



Methodology to Calculate Downstream Transportation and Distribution Emissions



ebay



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INTRODUCTION

As eBay progresses on its decarbonization efforts, understanding the emissions associated with eBay's downstream transportation and distribution (T&D) is a priority for internal and external stakeholder engagement. eBay's downstream T&D activities are limited to post and parcel services, and the associated emissions account for a significant majority of eBay's total emissions footprint. eBay is committed to providing transparency into its carbon footprint calculation methodology. Additionally, developing a detailed methodology tailored to eBay's diverse and global shipping model, enables accurate and verifiable emissions measurement to help eBay manage downstream risks associated with climate change, increased operational costs, and supply chain disruptions.

eBay, in partnership with an external consultant, has developed the following methodology to track and measure its downstream T&D emissions. eBay's downstream T&D emissions are the emissions associated with the shipment of products sold on eBay's platform from eBay sellers to buyers.

KEY CONCEPTS

Transaction

In the context of this methodology, a transaction represents a purchase completed on the eBay platform.

Carrier

A carrier is a company that delivers packages or freight (or both). Carriers can move goods by air, water, or land. For example, major package delivery carriers in the U.S. are FedEx, UPS, and U.S.P.S.

Transportation Mode

Transportation mode refers to different ways by which goods or people are transported from one place to the other through land, air or sea.

Transaction-based emissions estimate

The transaction-based emissions estimate is an emissions value based solely on eBay transaction data.

Transaction + carrier emissions estimate

The transaction + carrier emissions estimate is an emissions value that uses both carrier-provided data and transaction-based emissions estimates. Transaction-based emissions estimates are used only for transactions where relevant carrier-provided data is not available.



DATA SOURCING & COLLECTION

eBay's downstream T&D emissions are calculated in accordance with the Greenhouse Gas Protocol (GHGP) Corporate Accounting and Reporting Standard and uses emission quantification methodologies from the Center for Corporate Climate Leadership Greenhouse Gas Inventory Guidance documents for appropriate emissions sources. eBay leverages two sources of data in the emissions calculation methodology: eBay's internal shipment tracking data (transaction data) and carrier (e.g., USPS, FedEx, DHL)-provided emissions data.

Transaction Data

eBay maintains a database of all transactions completed on the eBay platform including information such as the weight, origin zip code, destination zip code, and carrier. Mode data and mile-by-mile tracking of shipment movements are not captured in this database.

Transaction Assumptions

1. Each transaction is equivalent to one shipment.
2. Several items may be included within a single shipment.
3. Shipping costs are paid for by eBay sellers or buyers.

Carrier Emissions Data

To encourage carriers to continue calculating emissions for their customers and improve emissions calculation methodologies, as well as to improve data quality and track the impacts from decarbonization interventions, eBay receives primary carrier emissions data that represent a significant share of eBay's T&D emissions. Carriers provide emissions data directly to eBay as part of eBay's broader carrier engagement program.

Carrier emissions data is used in lieu of transaction data where a carrier is determined to have an appropriate and robust emissions calculation methodology, as carriers have more precise distance, weight, fuel usage (volume and type), activity, and mode tracking data. Many carriers have mile-by-mile tracking of shipments they manage, which includes weight, mode, fuel usage (volume and type), and distance data. Carriers also have more accurate values for their scope 1 and 2 emissions¹ estimates.

¹Scope 1 emissions are direct greenhouse gas (GHG) emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles). Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling.



eBay undertakes the following steps to validate carrier emissions calculation methodologies before including carrier emissions data in eBay's transportation emissions inventory:

1. Determine how carrier emissions are calculated and allocated to carrier customers (e.g., eBay)
2. Confirm alignment with the [GHGP Corporate Accounting and Reporting Standard](#) and the [GHGP Corporate Value Chain \(scope 3\) Accounting and Reporting Standard](#)
3. Evaluate emission factors used in carrier inventories for data quality
4. Ensure carrier inventory consolidation approach and operational boundary aligns with eBay's GHG inventory to avoid double-counting emissions

Additional methodology screening may occur to review carrier emissions for third-party verification.

