

Application of ISO 14083:2023 and the GLEC Framework for the Post & Parcel and E-commerce Sector



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Individual industry and business sectors often have specific cargo or operational characteristics; this in turn means that there may be a benefit in developing additional guidance or providing specific examples in order to respond to these characteristics and clarify how ISO 14083 and the GLEC Framework can be implemented to maximize harmonization within a sector. The post and parcels sector, together with e-commerce, were identified as an area where additional review of existing industry practices and guidance would be beneficial.

A summary of the discussions held jointly between SFC, relevant partners like the International Post Corporation (IPC) and a number of postal, parcel and e-commerce entities, transport service users, organizers and operators about how the sector operates, assesses and allocates its emissions is presented below, followed by a recommendation on approach.

1. Assessment of the Post & Parcels/E-commerce Sector

The project included an assessment of the following aspects:

- Identification of the needs of the sector with dedicated feedback sessions and a session during Smart Freight Week in 2025.
- Regular interaction with organizations in the sector (industry associations, as well as transport service users, providers and operators).
- Revision of the Mail & Parcels guidance from the GLEC Framework V2.
- Analysis of the requirements included in ISO 14083 for this sector.
- Identification of future possible research.

1.1 Types of Service

The types of services included in the analysis were meant to include the challenges that characterize and impact the supply chain of the post and parcel sector. The rapid growth of e-commerce has significantly impacted and scaled consumer demand, requiring optimized supply chains that balance timely distribution, with the goal of minimizing GHG emissions.

In many postal networks, distribution of post and parcel items is increasingly combined in the same distribution network and vehicles for last mile delivery, which could impact the emission intensity for both types of services.

Connecting these factors together suggests differentiating up to three service types, both at a national and international level, for which this guidance can provide valuable information:

- Post
- Parcels
- E-commerce

1.2 Network Structure

The logistics activities in this sector can, at high level, be differentiated into three elements:

1. Sorting of the consignments at **logistics hubs**.
2. The **line haul activities** whereby individual items are consolidated and transported between the initial and final logistics hubs. (This in itself could involve multiple journey segments by different modes; for example, an international item may initially be received at a specialized center and sorted before continuing onwards to a local delivery center).
3. The **collection and delivery rounds** which involve relatively localized transport activities with multiple collections and deliveries within a single journey that starts and ends at a logistics hub.

The calculation of logistics emissions conducted by entities operating in this sector needs to reflect the above elements that form the transport chain.

2. Transport activity

According to ISO 14083 and the GLEC Framework, transport activity for freight transportation shall be the quantity of freight multiplied by the transport activity distance.

This parameter is usually expressed in tonne-km, with the **quantity of freight being defined as the actual mass transported** (please see section 2.2), and the transport activity distance being the Shortest Feasible Distance (SFD) or the Great Circle Distance (GCD).

In recognition of operational characteristics and differences within post and parcels/e-commerce operations, ISO 14083 enables correspondingly acceptable alternatives to the standard units for the quantity of freight that may be used.

2.1 Distance

As previously stated, distance is a fundamental metric to define transport activity.

The GLEC Framework and ISO 14083 state that the transport activity distance shall be either the SFD or the GCD. With GCD being used for air and SFD being the most commonly used for all other modes.

More information on these two distance types and how to overcome their unavailability can be found in the GLEC Framework Section 1, Chapter 2.

2.2 Mass

Mass, which should be calculated in metric tons (or tonnes) is the second metric which constitutes transport activity.

One important aspect to be highlighted is that **mass calculations must include the product and the packaging provided** for calculation by the Transport Service User (Shipper). However, calculations must not include additional packaging or handling equipment used by the Transport Service Operator (Carrier) or Transport Service Organizer (LSP).

2.3 Alternative units

Specific circumstances such as post and parcel/e-commerce operations may have limited availability of accurate activity data. In such situations, ISO 14083 allows for deviation from the standard units, provided that the alternative approach is clearly documented. This guidance reflects on the use of items and volume as a possibility, both relevant for this sector.

- **Item:** For post and parcel operations, as well as e-commerce, the knowledge of individual items' mass may be limited. In these cases, ISO 14083 recognizes that the quantity of freight may be defined as the number of items.
- **Volume:** Volume is often considered as a limiting factor in this sector, although not explicitly mentioned by ISO 14083 as an alternative parameter for road transport.

3. Emissions Calculation

The presence of three different types of elements requires that calculations of a full post & parcels/e-commerce transport chain need to be split into these three elements and then subsequently drawn together. This is reflected by breaking down the transport chain into at least three distinct transport chain elements (TCEs), each of which must be analyzed individually to accurately reflect the emissions of the entire chain.

