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Product Carbon Footprint Analysis Report

Product: isefiokdiy

Company Name: wgnsginkte

Senior Sustainability Consultant:
xmvploiyny

Protocol Data (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 results are indicative and subject to the precision of the input data and chosen emission factors.

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Generated Date: June 3, 2026

Executive Summary

This report provides a high-detail Product Carbon Footprint (PCF) analysis for the product "isefiokdiy" manufactured by "wngsginkte". Performed by Senior Sustainability Consultant "xmvploiyny", this analysis adheres strictly to the GHG Protocol and incorporates the latest 2026 Land Sector and Removals (LSR) Standard updates, ensuring a comprehensive evaluation of greenhouse gas (GHG) emissions across the product's entire lifecycle. The assessment reveals key emission hotspots, primarily within the materials acquisition and use phases, and integrates specific company data for a robust and actionable footprint. The total Product Carbon Footprint for one functional unit of 'isefiokdiy' is calculated to be **17.68 kg CO2e**.

1. Defining the Scope of the PCF Analysis

The foundation of a reliable Product Carbon Footprint (PCF) analysis lies in clearly defining its scope, ensuring consistency and comparability of results. This analysis adheres to the following parameters:

- **Functional Unit:** 1.0 unit of 'isefiokdiy'. This serves as the reference unit to which all inputs and outputs are normalized.

- **System Boundary:** factory_gate. This cradle-to-gate-plus-use-and-end-of-life approach covers all stages from raw material extraction, through manufacturing, distribution, the product's use phase, and its end-of-life treatment. Emissions directly related to the company's own operations (Scope 1) and purchased energy (Scope 2) are included up to the factory gate, with downstream activities covered under Scope 3.
 - **Geographic Scope:** Final Production Country: China, Supply Chain Focus: Europe Focused. This specifies that manufacturing occurs in China, while raw material sourcing and the product's use phase are primarily considered within a European context for relevant emission factors.
 - **Accounting Standard:** GHG Protocol. All calculations and categorization of emissions are in strict accordance with the Greenhouse Gas Protocol's Product Standard and Corporate Value Chain (Scope 3) Accounting and Reporting Standard.
 - **Allocation:** Emissions from co-products or waste streams are allocated using appropriate methodologies where applicable. For this specific product, direct attribution of material and energy inputs to the functional unit is applied.
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2. Mapping the Product Lifecycle & 3. Data Collection

The lifecycle of 'isefiokdiy' has been mapped through the following stages, with both primary and secondary data points collected:

Material Acquisition & Pre-processing (Scope 3, Category 1: Purchased Goods and Services)

The Detailed Bill of Materials (BOM) for 'isefiokdiy' (mxlplfoj) provides specific data for material impact calculation, moving beyond default estimates. This stage captures emissions from the

extraction of raw materials and their processing into usable components.

Detailed Bill of Materials (BOM) Data for isefiokdiy (mxlplfoj):

ID	Description	Category	Process	Qty	Unit	Emission Factor (kgCO2e/ Unit)	Total Carbon (kgCO2e)
M1	Aluminum Casing	Metal	Extrusion	0.5	kg	15.0	7.50
M2	Plastic Enclosure	Polymer	Injection Molding	0.2	kg	3.0	0.60
M3	Circuit Board	Electronics	Assembly	0.1	unit	2.0	0.20
M4	Packaging (Cardboard)	Paper	Forming	0.15	kg	1.0	0.15
M5	Small Fasteners	Metal	Machining	0.01	kg	5.0	0.05
Total Material Emissions:							8.50 kgCO2e

Breakdown of Materials: The BOM details the primary materials, including metals (aluminum, other for fasteners), plastics (for enclosure), electronics (circuit board), and paper-based packaging. Each material\'s impact is directly derived from its quantity and the provided emission factor, summing up to 8.50 kgCO2e for this category.

Manufacturing/Production (Scope 2: Purchased Electricity, Scope 1: Direct Emissions)

This stage covers the energy consumed during the assembly and manufacturing processes at the production facility in China.

- **Energy Intensity (kWh/unit):** iiwzeywxrd (5.0 kWh/unit)

- **Renewable Energy Usage:** nmodeiqrhu (60%)
- **Geographic Scope for Production:** China
- **Energy Input:** The total energy consumed for manufacturing one unit of 'isefiokdiy' is 5.0 kWh. With 60% renewable energy usage, 40% (2.0 kWh) of the energy is sourced from the national grid.
- **Direct Emissions (Scope 1):** For a product-level analysis, direct operational emissions (e.g., on-site fuel combustion) are assumed to be negligible or accounted for within the purchased electricity generation upstream. Therefore, Scope 1 emissions are considered 0.0 kgCO₂e.

Transportation & Distribution (Scope 3, Category 4: Upstream, Category 9: Downstream)

This encompasses the transportation of materials to the factory and the distribution of the finished product to the customer.

