

carboncalcpcf.com

Product Carbon Footprint Analysis Report

Product: nxvyzvgsyj

Company: xkqylftwdf

Protocol Data (Accounting Standard): GHG
Protocol

Senior Sustainability Consultant: rxsxrweey

This report is generated based on available data and industry standards. While every effort has been made to ensure accuracy, actual emissions may vary based on real-time operational data and specific supply chain dynamics.

Product Carbon Footprint Analysis Report for nxvyzvgsyj

Generated Date: May 28, 2026

Table of Contents

1. Executive Summary
2. Introduction
 1. Purpose and Scope
 2. Product Description
 3. Company and Consultant
 4. Accounting Standard
3. Methodology
 1. Define Scope
 2. Map Lifecycle (LCI Inventory Stages)
 3. Collect Data
 4. Calculate Emissions
 5. Review & Report
4. Product Carbon Footprint Analysis for nxvyzvgsyj
 1. Material Acquisition & Pre-processing (Upstream Scope 3)
 2. Manufacturing & Production (Scope 1 & 2, Upstream Scope 3)
 3. Transportation & Distribution (Upstream & Downstream Scope 3)
 4. Use Phase (Downstream Scope 3)
 5. End-of-Life (Downstream Scope 3)
 6. Total PCF Summary and Hotspots
5. GHG Protocol Compliance and LSR Update
 1. Scope 1, 2, and 3 Categorization
 2. 2026 Land Sector and Removals (LSR) Standard Application

3. Scope 3 Coverage

6. Recommendations

7. Disclaimer

8. References

1. Executive Summary

This report presents a high-detail Product Carbon Footprint (PCF) analysis for the product **nxvyzvgsyj**, manufactured by **xkqylftwdf**. Conducted by Senior Sustainability Consultant **rxsxrweey**, this analysis adheres strictly to the GHG Protocol, incorporating considerations for the upcoming 2026 Land Sector and Removals (LSR) Standard. The assessment covers the full product lifecycle, from raw material extraction to end-of-life treatment, utilizing specific Bill of Materials (BOM) data, logistics parameters, energy consumption figures, and circular economy considerations. The primary objective is to quantify greenhouse gas (GHG) emissions in CO₂e per functional unit (1.0 unit) and identify key emission hotspots, thereby informing targeted reduction strategies.

2. Introduction

2.1. Purpose and Scope

The purpose of this report is to quantify the greenhouse gas (GHG) emissions associated with the entire lifecycle of product **nxvyzvgsyj**. This Product Carbon Footprint (PCF) analysis aims to provide a comprehensive understanding of the environmental impact, identify emission hotspots, and support **xkqylftwdf**'s sustainability initiatives and compliance requirements. A PCF quantifies the GHG emissions generated over a product's lifecycle.

2.2. Product Description

The product under analysis is **nxvyzvgsyj**. For the purpose of this report, it is assumed to be a manufactured good with a defined bill of materials and lifecycle stages as detailed in the subsequent sections.

2.3. Company and Consultant

This report has been prepared for **xkqylftwdf** by **rxsrxrweeey**, a Senior Sustainability Consultant specializing in GHG Protocol accounting. The analysis leverages expert knowledge in lifecycle assessment and carbon reporting.

2.4. Accounting Standard

This Product Carbon Footprint analysis is conducted in full accordance with the **GHG Protocol Product Life Cycle Accounting and Reporting Standard**. This standard provides a robust framework for companies to quantify and report the GHG emissions of individual products using a lifecycle assessment approach. Emissions are categorized into Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased energy), and Scope 3 (other indirect value chain emissions).

3. Methodology

The PCF analysis follows the five-step methodology as prescribed by the GHG Protocol and industry best practices:

3.1. Define Scope

- **Functional Unit:** The functional unit for this analysis is defined as **1.0 unit of nxvyzvgsyj**, providing a consistent basis for quantification and comparison.
- **System Boundary:** The explicit system boundary parameter provided is **factory_gate**. However, to fulfill the requirement of expanding the 'Use Phase' and 'End-of-Life' scenarios, the analysis effectively adopts a 'Cradle-to-Grave' perspective for comprehensive impact assessment. This includes all processes from raw material acquisition, manufacturing at the factory (**factory_gate**), distribution, product use, and end-of-life treatment. A cradle-to-gate boundary considers processes up to the point the product exits the factory, while cradle-to-grave covers the full lifecycle.
- **Geographic Scope:** The final production country is **China**, with a supply chain focus on **Europe Focused** for upstream activities.
- **Allocation:** Emissions are allocated directly to the functional unit. For any shared processes or co-products, a mass-based allocation

approach would be applied, ensuring that only emissions attributable to nxvyzvgsyj are included.

3.2. Map Lifecycle (LCI Inventory Stages)

The lifecycle of **nxvyzvgsyj** has been mapped into the following stages, in line with the GHG Protocol Product Standard:

- **Raw Material Acquisition & Pre-processing:** Extraction, processing, and production of all raw materials listed in the Bill of Materials.
- **Manufacturing & Production:** All activities at the **xkqylftwdf** manufacturing facility in China, including energy consumption, direct emissions, and waste generation.
- **Transportation & Distribution:**
 - Upstream (inbound): Transport of raw materials and components to the manufacturing facility.
 - Downstream (outbound): Transport of the finished product from the factory gate to the customer, including last-mile delivery.
- **Use Phase:** Energy consumption and other impacts associated with the product's operation over its specified lifespan.
- **End-of-Life (EoL):** Impacts related to the disposal or recycling of the product at the end of its useful life.

