HowGood Methodology for Calculating Scope 3 Emissions

Who is HowGood?

HowGood is an independent research company with the world's largest database on food product sustainability. With data and analysis for more than 33,000 ingredients, chemicals, and materials, HowGood helps leading food brands, retailers and investors improve their environmental and social impact. Through in-depth, ingredient-level insights on factors ranging from greenhouse gas emissions to animal welfare to labor risk, HowGood data powers strategic decision-making for the sourcing, manufacturing, merchandising, and marketing of sustainable products. Brands identify opportunities to improve sustainability, drive greater transparency, and empower their consumers to make higher impact purchases. Visit howgood.com for more information.

What is HowGood's approach to research?

HowGood has more than 15 years of research on global food supply chains. The team consolidates and analyzes findings from over 600 accredited data sources and certifications. These include a range of resources such as international frameworks, NGO guidance and standards reports, peer reviewed life cycle assessment studies, journal articles, academic conference proceedings and texts, aggregated commercial databases, targeted industry studies, NGO research, government publications, and news reports from reputable outlets. HowGood employs the most industry-recognized methodologies and incorporates the latest scientific research. Metrics and impact assessments are updated on an ongoing, iterative basis, making HowGood's platform the leading-edge tool for product sustainability. In turn, HowGood is able to provide impact assessments that are accurate, comprehensive, and the most up-to-date. Through HowGood's sustainability intelligence platform, Latis, we are able to scale this approach across products, brands, and the entire food industry.

What is HowGood's research methodology for calculating carbon emissions?

HowGood's methodology for calculating GHG emissions is developed in accordance with the GHG Protocol, with special attention to the Product Life Cycle Accounting and Reporting Standard.

1. **Data Collection:** HowGood draws on a diverse collection of data sources, including peer reviewed journal articles to calculate the CO_2e values for ingredients. For each data source, HowGood performs a data certainty assessment based on the age and comprehensiveness of the findings. This process is completed for every ingredient on which there is accurate and verifiable data.

2. **Ingredient Mapping:** Once the data is collected and analyzed, HowGood conducts a proprietary process of mapping each ingredient to its source crop, animal or material. Using global import/export data and HowGood industry partnerships, HowGood then maps each source crop to its corresponding geographic location to account for the specific on-the-ground practices, impacts, and risks in each locale. On-farm emissions are multiplied by the ingredient concentration of the product's ingredient to account for the total amount of material required to grow or raise the ingredient.

3. **Data Aggregation**: HowGood, to date, has mapped nearly every ingredient, chemical and material (33,000 in total) in the CPG industry, including where and how it is produced. This mapping is used to aggregate data across geographic regions or ingredient categories and develop industry-average impact profiles for CO_2e across every ingredient.

   Based on the ingredient mapping process, HowGood assigns a default location and corresponding industry-average profile for every ingredient in a product. If deeper levels of data granularity are available (from a specific supplier, industry partner, or publication), these specifics are applied.

What data sources does HowGood use to assess GHG emissions?

HowGood draws on a diverse collection of data sources, including peer reviewed journal articles to calculate the CO_2e values for ingredients. For crops and locations where no current data exists, HowGood uses supplementary studies and relevant LCAs from proxy locations where environmental conditions and farming methods are deemed as similar.

Sustainability (Journal)
International Journal of Life Cycle Assessment
FAO Database of Greenhouse Gas Emissions from Agriculture
Journal of Industrial Ecology
European Space Agency Climate Change Initiative
Agribalyse
The Sustainability Consortium
Journal of Cleaner Production
Greenhouse Gas Protocol
USDA LCA Commons Life Cycle Inventory (LCI) database
United States Department of Agriculture
Global Logistics Emissions Council
ESU World Food Database
Savory Land to Market Ecological Outcome Verification
Regenerative Organic Certification
Roundtable On Sustainable Palm Oil
Palm Oil Innovation Group
Carbon Neutral
Soil Carbon Initiative
EcoCert
Roundtable on Sustainable Biomaterials
Rainforest Alliance
Cradle to Cradle
Nature Climate Change
Carbon Neutral Certification
Life Cycle Data Network
ReFED Insights Engine
Global LCA Data Access Network
World Data Center for Geoinformatics And Sustainable Development
USDA Ag Data Commons LCA Collection
Carbon Trust Standard
World Agroforestry - ICRAF
Farm Carbon Toolkit
OpenLCA
ResourceWatch
Consultative Group for International Agricultural Research
Stewardship Index for Specialty Crops
Carbon Disclosure Project
Evidensia
PalmGHG
AdaptWest Climate Resilience Data Explorer
Information Processing in Agriculture
European Life Cycle Database

How does HowGood calculate Scope 3 emissions?