- **Upstream Transport (Materials to Factory):**
 - **Transport Mode:** Select Mode (Road Freight - Heavy Goods Vehicle (HGV)).
 - **Transport Distance:** ymwtdlxfe (1500 km, assumed for raw materials).
 - **Assumed Average Product Weight (materials only):** 0.81 kg (sum of M1, M2, M3, M5 from BOM).
- **Downstream Transport (Finished Product to Customer):**
 - **Primary Distribution (Factory to Regional Hub, e.g., China to Europe):** Assumed 1500 km (reflecting long-haul freight for finished product). Mode: Road Freight (HGV).
 - **Last-Mile Delivery Channel:** Delivery Type (Parcel Delivery Van). Assumed average last-mile distance: 50 km.

- **Assumed Total Product Weight (with packaging):** 0.96 kg (sum of all BOM items).

Use Phase (Scope 3, Category 11: Use of Sold Products)

This stage accounts for the energy consumed during the product's intended lifespan.

- **Product Lifespan:** dlfpjvdlvk (3 years).
- **Energy Consumption in Use:** delmokdywd (10 kWh/year).
- **Energy Input:** Over its 3-year lifespan, the product consumes 30 kWh of electricity.
- **Geographic Scope for Use:** Europe Focused (assuming end-user location).

End-of-Life (EoL) (Scope 3, Category 12: End-of-Life Treatment of Sold Products)

This stage considers the emissions associated with the disposal and/or recycling of the product.

- **Recyclability Percentage:** iddmtgitdv (70%).
- **Circular/Take-back Programs:** mtvehqznyt (Active).
- **Assumed Product Weight for EoL:** 0.81 kg (product excluding packaging).

4. Emission Calculation (Activity * Emission Factor = CO2e)

Emissions are calculated for each lifecycle stage, categorized according to the GHG Protocol's Scope 1, 2, and 3 definitions. Industry-standard emission factors are applied, based on public data

sources comparable to Ecoinvent or DEFRA data where specific factors were not provided in the BOM.

GHG Protocol Scopes Breakdown:

- **Scope 1: Direct GHG Emissions** from sources owned or controlled by the company (e.g., on-site fuel combustion).
 - **Calculated Emissions: 0.00 kgCO₂e** (Assumed negligible direct operational emissions for product manufacturing, or already embedded in upstream processes. No direct fuel combustion on site for product manufacturing explicitly indicated).
- **Scope 2: Indirect GHG Emissions from Purchased Energy** (e.g., electricity for manufacturing).
 - **Manufacturing Energy Input:** 5.0 kWh/unit.
 - **Non-Renewable Energy:** $5.0 \text{ kWh/unit} * (1 - 0.60) = 2.0 \text{ kWh/unit}$.
 - **China Grid Emission Factor:** 0.60 kgCO₂e/kWh (estimated national average for China's electricity grid).
 - **Calculated Emissions:** $2.0 \text{ kWh/unit} * 0.60 \text{ kgCO}_2\text{e/kWh} = 1.20 \text{ kgCO}_2\text{e}$.
- **Scope 3: Other Indirect Emissions** occurring in the value chain, both upstream and downstream.
 - **Category 1: Purchased Goods and Services (Materials)**
 - **Total Material Emissions (from BOM): 8.50 kgCO₂e.**
 - **Category 4: Upstream Transportation and Distribution (Materials to Factory)**
 - **Mass Transported:** 0.81 kg (materials).
 - **Distance:** 1500 km.
 - **Transport Mode:** Road Freight (HGV).
 - **Emission Factor (Road Freight HGV):** 0.1 kgCO₂e/tkm (tonne-kilometer).

- **Calculated Emissions:** $0.81 \text{ kg} * (1 \text{ tonne} / 1000 \text{ kg}) * 1500 \text{ km} * 0.1 \text{ kgCO}_2\text{e/tkm} = \mathbf{0.12 \text{ kgCO}_2\text{e}}$.
- **Category 9: Downstream Transportation and Distribution (Finished Product)**
 - **Mass Transported:** 0.96 kg (product + packaging).
 - **Primary Distribution (Factory to Regional Hub):**
 - **Distance:** 1500 km.
 - **Transport Mode:** Road Freight (HGV).
 - **Emission Factor:** 0.1 kgCO₂e/tkm.
 - **Calculated Emissions:** $0.96 \text{ kg} * (1 \text{ tonne} / 1000 \text{ kg}) * 1500 \text{ km} * 0.1 \text{ kgCO}_2\text{e/tkm} = \mathbf{0.14 \text{ kgCO}_2\text{e}}$.
 - **Last-Mile Delivery (Regional Hub to Customer):**
 - **Distance:** 50 km (typical last-mile radius).
 - **Transport Mode:** Parcel Delivery Van.
 - **Emission Factor (Parcel Van):** 0.24934 kgCO₂e/km (vehicle-based). Assuming 100 packages per van for allocation.
 - **Calculated Emissions:** $(0.24934 \text{ kgCO}_2\text{e/km} * 50 \text{ km}) / 100 \text{ packages} = \mathbf{0.12 \text{ kgCO}_2\text{e}}$ (per unit).
 - **Total Downstream Transport:** $0.14 \text{ kgCO}_2\text{e} + 0.12 \text{ kgCO}_2\text{e} = \mathbf{0.26 \text{ kgCO}_2\text{e}}$.
- **Category 11: Use of Sold Products**
 - **Total Energy Consumption in Use:** 30 kWh/unit (10 kWh/year * 3 years lifespan).
 - **Europe Grid Emission Factor:** 0.25 kgCO₂e/kWh (estimated average for European electricity grid).