3.1 Logistics Hubs

ISO 14083 states that emissions from logistics hubs must be included when calculating emissions from a transport chain: all hub operations that consume energy or that cause refrigerant leakage have to be included, and storage can be optionally added.

The use of primary energy consumption is recommended and preferred to calculate emissions when available, followed by the use of a calculation model when additional data is needed. An activity-based approach using the GLEC Framework default emission intensity values (Section 3, module 2) is accepted when only tonnes throughput is known. Emissions can be calculated by multiplying transport activity by the default emission intensity value that most reflects the correct Hub Operation Category (HOC).

Tonnes of throughput and/or items shall be used when reporting transport activity and emission intensity values, but other relevant units, e.g. m², m³, TEU, number of containers, number of vehicles may be used in addition to mass and/or items.

When no information regarding hubs, their location or type is provided, the entity calculating the emissions can refer to what is stated in the GLEC Framework, by assuming transshipment occurs with every modal or vehicle shift and type based on the goods that are being shipped.

3.2 Line Haul Transport

In cases where line haul is conducted by an entity's own vehicles, emissions are calculated according to actual fuel use, and emission intensities are subsequently calculated from the knowledge of the quantity of freight transported and distance traveled. This is most likely to be the case for road transportation, where postal operators have their own fleet of line haul vehicles. According to ISO 14083, a fuel-based approach (primary data) as described above should be prioritized as the option to quantify GHG emissions and emission intensities when available. However, the majority of long-distance transport, particularly international transport by sea and air, but also much ground transportation by rail and road, is contracted to independent transport providers. For these line haul activities, an absence of primary fuel consumption data is likely. In these cases, the use of operator-sourced emission intensities can be an alternative, together with the option of modeling fuel consumption, as long as the provided values are aligned with ISO 14083. Lastly, an activity-based approach using the GLEC Framework default emission intensity values (Section 3, module 2) is recommended when only activity data is available. Emissions can be calculated by multiplying transport activity with the default emission intensity value that most reflects the correct Transport Operation Category (TOC).

3.3 Collection and Delivery Rounds

Collection and delivery rounds are the most complex element for this sector when it comes to emission calculation, which often defines a Transport Operation Category (TOC) in road transport operations.

For post and parcel/e-commerce operations where collection and delivery rounds are conducted by the entity's own vehicles, the total GHG emissions should be based on actual fuel information and, as a result, considered reliable. Otherwise, where the collection and delivery rounds are subcontracted, the calculations require either carrier reported emission intensity values in accordance with ISO 14083 based on actual fuel use or the use of activity data for modeling/estimation of the fuel used by the contractors by the customer, similarly to what is described in section 3.2 for line haul.

An example of emissions calculation for this scenario can be consulted in the GLEC Framework Section 3 Module 4, where example 1.6 highlights its characteristics.

This TOC is also explicitly mentioned in ISO 14083 as a case where limited information is likely, and that requires particular attention, with mode specific considerations for road freight.

It is worth noting that in this scenario, the transport activity in tonne-kilometers between the individual loading and unloading points may be estimated rather than precisely calculated, to be consistent throughout the full transport chain. This estimation may rely on modeling the collection and delivery rounds and establishing average values for distances of rounds/consignments and masses.

4. Emission allocation

When the same functionalities are provided for different freight groups, such as in the collection and delivery round where multiple customers are served within the same round and different types of post, parcel and e-commerce goods might be combined, the need to correctly allocate emissions arises.

An example of emission allocation for this scenario can be consulted in the GLEC Framework Section 3 Module 4, where example 1.6 highlights its characteristics.

Smart Freight Centre aims at harmonizing emission accounting and ensuring calculations that comply with ISO 14083. Therefore, to allocate emissions, the following approaches are suggested. Since the quantity of freight in transport activity is first defined as the net mass transported, the use of tonne-km as allocation parameter is to be preferred.

Reporting in conformance with ISO 14083 and the GLEC Framework shall include tonne-km or items, and the final allocation for reporting purposes should only revert to:

- **tonne-km:** allocating emissions based on the consignment mass (tonne) and transport activity distance is the preferred method, which should be privileged and facilitates summing of emissions throughout a transport chain.
- **Item/item-km:** item-based allocation is recognized by ISO as an alternative where knowledge of individual items is limited. Section 5.4 of ISO 14083, on transport activity calculation, recognizes item-based allocation as an alternative possibility, as well as item-km.