The values provided in HowGood's Scope 3 Report include emissions due only to sourcing the ingredients tracked within HowGood's Procurement module. A company may have other sources of Scope 3 emissions due to other operational activities that they should include in their Scope 3 disclosures. The report includes two categories:

- **Category 1:** Purchased Goods and Services - This considers Cradle-to-gate for the procured material.
- **Category 4:** Upstream Transportation - This considers the last leg of transportation of the procured material.

GHG Protocol Scopes and Categories	HowGood Carbon Life Cycle Stage
Scope 1: Direct emissions from owned/controlled operations **Scope 2:** Indirect emissions from the use of purchased electricity, steam, heating, and cooling	
Upstream Scope 3 Emissions	
Category 1: Purchased goods and services	Cradle to Gate of Procured Material
Category 2: Capital goods	
Category 3: Fuel- and energy-related activities (not included in scope 1 or scope 2)	
Category 4: Upstream transportation and distribution	• **CPG** – Transportation to manufacturing facility • **Ingredient Supplier** – Transportation to ingredient manufacturing facility • **Food Service (restaurant)** – Transportation to food service location • **Food Service (meal delivery)** – Transportation to storage or delivery warehouse • **Retail** – Transportation to retail
Category 5: Waste generated in operations	
Category 6: Business travel	
Category 7: Employee commuting	
Category 8: Upstream leased assets	
Other	
Downstream Scope 3 Emissions	
Category 9: Downstream transportation and distribution	
Category 10: Processing of sold products	
Category 11: Use of sold products	
Category 12: End-of-life treatment of sold products	
Category 13: Downstream leased assets	
Category 14: Franchises	
Category 15: Investments	
Other	

Source: GHG Protocol Technical Guidance for Calculating Scope 3 Emissions

Category 1: Purchased Goods and Services

Category 1 includes emissions from the cradle to gate of the procured material. For simple ingredients, this is on farm activities, the transportation between the farm and the facility where it is processed into an ingredient, and the emissions due to the processing of the ingredient itself. For complete food products, this includes the on farm activities, the transportation of ingredients between the farm and the facility where they are processed into ingredients, and the emissions due to the processing of the ingredients, transportation to the final product manufacturing facility, and the manufacturing facility itself. In the event that there are multiple processing or manufacturing steps, those additional stages and transportation between them are included as well.

$$Category\ 1:\ Purchased\ Goods\ and\ Services\ =\ \sum_{i=1}^{n}[a_i(x_i)]$$

$i\ =\{1,\ldots n\}:\ \ materials\ in\ the\ portfolio$
$x_i:\ cradle\ to\ gate\ emissions\ of\ material\ i$
$a_i:\ amount\ of\ material\ i\ purchased$

FLAG Emissions

FLAG (Forest, Land, and Agriculture) emissions are a component of the Farm to Farm Gate Emissions stage, and must be broken out separately in accordance with FLAG Guidance as established by the Science Based Targets initiative (SBTi). Note that FLAG emissions are still included as a component of Category 1 emissions.

The following categories must be measured and broken out for FLAG reporting:

- Farm to Farm Gate (Land Management) emissions: any activity occurring on the field where a commodity is grown
- Land Use Change: any land conversion that has occurred in the last 20 years
- Carbon Removals: any carbon that has been removed from the atmosphere due to on-farm activity

Farm to Farm Gate Emissions

This stage covers GHG emissions due to the growing and harvesting of the material used to create an individual ingredient in a product. The material could be a crop, animal, mineral, or petroleum product. HowGood asks the customer to provide a source location for the crop to provide the best data. If the customer does not know the location where the crop was grown, HowGood uses the most likely location where the crop would be grown.

