Smart Freight Centre

Voluntary Market Based Measures Framework for Logistics Emissions Accounting and Reporting

September 2023

About Smart Freight Centre

Smart Freight Centre is an international nonprofit organization focused on reducing greenhouse gas emissions from freight transportation. Smart Freight Centre's vision is an efficient and zero emission global logistics sector. Smart Freight Centre works to guide the global logistics industry in tracking and reducing the industry's greenhouse gas emissions by one billion tonnes by 2030 and to reach zero emissions by 2050 or earlier, consistent with a 1.5°C future.

Disclaimer

The views expressed in this publication are those of Smart Freight Centre and associated staff, consultants, and management, and do not necessarily reflect the views of the Board of Trustees of Smart Freight Centre. Smart Freight Centre does not guarantee the accuracy of the data included in this publication and does not accept responsibility for consequences of their use. The authors make no representation regarding the utility or lack of utility of this framework in the context of regulatory disclosures of greenhouse gas emissions.

Authors

Dan Smith and Alan Lewis.

Suggested Citation

Smart Freight Centre. Voluntary Market Based Measures Framework for Logistics Emissions Accounting and Reporting. 2023.

Contact

Smart Freight Centre
Keizersgracht 560, 1017 EM
Amsterdam, Netherlands

Telephone: +31 6 4695 4405
www.smartfreightcentre.org
info@smartfreightcentre.org

Acknowledgements

This publication was developed with funding from the following organizations:

- A.P. Moeller-Maersk
- C.H. Robinson
- Deutsche Post DHL Group
- Frito-Lay Trading Company (Europe) GmbH
- GoodShipping
- Klaveness AS
- Renewable Energy Group, Inc.
- Shell

Each of these organizations also delegated representatives to sit on a Technical Working Group that provided extensive input to Smart Freight Centre during the drafting and refinement of the framework, starting in the fall of 2021 and continuing through the first quarter of 2023[1].

World Economic Forum served as a strategic partner in the accounting framework development project, supporting stakeholder engagement and communications, and delegating Forum experts to sit on the project Technical Working Group. The Forum also provided graphic design services to the project team.

Smart Freight Centre consulted and received input from advisors at CDP, Kühne Logistics University, and Science Based Targets initiative in developing this framework.This accounting framework would not have been possible without the dedication and support of people at the organizations listed above. **However, this document does not necessarily represent the views of any organization listed in these acknowledgements, nor does inclusion of an organization's name in these acknowledgements signify that organization's endorsement of this framework.**

1 Smart Freight Centre also received feedback on the principles described in this document through a thirty-day public comment period on a draft of the accounting framework during the spring of 2022, and through extensive engagement with a variety of other organizations working on book and claim chain of custody tools to accelerate transport decarbonization.

Table of contents

Introduction

1

Introduction

The challenge

Freight transportation and logistics activities are the source of approximately 10% of global greenhouse gas (GHG) emissions. Without concerted reduction efforts, freight transportation emissions are forecast to increase by up to 42% by 2050 (1) – the opposite of what needs to happen if society is to achieve global climate goals.

Reducing freight transportation GHG emissions, however, is often a difficult challenge. Freight transportation emission abatement costs can be high per tonne of GHG emission reduction and freight transportation supply chains can be large, complex, and dynamic. Heavy duty freight transportation is "hard to abate" (2).

Barrier to decarbonization: High emission abatement costs

The high cost of reducing freight transportation GHG emissions can serve as a significant barrier to the deployment of low emission transportation services (LETS)[3].

Freight carriers[4] generally bear the cost to reduce emissions from their operations. For example, the cost of purchasing low emission transportation assets or energy sources is often paid by the transportation asset owner or operator. However, the high cost of many low emission transportation solutions means that carriers often cannot voluntarily (i.e., without regulation that applies a low emission requirement to all carriers) implement LETS while remaining competitive.

Shippers and logistics service providers (LSP) can reduce the LETS cost burden for carriers, either through engagement with the carriers or through direct engagement with the provider of a low emission solution (i.e., a solution provider)[5]. The shippers and LSPs most interested in voluntarily bearing increased costs for LETS, though, are likely to be the shippers and LSPs interested in reducing their freight transportation GHG emission footprints. And these shippers and LSPs will generally want to report lower transportation supply chain GHG emissions in their emission inventories in exchange for bearing the extra costs of LETS.