As previously mentioned, volume is a relevant factor, also considering that in this sector, bulk mail and parcels often travel within the same vehicle, while having different characteristics.

Therefore, volume (or other relevant units such as mass or area) may also be relevant during the allocation process and can often be used as a preliminary allocation parameter. It is important to consider the limitations that volume introduces in calculations, and it may be used to allocate emissions where it represents the primary constraint on capacity. In addition to volume being used to allocate emissions in a preliminary step before being subsequently reallocated to an emission intensity value expressed in tonne-km or items, volume (expressed in m³km for example) or mass may be reported as additional, supplementary values, but cannot serve as the sole reported metric.

5. Recommendations

A mix of approaches may be needed depending on the data availability of the three separate types of elements of the post and parcels/e-commerce chain (i.e. logistics hubs, line haul and collection and delivery). Table 1 summarizes the recommended approach for each scenario, using consignment mass to define the quantity of goods being transported. Items may be used in lieu of mass (or in addition), as a reported unit of transport activity.

According to ISO 14083, TOCs and HOCs have to be identified in a limited time period (up to one year), so an annual or more frequent collection is assumed in the recommendations.

Table 1: Recommended approach to GHG emission calculations in the post and parcel/e-commerce sector

	Logistics Hubs	Line haul	Collection and Delivery
Own Operations	<p>Understand and plan Establish the boundaries of each logistics hub from an emission calculation perspective, open discussions with the local management as they will be the ones most likely to know where to find the necessary energy use information and establish the hub's throughput in the appropriate units.</p> <p>Find emission sources Identify annual use per energy type based on available information.</p> <p>Calculate Convert to GHG emissions using ISO 14083 compliant fuel emission factors for each energy type.</p> <p>Report & reduce</p> <ul style="list-style-type: none"> • Total emissions for each hub • Emissions intensity per tonne throughput and/or per item • Hub activity in tonnes throughput or items throughput 	<p>Understand and plan Identify the full line haul network so that all individual activities (and handling operations) can be included and confirm whether under own operation or subcontracted.</p> <p>Find emission sources For each own operation establish the annual fuel consumption and transport activity in tonne-km.</p> <p>Calculate Convert to GHG emissions using ISO 14083 compliant fuel emission factors for each energy type.</p> <p>Report & reduce</p> <ul style="list-style-type: none"> • Total and operational emissions for each line haul activity • and operational emission intensities per tonne-km and/or per item for each line haul activity • Transport activity in tonne-km or items 	<p>Understand and plan Identify the nature of local collection and delivery activities at each logistics site. Establish if different services operate from the same locations and the extent to which different service levels are integrated / kept separate. (To know whether separate calculations need to be conducted for a single site.) Determine whether location data are collected to support a detailed calculation. Establish if there is a mix of own operation and subcontracting which would also add a level of complexity to the calculation.</p> <p>Find emission sources Identify annual use per energy type based on available information.</p> <p>Calculate Convert to GHG emissions using ISO 14083 compliant fuel emission factor for each energy type.</p> <p>Report & reduce</p>

			<ul style="list-style-type: none"> • Total and operational emissions for each collection and delivery service at each location • Total and operational emission intensities per tonne-km or per item • Transport activity in tonne-km or items
Subcontracted Operations	<p>Understand and plan Find contact details or public reports for each 3rd party logistics hub on the network.</p> <p>Find emission sources Engage with identified 3rd party logistics sites to see if they currently calculate emissions, and if so whether they follow ISO 14083 and the GLEC Framework. If not, encourage them to start calculating and reporting.</p> <p>Calculate If they follow ISO 14083 and GLEC Framework combine reported emission intensity values with known throughput to calculate total emissions. If not, identify a suitable default emission intensity value from the GLEC Framework Section 3, module 2 as a proxy until better information is available.</p> <p>Report & reduce</p> <ul style="list-style-type: none"> • Total emissions for each hub • Emissions intensity per tonne throughput (for 3rd party operations this is most likely a 	<p>Understand and plan Identify each 3rd party line haul operation on the network.</p> <p>Find emission sources Engage with identified 3rd party transport operator to see if they currently calculate emissions, and if so whether they follow ISO 14083 and the GLEC Framework. If not, encourage them to start calculating and reporting.</p> <p>Calculate If they follow ISO 14083 and the GLEC Framework combine reported emission intensity values with known throughput to calculate total emissions. If not, identify a suitable default emission intensity value as a proxy until better information is available.</p> <p>Report & reduce</p> <ul style="list-style-type: none"> • Total and operational emissions for each line haul activity • Emissions intensity per tonne-km for each line haul activity (for 3rd party 	<p>Understand and plan Identify the nature of local collection and delivery activities at each logistics site and the extent of any subcontracted operations. Establish whether actual fuel data is available for the subcontracted operations, or not.</p> <p>Find emission sources Collect fuel and activity data from the contracted operator or estimate total fuel according to a best knowledge of the vehicle operations conducted.</p> <p>Calculate Convert to GHG emissions using relevant fuel emission factors for each energy type as per ISO 14083 and GLEC Framework in the context of collection and delivery round.</p> <p>Report & reduce</p> <ul style="list-style-type: none"> • Total and operational emissions for each collection and delivery service at each location • Emissions intensity per tonne-km and/or per item • Transport activity in tonne-km and/or items