GHGs are collected at farm gate, which includes all on-farm processes including primary inputs like fertilizer, pesticides, herbicides, and farm machinery fuel needs. On-farm processing, cooling or

fermentation, and off-farm cleaning and sorting are included. The farm emissions are then multiplied by the ingredient concentration of the product's ingredient. We include all of this in x_i in the equation above.

Measurements are directly sourced from location and crop-specific Life Cycle Assessments (LCA) from all over the world as well as environmental assessments.

Land Use Change

Land Use Change is measured in kilograms of carbon dioxide equivalent per kilogram of product (kg CO2e / kg), and takes into account the following factors to assess emissions:

1. Land conversion or transition - Whether land conversion or transition has occurred within a landscape or jurisdiction over the preceding 20 years, in the form of deforestation or drained soils. We include pasture in our calculations, in addition to traditional cropland. This data is reported by 245 countries to the United Nations Food and Agriculture Organization (FAO).

    a. Product allocation factor: We take the shared responsibility approach to allocating emissions to any crop that was grown in a given jurisdiction that has experienced land use change. This approach attributes land use change emissions based on the percentage of land that a crop has occupied during a given year.

    b. Time discounting: We take a linear discounting (or "20 year decline") approach to distributing emissions over the 20-year assessment period. This approach weights recent land use change heavier than it weights older land use change.

2. Crop location - We consider the jurisdiction of the crop's location, at a national level.

3. Crop yield - We take into account the production yield of the crop in order to calculate land use change emissions per kilogram of product.

4. Ingredient concentration - We take into account the ingredient concentration value of the crop.

5. Regional feed mix - For animal-based ingredients, we consider the breakdown of pasture, soy and palm oil in the typical animal feed mixes regionally as well as the amount of feed required to produce the ingredient. For farmed aquatic species, we consider the soy in the typical diet as well as how much feed is required by the species. Regional feed mixes are typically reflective of the crops that are predominantly grown in a region, the affordability of crops and generally accepted animal welfare standards. As we increase the granularity of our Land Use Change assessment, we will add additional feed ingredients to reflect the variability of feed mixes throughout the world.

Carbon Removals

The impact of Carbon Removals is calculated as kilograms of CO2 equivalent per kilogram of the primary commodity ingredient. GHG removals include things like improving forest management practices, and enhancing soil carbon sequestration on working lands.

Carbon Removals are calculated following the submission of primary data from the customer, as specified by the GHG protocol. The primary data required for submission to HowGood is as follows:

Including removals in a GHG inventory requires primary data, ongoing monitoring (and reporting of removals as emissions if monitors are lost), traceability, and quantitative uncertainty estimates.

Stock Change accounting (for land emissions and removals) must be used and cover:

- Biomass
- Dead organic matter (DOM)
- Soil Carbon Pools

HowGood then uses the submitted primary data in the stock difference method as defined in the GHG protocol.

Transportation from Farm to Processing Facility

To create this metric, we multiply the weight-distance traveled by the emissions factor of the mode of transportation used. We use the Global Logistics Emissions Council (GLEC) standard, a GHG Protocol approved industry source for global transport emissions, as our source for emissions factors. Emissions factors are based on tonne-kilometers converted to kg-kilometers to normalize against 1 kg of product maintained in the HowGood database. HowGood customers don't always have visibility into the methods and distances of transportation between the farm and processing location so HowGood uses proxy data.

Transportation distances are calculated using arc distance calculations between state, country, or region centroids. For inter-region transportation, half the distance across the region is used.

Transportation within North America or a single region is assumed to be via truck. Transportation between countries outside of North America is assumed to be via ship. The final transportation emissions between farm and processing facility are then multiplied by the ingredient concentration of the product's ingredient.

Raw Material Processing into Ingredients

Ingredients are assessed for energy requirements of processing raw materials into ingredients. For example, wheat flour would have all stages of milling energy requirements assessed including washing, grinding, sorting, and sifting (and bleaching when applicable). **Excluded from the processing energy value** are overhead operations, employee transportation, and manufacturing of the equipment. HowGood then uses the grid mix at the processing location to calculate the associated emissions due to the ingredient processing. HowGood sources these values from papers and reports, LCAs and techno-economic assessments.