3.3. Collect Data

Data collection involved both primary and secondary data sources:

- **Primary Data:**
 - **Detailed Bill of Materials (BOM):** **gjrjqtgu** - This detailed BOM provides specific quantities and estimated carbon impacts for each component, ensuring high-accuracy material impact calculation. While the actual numerical values for each item are not provided here, the methodology assumes access to and utilization of specific data points (ID, Description, Category, Process, Qty, Unit, Emission Factor, Total Carbon) for each component.
 - **Energy Intensity (kWh/unit):** **sgpqftkqvh** - Direct energy consumption during the production phase per functional unit.

- **Renewable Energy Usage: dkmxxuyylj** - Percentage of renewable energy utilized in the production process, which directly influences Scope 2 emissions.
- **Transport Mode: Select Mode** and **Transport Distance: zqfxkmdruw** for inbound logistics.
- **Last-Mile Delivery Channel: Delivery Type** for outbound logistics.
- **Product Lifespan: rrdmzfoyn** and **Energy Consumption in Use: qwndqfsyux** for the use phase.
- **Recyclability Percentage: rojeuqlurw** and **Circular/ Take-back Programs: msyhwiijje** for end-of-life scenarios.
- **Secondary Data:** Industry-standard emission factors were sourced from reputable databases (e.g., Ecoinvent, DEFRA, ClimaTiq) for materials, energy grids, and transportation modes where primary data was unavailable or to cross-reference.

3.4. Calculate Emissions

Emissions were calculated using the fundamental equation: **Activity Data × Emission Factor = CO₂e**. The calculation process involved:

- Aggregating activity data for each lifecycle stage.
- Applying appropriate, context-specific emission factors (e.g., country-specific grid electricity mix for China, mode-specific transport factors).
- Converting all GHG emissions to Carbon Dioxide Equivalent (CO₂e) using their respective Global Warming Potentials (GWPs) over a 100-year horizon, as per IPCC guidelines.
- Categorizing emissions into Scope 1, Scope 2, and Scope 3 according to GHG Protocol definitions.

GHG Protocol Scope Categorization:

- **Scope 1 (Direct Emissions):** GHG emissions from sources owned or controlled by **xkqylftwdf**. For **nxvyzvgsyj**, this would include direct fuel combustion in owned vehicles for on-site operations (if any) or manufacturing processes that release GHGs directly.

- **Scope 2 (Indirect Emissions from Purchased Energy):** Emissions from the generation of purchased electricity consumed by **xkqylftwdf** in its manufacturing facility for **nxvyzvgsyj**. The geographical scope (China) is crucial here for applying the correct grid emission factor.
- **Scope 3 (Other Indirect Emissions - Value Chain):** This encompasses all other indirect emissions occurring in the value chain of **xkqylftwdf**, both upstream and downstream, not included in Scope 1 or 2. For this PCF, significant Scope 3 categories include:
 - Category 1: Purchased goods and services (raw materials, components).
 - Category 4: Upstream transportation and distribution.
 - Category 9: Downstream transportation and distribution.
 - Category 11: Use of sold products.
 - Category 12: End-of-life treatment of sold products.

2026 LSR Update Application: The Land Sector and Removals (LSR) Standard, effective January 1, 2027, provides accounting requirements for land emissions and CO₂ removals. While direct land use change for **nxvyzvgsyj**'s manufacturing facility might be minimal, the LSR Standard is relevant for upstream supply chain elements involving land-based activities (e.g., agriculture for bio-based materials, or deforestation linked to raw material extraction). If any components of **nxvyzvgsyj**'s BOM (**gjrqqtgu**) or their precursor materials involve such land sector activities, emissions and potential removals would be quantified and reported under the LSR framework, integrated into Scope 3. This standard accounts for land management, land use change, CO₂ removals, and biogenic products.

Scope 3 Compliance: As per 2026 requirements, this report aims for at least 95% coverage for Scope 3 reporting, ensuring that all significant upstream and downstream emissions are identified and quantified to the best extent possible with available data.

3.5. Review & Report

The final stage involved reviewing the calculated emissions for accuracy, identifying hotspots, and assessing data reliability. The report outlines these findings and provides actionable recommendations.

4. Product Carbon Footprint Analysis for nxvyzvgsyj

Based on the parameters provided, the following sections detail the emission calculations for each lifecycle stage of **nxvyzvgsyj**. Note that numerical values presented are illustrative, demonstrating the calculation methodology with plausible emission factors, as specific values for `gjrjqtgu`, `Select Mode`, `Delivery Type`, `zqfxkmdruw`, `dkmxxuyylj`, `sgpqftkqvh`, `rrddmzfoyn`, `qwndqfsyux`, `rojeuqlurw`, and `msyhwiijje` are placeholders in the prompt.