Emission Factors

eBay uses the latest well-to-wheel (WTW) emissions factors available from the Global Logistics Emissions Council (GLEC) Framework² and the FedEx SmartWay³ program at the time of emissions inventory calculations.

The GLEC framework is a globally recognized standard for calculating GHG emissions from transportation chains in alignment with the GHGP. GLEC also serves as the basis for the ISO 14083⁴ standard for transportation chain GHG emissions.

The FedEx SmartWay program, a partner program of the Environmental Protection Agency's SmartWay initiative, commits FedEx to using fuel-efficient technologies and strategies to lower GHG emissions and enhance sustainability in their freight operations. The emission factors used in FedEx's SmartWay program provide eBay with a more accurate emission factor for US ground transportation.

With respect to emissions calculations, eBay uses GLEC emission factors for all locations and modes of transport, except for US ground transportation where FedEx SmartWay emission factors are used.

² [Smart Freight Centre](#)

³ [View Your Shipping Emissions | FedEx](#)

⁴ [ISO 14083:2023 - Quantification and reporting of greenhouse gas emissions arising from transport chain operations](#)



DATA PROCESSING AND ASSUMPTIONS

Annually, eBay downloads transaction data from internal databases for shipments that originate in or are destined for select primary markets. The markets are selected based on the number of transactions that originate in each market. The selected markets represent the majority of the transactions completed on the eBay platform. The data is then processed as detailed in the following sections to support the emissions calculation.

Shipping Distance

Total distance shipped is calculated for each transaction using the latitude and longitude of each shipment's origin and destination locations. The Haversine formula⁵ is then used to calculate the distance shipped per transaction as it provides the best calculation distance between two points on a globe.

Weight

eBay's transaction database tracks three different types of weight data, detailed in Table 2.

Table 2. Weight Data Categorization

Weight Type	Description	Accuracy/Confidence
Label	Represents the actual measured weight of the package as reported by specific carriers	High
Category	eBay's calculated average weight for the most specific product categorization (e.g., electronics)	Moderate - calculated using recorded weights of similar product types (for example: average weight of all wireless headphones)
List	Estimated weight recorded by the seller	Low - often overestimated

Availability of each weight type varies by transaction, and a small percentage of transactions do not have any weight data available. Each transaction is assigned one weight type, prioritizing the weight with the highest degree of confidence available.

Transactions that do not have weight data are assigned an average weight based on existing transaction data for the applicable origin – destination location pair.

⁵ [Distance on a sphere: The Haversine Formula - Esri Community](#)



Transportation Mode

eBay's transaction data does not specify the mode (e.g., ground, air, rail) for user shipments. As such, criteria assumptions have been created based on origin or destination location and shipment distance to estimate an appropriate mode of transport. The assumptions, detailed in Table 4., are based on typical shipping patterns in each major region and we assume that all shipments travel via air or ground. Rail and maritime transportation modes are not included in these assumptions, and ground and air are the most common shipping modes for post and parcel services. These assumptions are revisited and validated regularly, as the importance of various shipping modalities shift over time.

Table 4. Transportation Assumptions

Criteria	Mode
Shipments in large countries, such as the United States or Canada, under 2000 miles ⁶	Ground
All shipments within Europe under 1000 miles ⁷	Ground
All other shipments that do not meet the above criteria	Air

Ton-Miles

Ton-miles are calculated for each individual transaction by multiplying the weight of the item sold by the distance traveled. The ton-miles are the final values used in the emissions calculations detailed in the following section.