2 As described here, freight can include mail and parcels. For an example of how the principles in this document may be applied in the mail and parcel sector, see Annex 1.
3 As defined here, a service is a piece of work done for a client or customer that does not involve manufacturing or producing goods. Transporting freight, or arranging the transportation of freight, are examples of services.
4 See Section 2 for a definition of carriers.
5 See Section 2 for a definition of shippers, LSPs, and solution providers.

Barrier to decarbonization: Large, complex, and dynamic supply chains

The size, complexity, and dynamism of freight transportation supply chains can serve as a barrier to the deployment of LETS.

In many freight transportation supply chains:

- Shippers and LSPs work with many carriers or other LSPs. In some cases, shippers and LSPs may not even know which carriers are actually moving their freight (particularly if the transportation service is provided through several layers of subcontractors).
- Carriers work with many shippers and LSPs, most of whom currently have no interest in paying a cost premium for LETS.
- Carriers, LSPs, and shippers have limited access to low emission solutions for their shipments. Solutions, defined here as products to decarbonize heavy transportation, are limited in availability and maturity.
- Individual transportation assets (e.g., trucks, aircraft, vessels) have limited regular physical involvement with a particular shipper or LSP's freight.

Under these circumstances, it can be very difficult for a carrier to directly access a solution, or for an LSP or shipper to directly access a LETS. Even if these organizations do have some direct access to solutions or LETS, it is difficult to link a LETS as generated with a specific transportation asset to significant GHG emission reductions in an individual shipper or LSP's freight transportation GHG footprint.

Industry needs tools to overcome these barriers

There is significant demand for a framework to overcome these barriers. The demand is evident in the recent proliferation of commercial offerings for transportation "insetting" programs. The demand has also been clearly articulated by senior executives from over a dozen of the world's largest freight forwarding, cargo carrying, and port operations organizations. During the fall of 2021, these senior executives issued a joint statement outlining the need for a low emission transport chain of custody standard that would facilitate decarbonization of freight transportation (3).

Barriers to freight transportation decarbonization can be reduced by a framework that outlines a way for shippers, LSPs, carriers, and solution providers to effectively partner with each other around LETS. The framework must:

1. Permit a provider of freight transportation or a solution provider to allocate the emission profile from abatement activities to the organizations that contribute to the abatement cost, even if those organizations' freight is not always transported using a low emission solution or service.
2. Permit a purchaser of freight transportation to contribute to the cost premium of and report the GHG emission profile of LETS, even if their freight was not physically transported on the LETS.
3. Be consistent, to the maximum extent practicable, with established freight transportation GHG accounting methods, such as those described in the Global Logistics Emissions Council (GLEC) Framework and in ISO Standard 14083:2023.

Purpose and scope of the framework, overview of freight transport supply chains

2

Purpose and scope of the framework, overview of freight transport supply chains

Purpose

The accounting framework outlined in this document is intended to help address the barriers to heavy transport decarbonization described in the introduction. The framework focuses on voluntary actions by organizations to accelerate transport decarbonization. As discussed in detail in Section 6, this framework is intended to complement regulatory requirements for transport decarbonization.

This framework focuses on GHG emission accounting for low emission transportation solutions and LETS. This framework, focused as it is on GHG emission accounting and allocation, is based on and supplements the fundamental transportation GHG accounting principles described in the GLEC Framework.

Relationship of this framework to other tools

GHG emission accounting and allocation standards are only one element of an overall system to transparently calculate and track the emission profile of a low emission transportation solution and an associated LETS.

Consider, for example, a low emission fuel as a transportation solution. There are several elements of a system to calculate, track, and allocate the emission profile of the fuel from the fuel's generation up to the GHG emission inventory in which the fuel's emission profile is captured. More specifically:

1. A sustainability certification system, such as those managed by International Sustainability and Carbon Certification (ISCC) or Roundtable on Sustainable Biomaterials (RSB), is a tool to establish and track the sustainability profile of the fuel (including the fuel's GHG emission factor).
2. A registry and associated rules for the registry are tools to register and track the transfer of the sustainability profile of the fuel according to a transparent and verifiable registry standard.
3. Accounting principles, like those described in this Smart Freight Centre (SFC) framework, are tools to account for and allocate the emission profile of the fuel in organizational GHG emission inventories.