4.1. Material Acquisition & Pre-processing (Upstream Scope 3, Category 1)

This stage accounts for the GHG emissions associated with the extraction, processing, and manufacturing of raw materials and components specified in the Detailed Bill of Materials (BOM): **gjrjqtgu**. Below is an illustrative breakdown, applying representative emission factors:

ID	Description	Category	Process	Qty	Unit	Illustrative Emission Factor (kgCO2e/unit)	Illustrative Total Carbon (kgCO2e)
1	Plastic Casing	Plastics	Injection Molding	0.5	kg	2.5 (avg. plastic)	1.25
2	Aluminum Frame	Metals	Extrusion	0.2	kg	16.91	3.38
3	Copper Wiring	Metals	Wire Drawing	0.1	kg	3.0 (avg. copper)	0.30
4	Printed Circuit Board	Electronics	Assembly	1	unit	0.8 (avg. PCB)	0.80
5	Battery (Li-ion)	Electronics	Manufacturing/Assembly	0.1	kg	10.0 (avg. Li-ion)	1.00
6	Packaging (Cardboard)	Packaging	Pulping & Forming	0.3	kg	1.0 (avg. cardboard)	0.30
Total Material Emissions:							

ID	Description	Category	Process	Qty	Unit	Illustrative Emission Factor (kgCO2e/unit)	Illustrative Total Carbon (kgCO2e)
							7.03 kgCO2e

Note: The "Total Carbon (kgCO2e)" values provided in the prompt's BOM format (`gjrjqtgu`) would be directly used if they were explicitly numerical. Here, illustrative emission factors from industry averages or databases like ClimaTiq are used to demonstrate calculation.

4.2. Manufacturing & Production (Scope 1 & 2, Upstream Scope 3)

Scope 1 (Direct Emissions)

Assuming minimal direct fuel combustion at the **xkqylftwdf** facility for **nxvyzvgsyj** production, or that such emissions are integrated into broader energy intensity metrics. In a real assessment, on-site fuel consumption (e.g., natural gas for heating, diesel for forklifts) would be quantified here.

Scope 2 (Purchased Electricity)

Emissions from purchased electricity for the production of **nxvyzvgsyj** in China are calculated using the provided parameters:

- Energy Intensity (kWh/unit): **sgpqftkqvh** (e.g., 5 kWh/unit)
- Renewable Energy Usage: **dkmxxuyylj** (e.g., 20%)
- China Grid Emission Factor: 0.556 kgCO2e/kWh (average for China).

Illustrative Calculation:

Total Electricity Consumption = **sgpqftkqvh** kWh/unit = 5 kWh/unit
Electricity from Renewables = **sgpqftkqvh** * (**dkmxxuyylj** / 100) = 5 kWh * 0.20 = 1 kWh
Electricity from Grid (Non-renewable equivalent) = 5 kWh - 1 kWh = 4 kWh
Scope 2 Emissions = 4 kWh * 0.556 kgCO2e/kWh = **2.224 kgCO2e**

Upstream Scope 3 (e.g., Waste from Production)

Emissions from waste generated during production would also fall under Scope 3. For instance, if 1 kg of production waste is generated per unit of product and sent to landfill, with an illustrative landfill emission factor of 0.5 kgCO₂e/kg, this would add 0.5 kgCO₂e. Recycling waste typically has lower emissions compared to landfilling.

4.3. Transportation & Distribution (Upstream & Downstream Scope 3)

This section quantifies emissions from transporting materials to the factory and distributing the finished product.

Inbound Logistics (Upstream Scope 3, Category 4)

- Transport Mode: **Select Mode** (e.g., 80% Sea Freight, 20% Road Freight within Europe/China)
- Transport Distance: **zqfxkmdruw** (e.g., 10,000 km for sea, 500 km for road for a 1 kg product)

Illustrative Calculation (for 1 kg product over 10,000 km sea + 500 km road):

Sea Freight (Illustrative EF: 0.016 kgCO₂e/tkm): $0.016 \text{ kgCO}_2\text{e/tkm} * 10,000 \text{ km} * 0.001 \text{ tonne (for 1kg)} = 0.16 \text{ kgCO}_2\text{e}$

Road Freight (Illustrative EF: 0.08 kgCO₂e/tkm): $0.08 \text{ kgCO}_2\text{e/tkm} * 500 \text{ km} * 0.001 \text{ tonne (for 1kg)} = 0.04 \text{ kgCO}_2\text{e}$

Illustrative Total Inbound Transport Emissions = **0.20 kgCO₂e**

Outbound Logistics (Downstream Scope 3, Category 9)

- Last-Mile Delivery Channel: **Delivery Type** (e.g., Road Transport - Van)
- Illustrative Delivery Distance: 100 km (for a 1 kg product)

Illustrative Calculation (for 1 kg product over 100 km road):

Road Transport (Illustrative EF: 0.08 kgCO₂e/tkm): $0.08 \text{ kgCO}_2\text{e/tkm} * 100 \text{ km} * 0.001 \text{ tonne (for 1kg)} = \mathbf{0.008 \text{ kgCO}_2\text{e}}$

4.4. Use Phase (Downstream Scope 3, Category 11)

This phase calculates emissions from the product's energy consumption during its active use, based on provided durability and consumption data.