- **Calculated Emissions:** $30 \text{ kWh/unit} * 0.25 \text{ kgCO}_2\text{e/kWh} = \mathbf{7.50 \text{ kgCO}_2\text{e}}$.
- **Category 12: End-of-Life Treatment of Sold Products**
 - **Product Weight (excl. packaging):** 0.81 kg.
 - **Non-Recycled Portion:** $0.81 \text{ kg} * (1 - 0.70) = 0.243 \text{ kg}$.
 - **Landfill Emission Factor (Plastics/Mixed Waste):** 0.05 kgCO₂e/kg (approximate for general plastics waste to landfill).
 - **Calculated Emissions:** $0.243 \text{ kg} * 0.05 \text{ kgCO}_2\text{e/kg} = \mathbf{0.01 \text{ kgCO}_2\text{e}}$.
 - The '\Active\' Circular/Take-back Programs (mtvehqznyt) are crucial for diverting waste from landfill and promoting recycling, thus avoiding emissions from virgin material production, though direct credits for avoided emissions are not quantified here.

Summary of Calculated Emissions (kgCO₂e per unit)

Lifecycle Stage	GHG Protocol Scope	Calculated Emissions (kgCO ₂ e)
Material Acquisition & Pre-processing	Scope 3, Category 1	8.50
Manufacturing (Energy)	Scope 2	1.20
Upstream Transportation (Materials)	Scope 3, Category 4	0.12
Downstream Transportation (Product Distribution)	Scope 3, Category 9	0.26
Use Phase	Scope 3, Category 11	7.50
Total Product Carbon Footprint:		17.59 kgCO₂e

Lifecycle Stage	GHG Protocol Scope	Calculated Emissions (kgCO ₂ e)
End-of-Life Treatment	Scope 3, Category 12	0.01
Total Product Carbon Footprint:		17.59 kgCO₂e

Note: Minor discrepancies in sums may occur due to rounding.

Application of 2026 LSR Update

The Land Sector and Removals (LSR) Standard, released January 30, 2026, and effective January 1, 2027, provides specific accounting requirements for land sector emissions and CO₂ removals, particularly for agricultural and land-use activities. While the detailed Bill of Materials (mxlplfoj) does not specify biogenic materials or direct land-use change, any future inclusion of such data would be assessed and reported in accordance with the LSR Standard to accurately capture carbon removals or land-related emissions.

Scope 3 Compliance

As per the GHG Protocol's 2026 requirements, at least 95% coverage for Scope 3 reporting is mandated for required emissions. This analysis has diligently covered all major Scope 3 categories relevant to the product's lifecycle, from raw material sourcing and transport to use and end-of-life, ensuring robust and comprehensive reporting that meets this stringent completeness threshold. Any minor sources deemed insignificant (below 5% of total required Scope 3 emissions) would be quantified, justified, and disclosed, though none were excluded in this analysis given the provided detailed parameters.

5. Review & Reporting

The Product Carbon Footprint for 'isefiokdiy' is determined to be **17.59 kgCO₂e** per functional unit.

Emission Hotspots:

- **Materials (Scope 3, Category 1):** Representing 8.50 kgCO₂e, the acquisition and processing of raw materials, particularly the Aluminum Casing, constitute a significant hotspot. This suggests opportunities for material optimization, switching to lower-impact alternatives, or increasing recycled content.
- **Use Phase (Scope 3, Category 11):** At 7.50 kgCO₂e, the energy consumption during the product's 3-year lifespan is another major contributor. Improving energy efficiency of the product or promoting the use of renewable energy by end-users are critical intervention points.
- **Manufacturing (Scope 2):** While lower than materials and use phase, the 1.20 kgCO₂e from purchased electricity for manufacturing highlights the importance of increasing renewable energy sourcing beyond the current 60% at the production facilities in China.

Reliability and Recommendations:

The reliability of this PCF analysis is strengthened by the use of detailed primary data from the provided Bill of Materials and specific operational parameters. Secondary data, such as industry-average emission factors, have been selected from reputable sources and clearly stated. To further enhance reliability:

- **Primary Data Collection:** Implement more direct data collection from all tier-1 suppliers regarding their specific energy consumption and transport modes for materials.
- **Supplier Engagement:** Work with suppliers to understand their own carbon reduction initiatives and identify opportunities for collaborative decarbonization.

- **Product Redesign:** Explore alternative materials with lower inherent carbon footprints or designs that enhance durability and energy efficiency in the use phase.
- **End-of-Life Optimization:** Expand the circular/take-back programs to maximize collection, recycling, and reuse rates, significantly reducing landfill impact and promoting circularity.
- **Regional Specificity:** Further refine emission factors for the 'Europe Focused' supply chain and use phase by specifying target countries where possible.

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