As outlined above, this accounting framework focuses on accounting for and allocating the emission profile of low emission transportation solutions and LETS across transportation supply chains. Other organizations have developed or are developing tools for the determination and certification of the sustainability profile of low emission transportation solutions, and registries with rules for tracking the transfer of the sustainability profile of low emission transportation solutions.

Figure 1. Elements of a system to track and allocate the emission profile of a low emission fuel

Sustainability Certification System

Establish and track the sustainabilty profile of the fuel

Rules for Registry **Registry**

Register and track the transfer of the sustainability profile of the fuel, according to a transparent and verifable standard

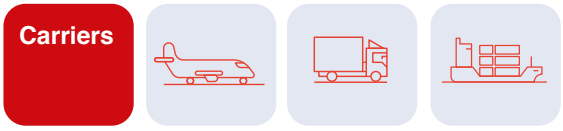
SFC Accounting Framework

Account for and allocate the emission profile of the fuel in GHG emission inventories

Application of the types of approach that accelerate investment in low emission transport solutions and services as set out in these guidelines are still relatively new. Hence, understanding and the systems that support them are evolving quickly. As a result we anticipate that open discussions between industry partners, together with implementation in the market, will lead to changes as the framework's strengths and weaknesses are revealed in practice. The Book and Claim Community recently launched by SFC and RMI is one place where such discussions may take place.

Organizations in freight transportation supply chains

As described in Section 1, freight transportation supply chains can be large and complex, and may involve many different organizations for a single unit of freight. There are four general categories of organization in freight transportation supply chain addressed in this accounting framework.



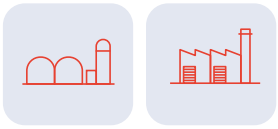
Carriers are organizations that operate transportation assets to conduct transportation activity in providing transportation services.

LSPs are organizations that secure and facilitate transportation activity for shippers. LSPs, as defined here, do not operate their own transportation assets or conduct transportation activity. Instead, LSPs hire carriers to transport the LSPs' customers' freight[6].

Shippers are organizations with freight that needs transportation. A shipper may retain an LSP to arrange transportation of the shipper's freight. A shipper may also contract with carriers directly for freight transportation activity.

6 Organizations that serve as LSPs may operate transportation assets for providing transportation services. In some circumstances, then, an LSP may also be a carrier.

Solution providers



Low Emission Solution Provider (Solution Provider) Solution providers are organizations that provide a low emission material or product to the transportation market. Solution providers do not conduct transportation activity, nor do they contract for freight transportation activity on behalf of their customers. Instead, solution providers provide the products that make LETS possible. One example of a solution provider is a supplier of a low emission fuel.

Focus on Roundtable on Sustainable Biomaterials

RSB has developed a book and claim standard that includes requirements related to the assessment, certification, and transaction of the sustainability attributes (including, but not limited to, the GHG emission profile) of low emission aviation and marine fuels.

The RSB book and claim standard, outlined in the *RSB Book & Claim Manual*, describes the rules which allow an organization to register, transfer, and retire book and claim units (sometimes referred to elsewhere as credits or certificates) in the RSB book and claim system. An RSB book and claim registry also forms a part of RSB's book and claim system (4).

The RSB book and claim standard complements this SFC accounting framework. That is:

- The *RSB Book & Claim Manual* explains the requirements for determining and tracking the sustainability characteristics of bioenergy (including the bioenergy's emission profile) from the point at which those characteristics are decoupled from the physical bioenergy product to the point at which those characteristics are retired by a transport service provider or other organization.
- The *RSB Book & Claim Manual* describes requirements associated with the registration, transaction, and retirement of book and claim units (units that represent the right to a claim through retirement and corresponding to a unique set of sustainability benefits (5)).
- The SFC accounting framework describes how organizations can allocate and account for the GHG emission profile of bioenergy associated with an RSB book and claim unit in GHG emission inventories and declarations.

In general terms, the RSB standard outlines requirements for establishing, certifying, registering, transferring, and retiring book and claim units associated with the emission profile of bioenergy through the RSB book and claim system. The SFC framework explains how to take an emission profile (a profile that could have been established, certified, registered, transferred, and retired through the RSB book and claim system), and to apply that emission profile in calculating and allocating a GHG emission footprint across a transportation supply chain.

Chain of custody for products and for services

3

Chain of custody systems

Introduction to chain of custody systems

Organizations need to know the emission profiles associated with the LETS that they pay to support. An organization is not likely to pay a premium for a LETS if that LETS cannot be quantified or accounted for in their GHG emission reporting and target setting. A chain of custody system is therefore the foundation of a framework for shippers, carriers, LSPs, and solution providers to partner around deploying LETS.