- Product Lifespan: **rrddmzfoyn** (e.g., 5 years)
- Energy Consumption in Use: **qwndqfsyux** (e.g., 10 kWh/year)
- Assumed Grid Emission Factor for Use (e.g., EU average, 0.27 kgCO_{2e}/kWh based on various sources for European grid mix, for 'Europe Focused' supply chain in use phase. Specific country in use would ideally be known).

Illustrative Calculation:

Total Energy Consumption over Lifespan = $qwndqfsyux \text{ kWh/year} * rrddmzfoyn \text{ years}$

= $10 \text{ kWh/year} * 5 \text{ years} = 50 \text{ kWh}$

Use Phase Emissions = $50 \text{ kWh} * 0.27 \text{ kgCO}_2\text{e/kWh} = \mathbf{13.50 \text{ kgCO}_2\text{e}}$

4.5. End-of-Life (Downstream Scope 3, Category 12)

The end-of-life scenario considers the impact of disposal versus recycling, incorporating circular economy principles.

- Recyclability Percentage: **rojeuqlurw** (e.g., 70%)
- Circular/Take-back Programs: **msyhwiijje** (e.g., Yes, active)

Illustrative Calculation (for a product with 1 kg total material weight):

Recycled Material (70%): 0.7 kg

Non-recycled/Landfilled Material (30%): 0.3 kg

Emission Factor for Recycling (avoided emissions/benefits): Typically negative or much lower than virgin material production. Illustrative avoided emissions for 0.7 kg of mixed materials = -0.5 kgCO_{2e}.

Emission Factor for Landfill: Illustrative 0.5 kgCO_{2e}/kg. For 0.3 kg of mixed materials = 0.15 kgCO_{2e}.

Net End-of-Life Emissions = $(-0.5 \text{ kgCO}_2\text{e}) + (0.15 \text{ kgCO}_2\text{e}) = \mathbf{-0.35 \text{ kgCO}_2\text{e}}$ (indicating a net benefit due to high recyclability and circular programs).

Note: The actual calculation would involve material-specific recycling benefits (avoided virgin material production) and landfill emissions. Recycling significantly reduces GHG emissions compared to landfilling and conserves natural resources. The presence of circular/take-back programs

(**msyhwiijje**) enhances the likelihood of achieving the recyclability percentage.

4.6. Total PCF Summary and Hotspots

Illustrative Total Product Carbon Footprint for nxvyzvgsyj (per 1.0 unit):

Lifecycle Stage	Illustrative Emissions (kgCO ₂ e)	GHG Scope(s)
Material Acquisition & Pre-processing	7.03	Scope 3 (Cat 1)
Manufacturing & Production (Scope 2)	2.224	Scope 2
Transportation & Distribution (Inbound)	0.20	Scope 3 (Cat 4)
Transportation & Distribution (Outbound)	0.008	Scope 3 (Cat 9)
Use Phase	13.50	Scope 3 (Cat 11)
End-of-Life	-0.35	Scope 3 (Cat 12)
TOTAL PCF	22.612 kgCO₂e	

Identified Hotspots: Based on this illustrative analysis, the primary hotspots for **nxvyzvgsyj** are the Use Phase (13.50 kgCO₂e) and Material Acquisition & Pre-processing (7.03 kgCO₂e). Manufacturing energy (Scope 2) also contributes significantly.

5. GHG Protocol Compliance and LSR Update

5.1. Scope 1, 2, and 3 Categorization

This report has diligently followed the GHG Protocol's categorization of emissions:

- **Scope 1:** Direct emissions from owned or controlled sources. For this product, direct manufacturing emissions would be allocated here if significant.
- **Scope 2:** Indirect emissions from the generation of purchased electricity. Our analysis explicitly quantifies this based on **xkqylftwdf**'s electricity consumption and the China grid mix, adjusted for renewable energy usage.
- **Scope 3:** All other indirect emissions across the value chain, which typically represent the largest portion of a product's footprint. This includes upstream emissions from purchased materials and inbound transport, as well as downstream emissions from product use, outbound transport, and end-of-life treatment. The comprehensive breakdown provided ensures robust Scope 3 reporting.

5.2. 2026 Land Sector and Removals (LSR) Standard Application

The 2026 GHG Protocol Land Sector and Removals (LSR) Standard, effective January 1, 2027, addresses GHG accounting for land management, land use change, and CO₂ removals. While **nxvyzvgsyj** itself is a manufactured product, the LSR Standard is crucial for tracing impacts within its supply chain, especially if any raw materials (e.g., bio-based plastics, paper pulp for packaging) originate from activities subject to land use change or specific land management practices. The report acknowledges that in a real-world scenario, specific data on land use impacts for materials in **gjrqqtgu** would be collected and reported under this standard, accounting for both emissions and potential carbon removals (e.g., from sustainable forestry or soil carbon sequestration initiatives). This applies to companies with land sector activities in their operations or value chain.

5.3. Scope 3 Coverage

In adherence to the 2026 requirements, this analysis aims to achieve at least 95% coverage for Scope 3 emissions. By detailing emissions from raw materials (Category 1), all transportation (Categories 4 & 9), product use (Category 11), and end-of-life (Category 12), a substantial portion of the value chain emissions is captured. Any remaining minor categories would be estimated or flagged for future data collection to ensure complete compliance.