	<p>restatement of the information provided) and/or per item</p> <ul style="list-style-type: none">• Hub activity in tonne and/or items	<p>operations this is most likely a restatement of the information provided) and/or per item</p> <ul style="list-style-type: none">• Transport activity in tonne-km and/or items	
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6. Future research

This guidance has been developed to align with ISO 14083 within the post and parcel/e-commerce sector.

However, the recommendations provided to allocate emissions are effective when primary data is available, while their application may be limited when using secondary default data.

Another fundamental aspect to consider is that the emission intensity values currently provided in the GLEC Framework are based on a point-to-point approach, which does not fully adapt to the complexities of collection and delivery rounds, and which could lead to underestimating emissions. Therefore, the use of an activity-based approach could lead to less reliable emissions calculations.

It is worth noting that recognizing personal or customer travel associated with customer drop off, direct injection, parcel pickup and box-delivery as a Transport Chain Element (TCE) can provide a more complete representation of emissions in the post and parcels, and e-commerce sector. While the Greenhouse Gas Protocol does not require the inclusion of these emissions, and reliable data is often scarce or has high variability, accounting for this component can improve the accuracy of reporting. As the sector often relies on out-of-home delivery solutions such as parcel lockers or pickup points, this TCE can serve as an important additional consideration. Nevertheless, this could also be considered out of scope for transport service operators if it is not part of the contractual agreement.

Note: this refers to, for example, a customer who chooses to collect their parcel from a nearby pickup point. On the way home, they drive a few km to retrieve the package. Although this personal trip is outside the direct operations of the Transport Service Organizer (LSP), it could still be linked to the delivery process. When included as an optional TCE, the estimated emissions from this trip help illustrate the impact of customer related travel and highlight opportunities to improve also pickup point placement and travel efficiency.

Future research should therefore focus on creating sector-specific emission intensity values, which reflect the specific context, or to possibly create an uplift that can improve the already existing values present in the GLEC Framework. Particular attention can be given to the e-commerce sector, where entities often do not operate their own fleets and have limited visibility into the three defined network structure elements. Other emerging models including bundled intercontinental transport should be researched as they supplement traditional models in the post and parcel industry.

Finally, other specific challenges within the sector, such as undelivered packages that require a second delivery or e-commerce returns could be explored, together with new methods to accurately account for all the abovementioned situations in emissions assessments.

7. Calculation Example

The objective of this exercise is to quantify and allocate greenhouse gas (GHG) emissions from a collection and delivery round performed by a 3.5 t GVW diesel van transporting mail (letters) and parcels (electronics). The round starts and ends at the same logistics hub, with freight being unloaded unevenly in 7 stops before returning to the hub.

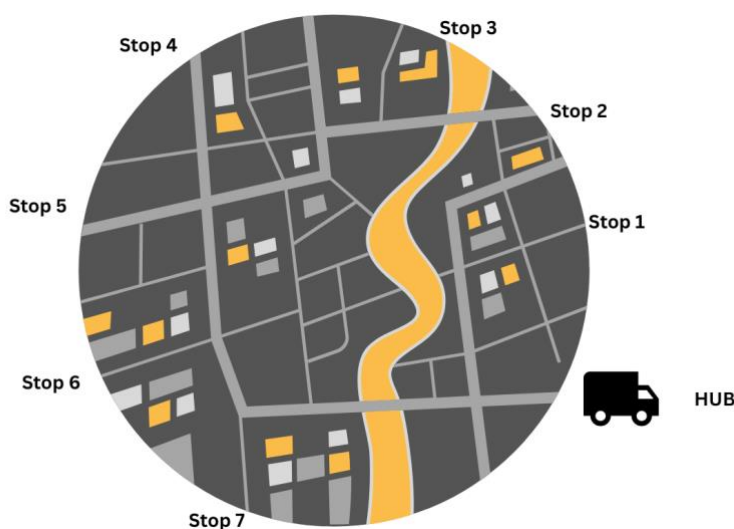
The calculation follows ISO 14083 and the GLEC Framework allocation methodology set in this guidance for road freight transport, showing the complexity of this scenario.

