

Vaayu Methodology

Klarna Post-Purchase GHG Estimates

About

Klarna.

Since 2005 Klarna has been on a mission to revolutionize the retail banking industry. With over 150 million global active users and 2 million transactions per day, Klarna is meeting the changing demands of consumers by saving them time and money while helping them be informed and in control. Over 450,000 global retail partners, including H&M, Saks, Sephora, Macys, IKEA, Expedia Group, and Nike have integrated Klarna's innovative technology to deliver a seamless shopping experience online and in-store. Klarna has over 6,000 employees and is active in 45 markets. Klarna believes that conscious shopping should be effortless and launched its Carbon Footprint Tracker in 2021, which enables millions of users worldwide to see the climate impact of their purchases in the Klarna app. Klarna partners with Doconomy and Vaayu to provide average kg CO₂ estimations on the product and transaction level. This represents one of the largest awareness efforts on carbon footprints ever made.

About

Vaayu

Vaayu is the world's first automated carbon software that empowers retailers to track and cut their climate impact in real-time. The software estimates the carbon footprint of completed online product purchases by consumers using Klarna. Automated calculations are generated within the framework of a cradle-to-grave life cycle assessment (LCA) approach. The LCA approach followed by Vaayu is guided and informed by relevant international standards, including ISO 14040, 14044 and 14067 and aligned to core foundational principles of leading standards such as the Greenhouse Gas Protocol. It incorporates all relevant life cycle stages of the purchased product and relies on the best quality data available, according to the rules and goal constraints set forth below.

?

Note on Uncertainty

Like all LCA-based calculations, Vaayu's calculations for Klarna are estimates that are subject to uncertainty. The level of uncertainty may be high for many products, because calculations are automated and access to primary supply chain data is not currently feasible. Estimates are based primarily on third-party data (including global average data) that is not directly related to the production of the specific products analyzed.

Even so, product-level estimates demonstrate greater accuracy and specificity than comparable enterprise-level solutions such as spend-based methods (assigning emission values based on the value of products). Vaayu is consistently improving its approach by, for example, working to obtain streamlined access to more product and supplier-specific primary data that will result in accuracy improvements over time.

Additionally, Vaayu's modeling software currently calculates only greenhouse gas emissions expressed in carbon dioxide equivalent (CO₂e), which causes climate change. Other environmental impacts, some of which may be significant for individual products (such as impacts on water quality or resource depletion) are not analyzed within the current approach.

Goal and Approach

The goal of the calculation process is to provide informative carbon emission estimates for users about the impact of their completed purchases with Klarna. To achieve this goal, calculations must be performed in real time at scale, requiring reliance on a combination of automated modeling, product category information, and the most relevant third-party emissions data. A visual breakdown of the calculation process, along with planned future improvements, is shown in Figure 1.

Calculation Process

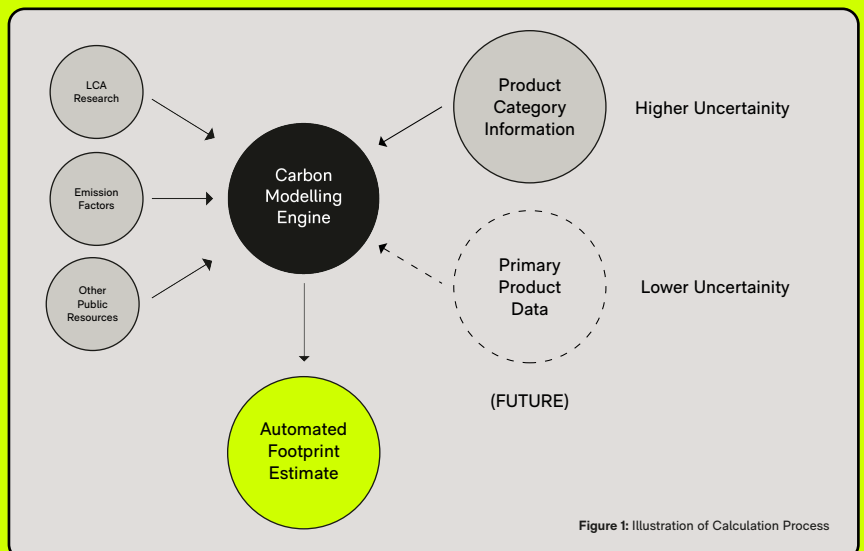


Figure 1: Illustration of Calculation Process

System Boundary

Product footprint estimates calculated by Vaayu's Carbon Modeling Engine incorporate all relevant life cycle stages within the boundary of the product system under review, such as raw material extraction, raw material processing, product assembly, distribution and deliveries, use phase, and end of life (see Figure 2 below).

Significant processes considered within each lifecycle stage can vary for different product types. Likewise, the level of contribution made by individual stages to a product's footprint may vary significantly across product categories. For example, the "use phase" of a sweatshirt may occupy a much greater share of that product's overall emissions (due to washing and drying) than the "use phase" of a beauty product. Processes of minor importance that would not significantly impact the footprint result for an individual product (such as emissions from employees commuting to work, corporate office lighting) are excluded from the product footprint estimates.

Lifecycle Stages for Consumer Products



(Percentages are for illustrative purposes only)

Raw Material Extraction	29%
Raw Material Processing	10%
Product Assembly	21%
Distribution and Deliveries	12%
Use Phase	15%
End of Life	13%

Figure 2: Illustration of System Boundary and Lifecycle Stages

Product Definition and Assumptions

Vaayu currently calculates the emissions of Klarna products at the product category level. This means the emissions displayed for a men's t-shirt of a given brand, size and composition incorporates assumptions about an average "t-shirt" that are common across the product category (such as average weight and composition).

Data Sources *and* Selection Process

Vaayu's Carbon Modeling Engine is designed to compute a combination of **primary data** provided by brands and/or manufacturers (from direct measurement of a known process, which may be site-specific) and **secondary data** (from published and peer-reviewed literature, established emission factors, and other representative data). Vaayu's Carbon Modeling Engine prioritizes primary data in all cases where available, which can be added via manual enrichment or automated extraction.

Vaayu's existing LCA database comprises over 600,000 data points, derived from reliable third-party sources as outlined above. Included data are assessed and categorized by Vaayu based on standard quality criteria such as geographical coverage, temporal relevance, technological coverage, completeness, and methodological quality, such that the most relevant and reliable data points can be automatically selected when computing a product footprint.

In the case of Klarna (a third-party payment platform that cannot feasibly access primary data for significant product-level processes at this time) available data regarding individual products are extracted automatically from Klarna product information. Vaayu's Carbon Modeling Engine then uses this information to draw upon the most relevant existing emissions data available for the product within Vaayu's LCA database. A simplified version of the process is illustrated above in Figure 1.

Vaayu and Klarna are working to incorporate more specific product composition data (i.e., beyond the product category classification) and supplier-specific primary data for future iterations of the footprint estimates.

Greenhouse Gases Covered

Although we often talk of “carbon” emissions, carbon dioxide (CO₂) is only one of the gases that causes climate change. Footprint estimates calculated by Vaayu are expressed in kilograms of carbon dioxide equivalent (CO₂e), which also accounts for other relevant greenhouse gases, including methane (CH₄), hydrofluorocarbons (HFCs), nitrous oxide (N₂O), sulfur hexafluoride (SF₆) and perfluorocarbons (PFCs). Vaayu uses the conversion factors from IPCC's Fifth Assessment Report to translate the different warming potentials and atmospheric lifespans of these greenhouse gases to CO₂e.