6. Recommendations

Based on the PCF analysis of **nxvyzvgsyj**, **xkqylftwdf** should consider the following recommendations to reduce its product's carbon footprint:

- **Material Optimization:** Focus on sourcing lower-carbon alternative materials, especially for components like aluminum and plastics that show high material-related emissions. Engage with suppliers to obtain primary emission data and explore design changes to reduce material intensity.
- **Energy Efficiency in Manufacturing:** Further optimize energy consumption at the China production facility. Increase the share of renewable energy beyond **dkmxxuyylj**, potentially through on-site generation or purchasing renewable energy credits, to significantly reduce Scope 2 emissions.
- **Logistics Streamlining:** Evaluate transport modes for inbound and outbound logistics. Prioritize less carbon-intensive options (e.g., shifting from air to sea or rail where feasible) and optimize load factors for road transport to minimize emissions over the **zqfxkmdruw** distance and for **Delivery Type** last-mile channels.
- **Use Phase Efficiency:** Explore opportunities to reduce the product's energy consumption during its **rrddmzfoyn** lifespan, as this is a major hotspot. This could involve design for energy efficiency or providing users with guidance on sustainable use.
- **Enhance Circularity:** Leverage the high **rojeuqlurw** recyclability and existing **msyhwiijje** circular/take-back programs. Continuously improve recycling infrastructure and processes to maximize material recovery and minimize landfill contributions, further increasing avoided emissions from end-of-life.

- **Supply Chain Engagement:** Work closely with upstream suppliers to gather more specific data on their Scope 1 and 2 emissions, enabling more precise calculation of Scope 3, Category 1 emissions and supporting their decarbonization efforts.

7. Disclaimer

This Product Carbon Footprint analysis is based on the data and parameters provided by **xkqylftwdf** and supplemented with industry-standard emission factors from publicly available databases. While every effort has been made to ensure the accuracy and completeness of this report, it represents an estimate of the product's environmental impact. Actual emissions may vary based on dynamic operational conditions, supply chain fluctuations, and specific regional energy mixes. This report is intended for internal strategic planning and reporting purposes for **xkqylftwdf** and should not be used as a standalone document for external claims without further verification and context.

8. References

- Current time information in St Louis, MO, US. <https://www.google.com/search?q=time+in+St+Louis,+MO,+US>
- Land Sector and Removals Standard - GHG Protocol. (2026, January 30). <https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGrfdvTCTsaAOIUzHqelfsC01n7aJWlZCvxvJt9FliZyPjPwRy3CkXNuGx5tV6dpW9PcSadfmYzLtDaDLo6E7TMJjiyLSCobc8C9CpcgtfmPoD3YJl9sQO35DTel7s09-EUn2Kp7xABb9uxcF6p94ivS->
- Land Sector and Removals Standard: What You Need to Know - GHG Protocol. (2026, January 30). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQHLbh5obzKUjtKq5BX3BPIjpsBVRcu-dvZbWQ4qANdU2EHLyQBjd7hPeYcKxtqR2KlimOKyiHwpp-IViiPLCFGNitagN52bctwmbDd0H78S6DliRFbuLkk_pXC6qmtE4GweA0_IHSrcTRN4TYIRWzclQzIXX1ZSplaumCbLg62s4YnYQ8it79Y_v0rM
- GHG Protocol publishes Land Sector and Removals Standard. (2026, February 03). <https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQF0AfwHCsYArg-YCcnL4gMztQ7J86e9ap68Gd91YiBdi8BOIXxscmlvS8uXIVFGrjzAjpEG>

EVbIT_IHbeft5nZJCc9ZKvcjm4QNAmcMKfjHqVqJBILXUZj33xOXa6SilyNzOquLY1A2Z7I2yPxfgi5j16NPPnUN1kh-F3C3CA=

- What are Scope 1, 2, and 3 Emissions? Guide to GHG Emissions | SAP. (2024, October 24). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGczMfbX4QLcaWK7XwnqWL8o0EOlw8nhtATY2hJElsz0Krl4KEcWsa_cUNEOq_PI4ZYS4-eA9DPHxV9y5Nfz2-apJNjlg5d3OfRlqmk5kt-Zscksc-eyO8AxQ__s227t60p1ZQqRMowV77V-dO2IhG_Mubb0PY7
- Calculation Tools FAQ - GHG Protocol. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEMnkleOgQCFqQrMwDVhs2Ah_pAtn__BjgFBAjiPNPXftmG82KRRrI0f9hWK4nF72SYkGm5ca2-k2EbV06ryH1kVBO9AF2IsCnfej_A293-ZpyANZWO6pVcaapKSrruMgsAr09cPwi
- The GHG Protocol: Scope 1, 2, and 3 GHG Emission Reductions Companies Must Reach to Achieve Carbon Neutrality | Murata Manufacturing Articles. (2025, September 29). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQFY98qd-y-ZRS09KkyLbdh3LdGFtNfYW3DPeN5GrMvlcjoeYf9VIHq_zu27hjVPslnADvn4ji0uX7oafB0ZFmzlmKwSeeMki2yx0uqEiVgBI0QuQwHwrHdXlgaNISYx2ZnQLXMesWe4AcY_W7RnZBcM8aQGEEHH4QWTYA0=
- GHG Protocol releases new Land Sector and Removals Standard | Carbon Direct. (2026, March 11). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQH3d8R7uS8vNCNBchRRFo5cp6zMcgAsAdcq4Y1ZErQt8PgwYTrq3SI84FXWebuoS4rflif9tBesvLb5Fjcl4JtjuV5ObpwUoV5CyK8xiNKTY3ie5nBFtdajAvYYY4O_HliZd6C1K2QWBerYnU7rSWbxyzz9fru3ZOAktkq6KprjuMe8Caa9mvmmdZZIhVf-1neQEdOmVgDseu1SFGU=
- Scope 1, 2, 3 emissions explained - Circularise. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQH3JUCXsiWJr8YKgftUwY3qmru1Uev9OzdnceXDFECye5UacxPf_AfH05YB6uNtry2Fz1rHlc5uPiTUjKF1gdH_ojT_Eoj4m3DTsjgXMIDKS9hw0xgwwwKlIZ6o_gjjtrXfQyMHjRmVP77vFQe6_KroGpjf9CRitPqdzjU=
- GHG Protocol Releases New Land Sector and Removals Standard - Circular Ecology. (2026, February 02). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGtj92M-XTCObNWN_Z7bb8V-h7UuriQYb8Vsk9jif0slkDibYP-nkY1Vefy51EemMBiGMMbjZM-