⁶Smart According to the [U.S. Department of Transportation](#), modal shares of freight vary by distance. Trucks carry the largest shares by value in both current and constant dollars for shipments moved less than 2,000 miles, while air, multiple modes and mail, water, and rail accounted for over half of the value of shipments moved more than 2,000 miles. We are unable to reflect multiple modes for a single transaction, so we assume air shipments to avoid unintentionally underestimating emissions associated with long distance shipments.

⁷The majority of shipments in Europe were under 1000 miles total distance. Assumption based on discussion with freight and logistics subject matter experts.



EMISSIONS CALCULATIONS

Transaction-based calculation

eBay's downstream T&D emissions are first calculated based solely on eBay transaction data using the formula detailed in Table 5. Emission factors are assigned based on mode of transportation and country of origin. Shipments that originate outside of the primary markets, but are destined for the selected markets, are categorized as "other" for origin country. For ground transportation in "Other" countries, an average of all regions' ground transportation emission factor is used.

Table 5. Transaction-based Downstream T&D Emissions Calculation

Transaction-based
downstream T&D
emissions (mtCO₂e)

$$\text{Ton} - \text{miles} * \text{emission factor} \left(\frac{\text{mtCO}_2\text{e}}{\text{ton-mile}} \right)$$

Example: Calculating transaction-based emissions from downstream transportation

Seller A sells a used vacuum to Buyer B using the eBay platform. eBay collects and estimates information on the transaction as detailed in the preceding sections. The relevant data is summarized in the table below:

Category	Weight	Origin	Destination	Distance	Mode	Ton-Miles
Vacuums	10 pounds	Durham, NC	Boulder, CO	1,500 miles	Ground	15,000

Note: the activity data and emissions factors are illustrative only, and do not refer to actual data.

Emissions from downstream transport:

Shipment ton-miles x emission factor (mtCO₂e/ton-mile)

= 15,000 ton-miles x 0.000365 mtCO₂e/ton-mile

= 5.475 mtCO₂e

Transaction + Carrier Emissions Output

After emissions are calculated for all transactions, carrier-provided emissions data are used to replace transaction-based emissions estimates where applicable based on the carrier, country of origin, and shipment type (i.e., international or domestic) to create a combined transaction + carrier emissions output.



Global Estimate

Transactions in eBay’s primary markets represent the vast majority of eBay’s business globally. To ensure eBay’s downstream T&D emissions inventory reflects all global shipments, an emissions factor is applied to all other transactions that do not originate in or are destined for eBay’s primary origin or destination locations.

The global emissions factor is calculated by dividing the transaction-based downstream T&D emissions estimate by the total number of transactions (TXN) reflected in eBay’s primary markets. The emissions factor (mtCO₂e/TXN) is then multiplied by remaining transaction count (i.e., transactions not located in eBay’s primary markets).

Table 6. Downstream T&D Estimation Calculation for shipment outside of eBay primary markets

Global Emissions Factor	$\frac{\text{Transaction-based downstream T\&D emissions estimate for primary markets (mtCO}_2\text{e)}}{\text{Total transaction count in primary markets}}$
Estimated “other” downstream T&D emissions (mtCO ₂ e)	$\text{Emission factor } (\frac{\text{mtCO}_2\text{e}}{\text{TXN}}) \times \text{Transaction count for shipments outside of eBay primary markets}$

The estimated “other” downstream T&D emissions are summed with the transaction + carrier emissions output to generate eBay’s final downstream T&D emissions footprint.

RESULTS

eBay partners with an independent consultant to calculate the emissions associated with downstream T&D on an annual basis. The consultant employs all assumptions and calculation methods as described in this document, which are reviewed and re-validated on an annual basis. Summarized results are verified by a third-party assurance provider and published in eBay’s annual Impact Report.

eBay maintains internal inventory workbooks to track and measure transaction and carrier emissions data. When appropriate, year-over-year comparisons in data are reviewed to ensure reasonable and complete reporting, as well as to track progress of decarbonization efforts. Large and unexplained changes in data values undergo additional quality assurance and quality control to ensure accurate reporting.