Accounting Standard): GHG
Protocol

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Disclaimer: 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 specific operational conditions and data availability.

Product Carbon Footprint Analysis for okhemzeqyn

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Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product okhemzeqyn, manufactured by tppsvmkzjr. The analysis was conducted by dzvisdqwx, a Senior Sustainability Consultant specializing in GHG Protocol, to quantify the greenhouse gas (GHG) emissions across the product's lifecycle. Adhering strictly to the GHG Protocol's methodologies, including the 2026 Land Sector and Removals (LSR) Standard update and the 95% Scope 3 coverage requirements, this report identifies emission hotspots and provides a robust baseline for future decarbonization strategies. The total estimated Product Carbon Footprint for one functional unit of okhemzeqyn is calculated to be 60.47 kg CO₂e.

1. Methodology and Accounting Standard

The Product Carbon Footprint (PCF) analysis for okhemzeqyn follows the comprehensive framework of the **GHG Protocol Product Life Cycle Accounting and Reporting Standard**. This standard provides a robust methodology for quantifying and reporting GHG emissions associated with products across their entire lifecycle.

1.1 GHG Protocol Adherence

Emissions are categorized into three scopes as defined by the GHG Protocol:

- **Scope 1 (Direct Emissions):** Emissions from sources owned or controlled by the reporting company. For a product-level analysis with a 'factory_gate' boundary, direct operational emissions within the factory are typically integrated into the manufacturing process emissions.
- **Scope 2 (Purchased Energy Emissions):** Indirect emissions from the generation of purchased electricity, steam, heating, or cooling consumed by the reporting company.
- **Scope 3 (Value Chain Emissions):** All other indirect emissions that occur in the value chain of the reporting company, both upstream and downstream. These often represent the majority of a product's carbon footprint and are critical for a comprehensive assessment.

1.2 2026 Land Sector and Removals (LSR) Standard Update

This analysis considers the principles of the GHG Protocol's Land Sector and Removals (LSR) Standard, released on January 30, 2026, and effective January 1, 2027. The LSR Standard provides requirements and guidance for accounting and reporting GHG emissions and CO₂ removals from agricultural and land use activities, as well as technological CO₂ removals. While the primary focus of this product's lifecycle (okhemzeqyn) is on manufactured goods and energy, the LSR principles are acknowledged, particularly in the context of raw material sourcing where land use changes or biogenic carbon flows might be relevant for other product categories.

1.3 Scope 3 Compliance (95% Coverage)

In line with the proposed 2026 GHG Protocol Scope 3 Standard revisions, this report aims to achieve at least 95% coverage of total required Scope 3 emissions. This includes rigorous data collection and calculation across significant upstream and downstream value

chain categories to ensure a comprehensive and transparent inventory.

1.4 Methodology Steps

1. **Define Scope:** Establish the functional unit, system boundaries, geographic scope, and allocation rules.
 2. **Map Lifecycle:** Identify all relevant lifecycle stages and associated processes (LCI inventory stages).
 3. **Collect Data:** Gather primary activity data and supplement with secondary data from industry-standard emission factor databases.
 4. **Calculate Emissions:** Apply appropriate emission factors to activity data to quantify GHG emissions in CO₂e (Activity × Emission Factor = CO₂e).
 5. **Review & Report:** Analyze results, identify hotspots, assess data reliability, and compile the final report.
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2. Scope Definition

- **Functional Unit:** 1.0 unit of okhemzeqyn
 - **System Boundary:** Cradle-to-grave, with a primary focus on emissions up to the **factory_gate** for direct control, extending to the use phase and end-of-life for a holistic PCF. This includes raw material acquisition, manufacturing, transportation, use, and end-of-life treatment.
 - **Geographic Scope:**
 - **Final Production Country:** China
 - **Supply Chain Focus:** Europe Focused (for upstream material sourcing)
 - **Allocation:** Emissions are allocated directly to the functional unit (1.0 unit) of okhemzeqyn based on mass and energy consumption attributable to its production and lifecycle stages.
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3. Lifecycle Mapping & Data Collection

The lifecycle of okhemzeqyn is broken down into key stages, with specific data points collected or assumed for calculation. Industry-standard emission factors are applied, drawing from sources such as Ecoinvent and DEFRA principles, ensuring robust and comparable results.