P8npTrEJDDX7UDcMAKawI2hzuGgUbGIocqBCSYRtJoxKnHqFosarWb
90DoVlwylBF8Bq7znZ8HEX3gOqFYBlnYjocyUTSHQUNYBtQCPDjcN5
_fsvx5GhgM4HI58FvBY=

- Decoding Product Carbon Footprints: Methodologies and Benefits. (2025, January 16). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEEhi4TX0XMA72Ac9EAzCKrtwX54LfMYdYwEp34gjzlQ1s9OZuSCUHI9_Dz7ss_LnDMGuCHZsywppsrVa24_XycLhQ5WlwyO3g5ynQK8-vbSjKf19p5kGyZi-A_Wfzx1JmNK9mv8D2pPpO4OvK-vFFNe0lpOrKe6onBcOeADNcXqK_BnlMy7TLHNE5le-GYpE4_5XJajmqwY94u_gqVOqX3Og==
- Product Carbon Footprint (PCF), Explained - CarbonChain. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEHc8ai2SvsCdTQP678yH_9kXZNMmh1_ipc3jG-g2pRCNaGrOo5FfbgskkhswX92bL1BJPlkpYBIkiSYoNzkFO1GYjZ1VEE66catZr4M4hV_9R_Yt00WY6b2L5JM9Ljy-yLyLkWK-9287lCGu_IYv_QpeuFEaMFtZvZPdXnEkQfm_w==
- Landfilling vs. recycling in the U.S.: A policy and systems perspective on carbon footprint and end-of-life uncertainty. (2025, November 22). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQFssFT7jGEoz9PIRmAYGlCfr0LGsmYcTQdoPm7a47QZLuE599teKsqYa1sgDUOjo3ns7KaUx2tLWq-OmXHHj-PBVjplYWeK7Q6LL0Ha9B_KDx3yc-u7UvYMuEp2ZUoPKM7y94okoeUIOpY9ya5hSm69jIBNEb_D3JSI1WzeRE6NuA==
- Product Carbon Footprint: A Clear Guide to Sustainability Metrics - Vaayu Tech. (2025, March 14). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEdb6eSFdEw_n4IAmb8dpHy2bj1cIIHNSwh0asIZwBAie39Vx8ZkrZRxeZCshHs8rq7JRny9uYu6PQPVTwNudvL09ADmNcylFnuclmWHmB8aB8Nm08YA_SB2IIPb1afvcY7rcH28pdozUbZBL1bNMuqOWcU=
- Product Carbon Footprint (PCF), Explained - CarbonChain. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEHc8ai2SvsCdTQP678yH_9kXZNMmh1_ipc3jG-g2pRCNaGrOo5FfbgskkhswX92bL1BJPlkpYBIkiSYoNzkFO1GYjZ1VEE66catZr4M4hV_9R_Yt00WY6b2L5JM9Lm-yLyLkWK-9287lCGu_IYv_QpeuFEaMFtZvZPdXnEkQfm_w==
- A Practical Guide to Product Carbon Footprints (PCF) - Breeze. <https://vertexaisearch.cloud.google.com/grounding-api-redirect/>

AUZIYQG5irfBPskUhUg3Gb5-
noJe4hVLk1FiX0SWXDuWyWvVdvE7aUkXv9pUSd9XQPuZLnQjE2pg
QwKbh6K0MynME1VD4RXJOnLfwl8Kw0yA_Q5JuaRibwRTnFPuKlfY4l
oLuf8j0I0bVN4MOK_pv0M3cwf4eGD_OL-5FA==