A chain of custody system can generally be defined as a set of measures underlying the process by which materials or products (and information on those materials or products) are transferred, monitored, and controlled as they move through each step in a supply chain (6). There are several models for chain of custody systems.

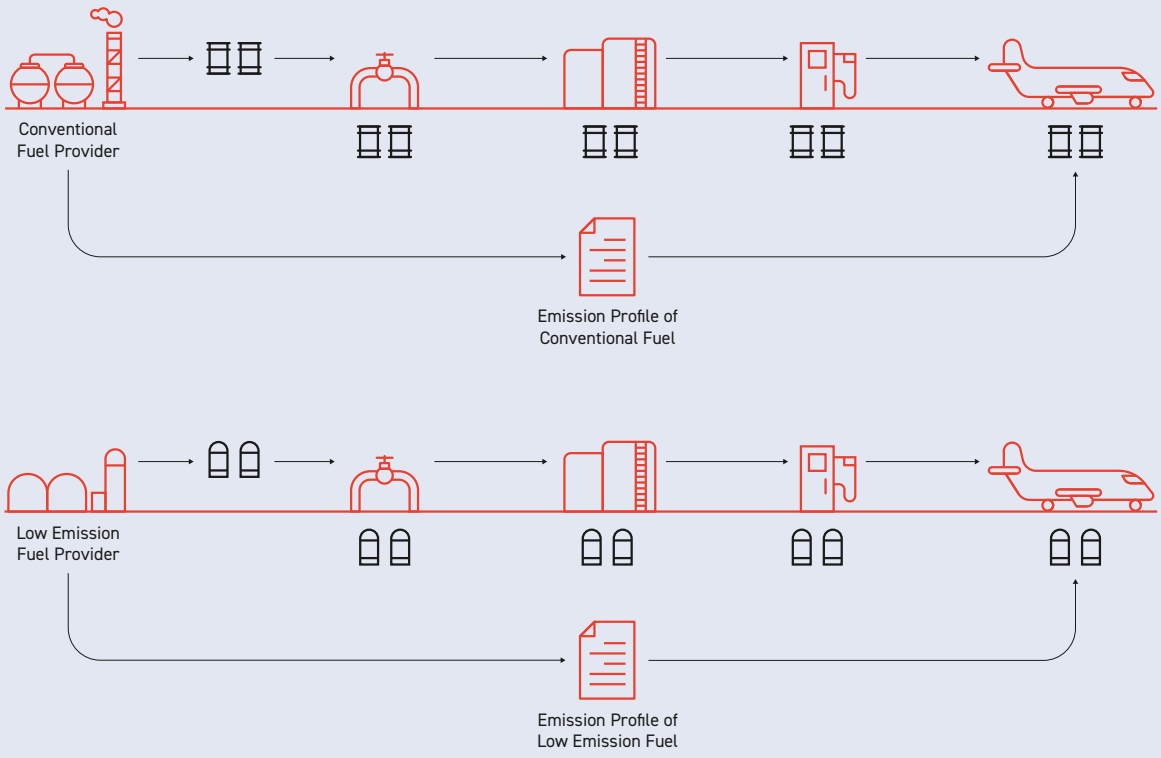
Physical separation

A physical separation chain of custody model requires the physical segregation of materials or products with certain characteristics as those materials or products move through a supply chain.

Figure 2 shows an example of a physical separation chain of custody model for liquid fuels. Conventional fuel and low emission fuel are not mixed with each other during distribution. The emission profile of the low emission fuel (a characteristic of the fuel) remains coupled with the low emission fuel, and the emission profile of the conventional fuel remains coupled with the conventional fuel, from generation to consumption.

ISO Standard 22095:2020 distinguishes between “identity preserved” and “segregated” chain of custody models. Some other organizations also make a distinction between these models – with what may be varying interpretations of the difference between “identity preserved” and “segregated” models. This SFC accounting framework does not distinguish between “identity preserved” and “segregated” models. The source (or identity) of a product could be tracked as a characteristic of that product through a product distribution network, and potential distinctions between “identity preserved” and “segregated” models are not material in the context of this framework. As such, both “identity preserved” and “segregated” models are treated simply as physical separation models in this framework.