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

The following Bill of Materials (BOM) for okhemzeqyn was used to calculate the material acquisition and processing emissions. The '\Emission Factor\' represents kg CO2e per unit of quantity.

ID	Description	Category	Process	Quantity	Unit	Emission Factor (kg CO2e/ Unit)	Total Carbon (kg CO2e)
1	Aluminum Casing	Metal	Casting	0.5	kg	2.0	1.00
2	Plastic Enclosure	Plastic	Injection Molding	0.3	kg	3.5	1.05
3	Circuit Board	Electronics	Assembly	0.1	kg	15.0	1.50
4	Copper Wiring	Metal	Extrusion	0.05	kg	1.8	0.09
5	Packaging (Cardboard)	Paper	Converting	0.2	kg	1.0	0.20

Total Product Weight: 1.15 kg

Total Material Acquisition Emissions: 5.74 kg CO2e

3.2 Energy Inputs - Production Phase (Scope 2)

- **Energy Intensity (kWh/unit):** 10 kWh/unit
- **Renewable Energy Usage:** 50%

- **Non-renewable Electricity Consumption:** 5 kWh/unit (10 kWh/unit * (1 - 0.50))
- **Electricity Grid Emission Factor (China):** 0.556 kg CO₂e/kWh

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

- **Upstream Transport (Materials to Factory):**
 - **Transport Mode:** Road freight (HGV > 16t)
 - **Transport Distance:** 1500 km (imzdrjrvwv)
 - **Assumed Material Weight:** 1.15 kg (total product weight)
 - **Emission Factor (Road freight):** 0.08 kg CO₂e/tonne-km
- **Downstream Transport (Product to Customer):**
 - **Main Transport Mode:** Road freight (HGV > 16t)
 - **Main Transport Distance:** 1450 km (portion of imzdrjrvwv)
 - **Last-Mile Delivery Channel:** Parcel delivery van
 - **Last-Mile Distance:** 50 km (illustrative)
 - **Product Weight:** 1.15 kg
 - **Emission Factor (Road freight):** 0.08 kg CO₂e/tonne-km
 - **Emission Factor (Parcel delivery van):** 0.25 kg CO₂e/km

3.4 Use Phase Data (Scope 3, Category 11)

- **Product Lifespan:** 5 years (mwzxsxsswhw)
- **Energy Consumption in Use:** 20 kWh/year (xdwdxgjrqs)
- **Total Energy Consumption (Lifespan):** 100 kWh
- **Assumed Electricity Grid Emission Factor (Use Phase):** 0.45 kg CO₂e/kWh (global average for illustrative purposes)

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

- **Recyclability Percentage:** 80% (ttgnhphels)
- **Circular/Take-back Programs:** Yes, established take-back program (nutdfjzdyx)
- **Non-recyclable Portion:** 20%

- **Product Weight:** 1.15 kg
- **Recycling Credit (Illustrative, average avoided virgin production):** -1.0 kg CO₂e/kg
- **Landfill Emission Factor (General Waste):** 0.446 kg CO₂e/kg

4. Emissions Calculation

4.1 Categorization by GHG Scope

The emissions are categorized in accordance with the GHG Protocol's definitions for Scope 1, 2, and 3.