- Product Carbon Footprint Methodology | Latis Help Center - HowGood. (2026, January 21). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEItFBCzjByoSTcmLabIDWG_iPBUISzICD1sa9MZSnHN_oltkWdG9ESei9Geo7yj1LDq3IExTNVmrMMcWDlqc3xTG_jqX14HA-hhHbM5vcP9Gqf6lYlQS2EL_Oa8SfkmGhw1wSYpQtyg96lky0WiHliM MqkRTrqwNtHouSBuMr48msBt8_M_1yuAxuhVboC6Gud
- 8 Freight transport emission factors. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQFq5Ds4vTcPJw3fIWfnSV2AkN2_2MqFTFwLZLHmj1f3Zk9W9oaOK-fU-_crUjh353ipGbHn116o375zkMAAtymqUWcLCkArrbahb778gObN4iXm Qd_ojudsuH1OrMjfSCdneRYXDluzwwsQzYpfLKm2Q7TY5Dd1gRmi_GiK1
- From Landfill to Lifecycle: Reducing Waste Through Recycling - Global Ardour. (2025, December 27). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQF8A4LnESMx4_ycuwSlJukxtvgeW3CaB0SjySSgQ4CmKnufYC98ydLfeqVFXA419ARnRqV-E6iB1hGsa3gCbKj0C8qE7Lo0S7BtRv9Ah_j-TddEcZ2bRD7QusM75x3vV1QO8XRR-87QguvSVXDDvW6k1fm1mFf1cte1o-9jfx_i6oDQ4dBK5ZZQ0EKwq-rQ9j1L
- Recycling Basics and Benefits | US EPA. (2025, September 02). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQFzL5NCdP23GjpHrHjPmWw5Puj_UE2DjhGQRdoAK9ySbx-m7nqQ1aA1D-l-bDrXcy-AvmMTFaX-2w5wnpb_diK9InWy6TNdecl7HQmWPyY6BvAQVzoWQuFMRtmtAYUKYM2KKDSIG4Q3PSATEjsdOXJ7GKR
- Aiming for accuracy when calculating freight emissions - ClimaTiq. (2025, March 03). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGeC_Uw5aafBXxilqfakwFTRIRLmib8NUO-iGsKZAW5JVAv9sK8nA8BaTp9m_zvJmcAc3_BqmJDmTQ7UwhQJV70i-PEsIJG3IN_VRxBG02Xu6JOjTTZEgeLqfgmlAtPk2W4xlz2RrNTA10oJk396RV96aHvF6zZIF-Pr5L5rNFM=

- Landfills vs. Recycling: The Environmental Impact You Need to Know. (2025, May 09). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQFveodYSf50a3ESFmOGuH1s9WH5uIXWc2DdsDuYKQxJTukR5KUI-LP-J4N6kZRDolSLKvI9YWWMB0iE2VsGCeDfDvijVTWTB1I6Z0shwFCHfeOcNu_-yOE6jOhJfjXlfxagNSK77dFiA-pyYDlrFpBQG9ljegQ9qt71_s5m6GDZ8yhOqveLS9JkogKBD1keFL7ZA0bT6EJHSA11gyb0rMOx5NeEQ==
- Air-Sea Freight CO2 Emissions Calculator: Comparing Carbon Footprints. (2026, April 23). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQEIqrVpDVSHIaUQ9QyrTXe5f6EfwOlhhd97ODZ_ebRoVhN6tt9RxhP-8dyzgGkLWYk6rnSatuKOAP9dRsfWZmyHfrl1iEZvAX94ZDxtndsoFv5TXao9BdTcCvYbzOOcRWh_SALQM4rKL3smZcF2d2-tk2z87HXSUeuAqT26J5LoIXpNh4q9bZcykXKLcfLjZNWI21luuDF48nahRyEbSxfEmB2oHPmuTN4ng_dftzo=
- Incineration vs. Landfills vs. Zero Waste: 2023 Life Cycle Assessment for of Delaware County, Pennsylvania - Energy Justice Network. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQF_uivbqASPFwMkbL_uf2ReWubQnzuzMpkgxf0PIOzl4Z9L7fqnmk5ABTMotQpfxqJoFf15i7LuyrpucsXfKFJ08GogsCD6gEKZlOPaRxMbrEl_2g3r3Im2C5eCPm63meiXM1K4mbZp7liA9Nys5Wgw6CyQ
- Freight Transportation | MIT Climate Portal. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQG8Dsv_qIM4k0L59hRBzSWgLnIJOJBKM4cDRd-vel3uI1WP61FUczkeMVXrgYJUigOc66RSDXalcOCcrVAT30zMP5K0eD_gPcbl_H-u2Kh5qbhzXrLE8fC9V0q7k5HU-cbFpY8YuShGh-Ne7LjzjPJ8mJcG
- Emission Factor: Electricity supplied from grid | Energy | Electricity | China - ClimaTiq. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQFzeRWwp-54JOrQRTiMuGWduvOlmgJ1MEJZDrppiuk5NyWU8Nzl_pk4SuSUPH0f2km-jmy-YTssowEzVq1PtS8bbMS1e2Gr84ey0E5zfwf-CwbtnrYaebfMW2AuzAjsSoxW5nfgF5uzDgII5sBGXPO-QAvnQb8tfijj8-F9kFZoDogobpRWs0R2AVu21
- FreightosCO2 Emissions Sea & Air Freight Calculator | Freightos. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQF9F07cqV9TsuQ9Ft_yhg3QKMKpnyqjN6LfxCFG_WSIRec9xX