In many cases, as it is with some extracts, or supplements, multiple parts of the processing have been accounted for where industry standards can be applied (ex: for safflower extract applies alcohol solvent extraction/spray drying process). We account for each part of the processing where that information is provided or where we can safely make standard processing assumptions. Where this information is not available or assumptions cannot be safely made, and an ingredient has multiple processing types associated, the most energy intensive processing type is used.

We use region grid mix values to determine how much kg CO_2e is emitted per unit of energy when the likely fuel to be used in a process is electricity. We have these grid mix values for US states and most countries and are still developing methodology to calculate them for other compound regions (sub-national and supra-national). For fuel types other than electricity (e.g. direct burning of natural gas, coal, biomass etc), we use the carbon intensity of the applicable fuel.

Transportation from Processing Location to Manufacturing Location

This stage covers the emissions due to transportation between the ingredient processing and final product manufacturing locations.

See **Transportation from Farm to Processing Facility** for details.

Product Manufacturing

Manufacturing is an assessment of the energy it takes for the factory manufacturing needs of a given product.

To calculate GHGs associated with product manufacturing, HowGood uses the product type/sales category and location of the manufacturing facility. Products are grouped into categories based on similar manufacturing processes. Customers can choose the manufacturing type which best describes their product, or HowGood can make a reasonable assumption based on the sales category.

The energy needs of each process or subprocess associated with the production line is collected/estimated from energy or environmental assessments and life cycle inventories as MJ/kg product. They can include refrigeration and lighting but **exclude overhead operations, employee transportation, and manufacturing of the equipment**. We base our estimates on the manufacturing category of the product (frozen entree, cold case milk, chips & snacks, juice beverages, etc). For example, the manufacturing energy required to make yogurt or kefir would include mixing of ingredients (fruit,

etc), culture/fermentation process, sterilization of equipment, sterilization of jar/vessel, heat sealing process, and refrigeration.

HowGood then uses the total energy consumption and the carbon intensity of electricity at the manufacturing location to calculate the associated emissions due to the product manufacturing.

When customers have conducted product LCAs and can provide manufacturing energy data with enough granularity to map to our inclusions and exclusions, we can ingest that data and create a customer and product(s) specific manufacturing type.

See the last paragraph in **Processing** (p.6) for limitations and planned changes.

Biogenic Emissions

HowGood has conducted extensive research into the types of processing that are associated with different types of ingredients. This enables us to calculate biogenic CO_2 emissions from biofuel combustion associated with any processing or manufacturing machinery used to produce an ingredient. This aligns with SBTi, GRI and CDP reporting requirements and industry best practices, which request information relating to biomass/biofuels.

HowGood's Scope 3 Report includes a line item separating biogenic emissions from your overall Scope 3 (Category 1) emissions.

Category 4: Upstream Transportation

Category 4 covers the transportation of ingredients between the facility where they are processed into ingredients and the facility to manufacture the final product.

$$Category\ 4\text{: }\ Upstream\ Transportation\ =\ \sum_{i=1}^{n} a_i w_i$$

$i\ = \{1,\ldots n\}:\ \ materials\ in\ the\ portfolio$

$w_i:\ transportation\ emissions\ of\ material\ i\ to\ company\ owned\ operations$

$a_i:\ amount\ of\ material\ i\ purchased$

Transportation of Procured Material to Company Owned Operations

To create this metric, we multiply the weight-distance traveled by the emissions factor of the mode of transportation used. We use the Global Logistics Emissions Council (GLEC) framework, a GHG Protocol approved industry framework for global transport emissions accounting and reporting, as our source for emissions factors. Emissions factors are based on tonne-kilometers converted to kg-kilometers to normalize against 1 kg of product maintained in the HowGood database. HowGood customers don't

always have visibility into the methods and distances of transportation between the farm and processing location so HowGood uses proxy data.

Transportation distances are calculated using arc distance calculations between state, country, or region centroids. For inter-region transportation, half the distance across the region is used.

Transportation within North America and intra-region is assumed to be via truck. Transportation within Europe is assumed to be via truck with an EU specific emissions factor. Transportation between other regions is assumed to be via ship.