Vehicle and Route information:

- **Vehicle:** 3.5t GVW Diesel van
- **Route length/Distance travelled:** 30 km, collection and delivery round
- **Fuel used:** 3 L

Load Characteristics:

- **Mail/Letters:** 6,000 items
- **Parcels:** consumer electronics; 2.7 m³, 268 items



Transport Activity definition:

Stop	Distance travelled (km)	Shortest Feasible Distance from Hub to Stop (km)	Mail/Letters delivered (item)	Parcels delivered (m ³)	Transport activity (tonne-km) ¹
Hub					
Stop 1		2.0	400	0.15	0.10
Stop 2		4.5	1,200	0.60	0.66
Stop 3		6.0	650	0.25	0.37
Stop 4		3.5	900	0.50	0.44
Stop 5		5.0	1,050	0.40	0.51
Stop 6		7.0	750	0.30	0.50
Stop 7		6.5	1,050	0.50	0.76

¹ For the calculation of transport activity an average weight of 100g per letter and a density of 200 kg/m³ per parcel was assumed

Hub		3.0			
TOTAL	30	37.5	6,000	2.7	3.32

Total emissions calculations:

$3.0 \text{ L} \times 0.832 \text{ kg/L} = \mathbf{2.50 \text{ kg diesel}}$

With a WTW fuel emission factor of **4.19 kg CO₂e per kg diesel**

$2.50 \text{ kg} \times 4.19 \text{ kg CO}_2\text{e/kg} = \mathbf{10.48 \text{ kg CO}_2\text{e}}$

Emissions allocation:

A preliminary division of emissions can be performed by allocating 60% of the emissions to the parcels, and 40% of total emissions to the letters, based on the % of volume occupied by both.

This way:

$10.48 \text{ kg CO}_2\text{e} \times 0.60 = 6.288 \text{ kg CO}_2\text{e}$

$10.48 \text{ kg CO}_2\text{e} \times 0.40 = 4.192 \text{ kg CO}_2\text{e}$

Emissions associated with letters can be allocated based on the **number of items** delivered, by developing an emission intensity value with the following approach:

$4.192 \text{ kgCO}_2\text{e}/6,000 \text{ items} = \mathbf{0.7 \text{ gCO}_2\text{e/item}}$

Emissions associated with parcels can be allocated based on the occupied **volume** in the van, but then need an allocation based on mass or item to report in conformance with ISO 14083 and the GLEC Framework. Here **mass** is selected as allocation parameter:

Volume occupied by the parcels: 2.7 m^3

Average density associated with electronic equipment: 200 kg/m^3

Assumptions:

Medium Laptop (15-inch)

- **Length:** 0.40 m
- **Width:** 0.28 m
- **Height:** 0.09 m

Volume: $0.40 \times 0.28 \times 0.09 = 0.0101 \text{ m}^3$

$2.7/0.0101 = 268 \text{ boxes}$

One computer weights on average 1.5 kg, 2 kg with box

Total kg = $2 \times 268 = 536 \text{ kg}$

Density $536/2.7 \approx 200 \text{ kg/m}^3$

Calculated mass for the loaded electronic equipment: $2.7 \times 200 = 536 \text{ kg} = 0.5 \text{ tonnes}$

Transport activity: 3.32 tonne-km

Emission intensity developed: $6.288/3.32 = \mathbf{1.89 \text{ kgCO}_2\text{e/tonne-km}}$

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15 April 2026

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Suggested citation: Smart Freight Centre Application of ISO 14083:2023 and the GLEC Framework for the Post & Parcel and E-commerce Sector 2026

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Acknowledgements

This report was written by Teresa Biliato and Marcus Lomax of Smart Freight Centre.

Smart Freight Centre (SFC) is a globally active non-profit organization for climate action in the freight sector. Our goal is to mobilize the global logistics ecosystem, in particular our members and partners, in tracking and reducing its greenhouse gas emissions. We accelerate the reduction of logistics emissions to achieve a zero-emission global logistics sector by 2050 or earlier, consistent with 1.5° pathways.

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