Lifecycle Stage	GHG Scope & Category	Calculation	Emissions (kg CO ₂ e/unit)
Material Acquisition & Processing	Scope 3, Category 1: Purchased Goods and Services	Sum of 'Total Carbon' from BOM	5.74
Manufacturing Energy	Scope 2: Purchased Electricity	(10 kWh/unit * (1 - 0.50)) * 0.556 kg CO ₂ e/kWh	2.78
Upstream Transportation (Materials Inbound)	Scope 3, Category 4: Upstream Transportation and Distribution	0.00115 tonnes * 1500 km * 0.08 kg CO ₂ e/tonne-km	0.14
Downstream Transportation (Product Outbound - Main)	Scope 3, Category 9: Downstream Transportation and Distribution	0.00115 tonnes * 1450 km * 0.08 kg CO ₂ e/tonne-km	0.13
Downstream Transportation (Product Outbound - Last Mile)	Scope 3, Category 9: Downstream Transportation and Distribution	50 km * 0.25 kg CO ₂ e/km	12.50
Use Phase	Scope 3, Category 11: Use of Sold Products	(20 kWh/year * 5 years) * 0.45 kg CO ₂ e/kWh	45.00

Lifecycle Stage	GHG Scope & Category	Calculation	Emissions (kg CO2e/unit)
End-of-Life Treatment	Scope 3, Category 12: End-of-Life Treatment of Sold Products	$(0.92 \text{ kg} * -1.0 \text{ kg CO2e/kg}) + (0.23 \text{ kg} * 0.446 \text{ kg CO2e/kg})$	-0.82

4.2 Total Product Carbon Footprint (PCF)

Total Estimated PCF for okhemzeqyn: 60.47 kg CO2e/unit

5. Review & Report

5.1 Emission Hotspots

Based on the detailed PCF analysis, the primary emission hotspots for okhemzeqyn are identified as follows:

- **Use Phase (45.00 kg CO2e):** This stage contributes the most significant portion of the product's footprint, primarily due to electricity consumption over its 5-year lifespan. This highlights the importance of energy-efficient product design and promoting renewable energy adoption by end-users.
- **Downstream Transportation (Last Mile) (12.50 kg CO2e):** The last-mile delivery, although a shorter distance, uses a higher intensity mode (parcel delivery van) which significantly contributes to the overall footprint. Optimizing logistics and exploring lower-emission last-mile options are critical.
- **Material Acquisition & Processing (5.74 kg CO2e):** The raw materials, particularly the Circuit Board and Plastic Enclosure, have notable embedded emissions, indicating opportunities for sourcing lower-carbon alternatives or increasing recycled content.
- **Manufacturing Energy (2.78 kg CO2e):** While partially offset by renewable energy usage, the non-renewable portion of manufacturing electricity in China still contributes to the footprint.

Further increasing renewable energy procurement at manufacturing facilities would reduce this impact.

5.2 Reliability and Limitations

This report relies on a combination of primary data (e.g., BOM quantities, energy intensity) and secondary data (e.g., industry-average emission factors). While the GHG Protocol provides a robust framework, and specific emission factors have been used where available (e.g., China grid mix), certain assumptions were made for illustrative purposes regarding generic transport distances, last-mile delivery models, and global average energy mix for the use phase. Actual emissions may vary with more specific activity data from direct suppliers and end-users. The calculation of recycling credits is based on the principle of avoided virgin production, an accepted but sometimes debated accounting method.

5.3 Key Insights and Recommendations

- **Product Design for Energy Efficiency:** Prioritize designs that significantly reduce energy consumption during the use phase to address the largest hotspot.
 - **Sustainable Sourcing:** Invest in R&D for materials with lower embedded carbon and explore opportunities for higher recycled content in components like the Aluminum Casing and Plastic Enclosure.
 - **Green Logistics:** Optimize transportation networks, particularly for last-mile delivery, by exploring electric vehicles, consolidated shipments, and local distribution centers.
 - **Renewable Energy Transition:** Continue and accelerate the transition to 100% renewable energy for manufacturing operations in China to eliminate Scope 2 emissions.
 - **Circular Economy Integration:** Strengthen take-back programs and partnerships for product end-of-life to maximize recycling and material recovery, enhancing the product's circularity.
 - **Data Granularity:** For future analyses, focus on collecting more specific data for upstream supplier emissions and precise end-user behavior to refine the accuracy of Scope 3 calculations.
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