_If_2WsFnHkXwn45mZsZY_I3SGFv94y0j478Kbl93bPow8OBhwWFWj
lOydqpZuB8PeqBCp96B1xRFpaMWu-
fWKb4RguMoyZHcrIFqfnXBad2SVDOCCbBjVML02j5RzLxxrbczCman
LxbmmQ==

- Emission Factors for Greenhouse Gas Inventories - EPA. (2024, June 05). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQH8zm0FHsTKKufSaj1w7TpyrVKEu10dR3NJMRNxmJm7VoxQwHLBRI02YhwgY_CpDIYWeL7ljDleSn3PXeLhC3n5kp1dRhbrVCQZTnc7wcn-Pg3ptYY8Ttv3-l4kNtj8ZapFD5FrbYjAS-4npsLXyLNk_9fhhQ49GqkS3QE2zQ227wje56ZLLu9wOOlrrVLb
- Emission Factors for Greenhouse Gas Inventories - EPA. (2025, January 10). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGd0Pl6sg6B4diSjrEC-6J_qUVMEzhz50_jvxYJ5vhWHiKDzDwZzkBayg2JIYmdiDSnVG3mdMZ3X-tLIC6zjgZJBuzViuLd0qkAmbfktV1glve9WIPS843_z4jhCu15QLcCnoM1Ull3-9Ad2P9TRYa8KW8w3o_p6VikILWiKQAhkSvcRBv6H6Xofn4R3720
- A Quantification Method for Determining Emission Reduction Factors due to Recycling in California. (2011, November 14). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQHuaBzp_gu8HRX9JU8pcXan6JVPj4yxDcfGUTv0llpNKYXgdmTNLeDaTbOEdvz4pGvCuCiy-V1XgmiwxQs0g1DFHlyjO6o73474DrXeHv42czKC9NPWeLNDHZzzR9Z0tMQ_BZ7fwSpl3cSPhylw2Qh0wX5PZLj63TTROZDYC3gyN6pyvyNlm6dLjZopd5I6
- EMISSION FACTORS 2025 DATABASE DOCUMENTATION. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQHvbH9Dk-4p8aGo_m9_S610W0e4LWpbLGLO5YT_Bcvon6ph8hZcpcnmAn7DaX_2YsR2jikkv8apg7XR6WSaHhjoKllsHkj1rvtKncaUsLuXuYlgNOF09n3QUkcUnvITg6TmChw3-pqEz6LaMK6CWSjtydBR2HzFTd2cNmlvgWF1xSKTvjBeaNPPHa1H-rukjGlu_xz3iVTdyyDAmLeK7rYpuq6rgS1flGxIX9fbVx
- International Electricity Factors 2025 | Global Carbon Data - carbonfootprint.com. (2025, October 15). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQHv4__x8fUACDJEHmVPr21R3o0GeG8CDdpkbDbM6F27LhThSyrS1uYmyApd_UpyEgGRstlMT4MMdDPrtcPTCWce1x8n6WmY5DwF

AkmpserlymzlzYOIRX9blczwnv0CaTty8gn8I7-
I3UmGd6RDOOkcoOkATUavujR5JGrfs75fRw==

- Decarbonizing China's grid: provincial grid carbon footprint factors and export-embedded electricity emissions from 2020 to 2060 - OAE Publishing Inc. (2025, October 30). https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQHYDCrSF7VE3IdRVuP33hejHoBctCALb9bZW4LwQpilEhWFJVU9ucfORPPSxC2DDyjdUXvPbo9FNECgRc4nMD7vlbb1ou414KeClb9gFC_08ts2IBgMNIOSIfmS9-Ur55C_dpjpuwlf9Q==
- Emission Factor: Aluminum production | Materials and Manufacturing | Metals - ClimaTiq. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQF7KMoMwgcWq0WDbOxKpXmnG3Tp85Q1IOF2ULAKI9uLrHaon1lgxyjiAyYkXS93A4ap1v6dVzuVkBPC5IfvDfIBASnhlf3j4z0G2BPuhuhEAazB_ZMRsbv-IGfYIVG2oDoIJo5IB9YQJevUq4ACA47LdfmoVH3OKnCyvq9hgUuQwb-K71eK1NfjXSDV
- China - Countries & Regions - IEA. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGvJBGdel1TeQRuzG8Ej7Dus8B6Mwymulz8QnuCHUzmqPVwWLUE4mZWzsogjwoxUNByQkowgDX1UZTKB5c-tDxA2XxRy5VB_yKG6w5GcD4m-1DcTdz9G_0HXvnUte0=
- Emission Factor: Steel production | Materials and Manufacturing | Metals - ClimaTiq. https://vertexaisearch.cloud.google.com/grounding-api-redirect/AUZIYQGj71z5dQwzxVZbZPOB9Wq3Fi58TOKS4PnsF0Ann4DIjl_Re6fWOrppj9neVip0Uy8lagNWiNqKOvoJKAreXdj2WIZpfqypN0sw7fLnLO1ueBLL4SrgzzlYk4ZVdpLk5n_ROahifvU-IZbNt7SEIIC0JRD4P8DoBStKQ1SvLsII0mZUQd3uyGx2ckAp