Figure 2. A physical separation chain of custody model



Mass balance

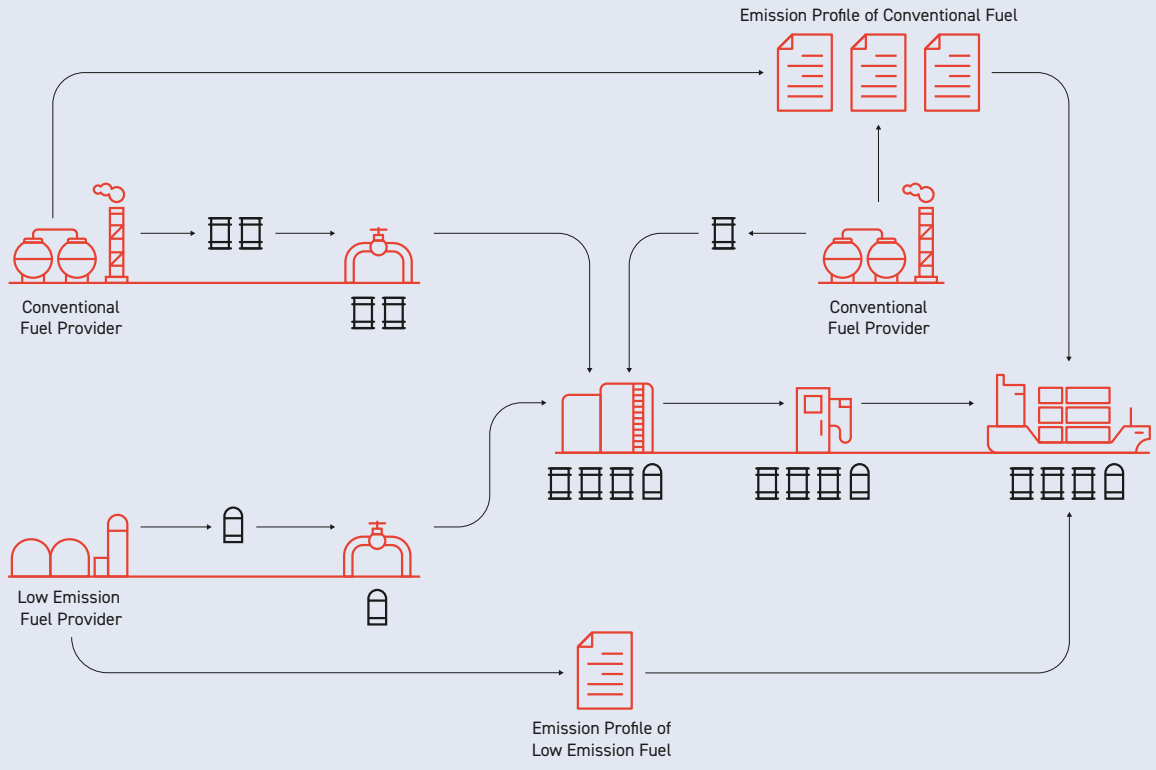
A mass balance chain of custody model allows the mixing of materials or products with certain characteristics with other materials or products as they move through a supply chain. The amount and the characteristics of the materials or products are tracked separately from each other throughout the distribution process, even though the materials or products themselves are physically mixed.

Figure 3 shows an example of a mass balance chain of custody model for liquid fuels. Although the conventional fuel and low emission fuel are mixed, the proportion of the fuel mix comprised of conventional fuel and the proportion of the fuel mix comprised of low emission fuel is tracked throughout distribution. The emission profile of both the low emission fuel and of the conventional fuel both go to the fuel consumer that physically receives the mixed product.

ISO Standard 22095:2020 describes a “controlled blending” chain of custody model. This SFC framework does not distinguish between mass balance and controlled blending models. Instead, mass balance is defined here to mean a model in which the organization allocated the special characteristics of a product (e.g., the emission factor of a low emission fuel) physically receives a known amount of product with those special characteristics over a certain period of time.

For example, a fuel provider sells a carrier a 10% low emission fuel blend. An individual batch of fuel that the carrier receives from the fuel provider may or may not physically be comprised of 10% low emission fuel molecules. However, averaged over all loads of fuel that the carrier receives from the fuel provider, 10% of the fuel that the carrier receives is comprised of low emission fuel molecules.

Figure 3. A mass balance chain of custody model



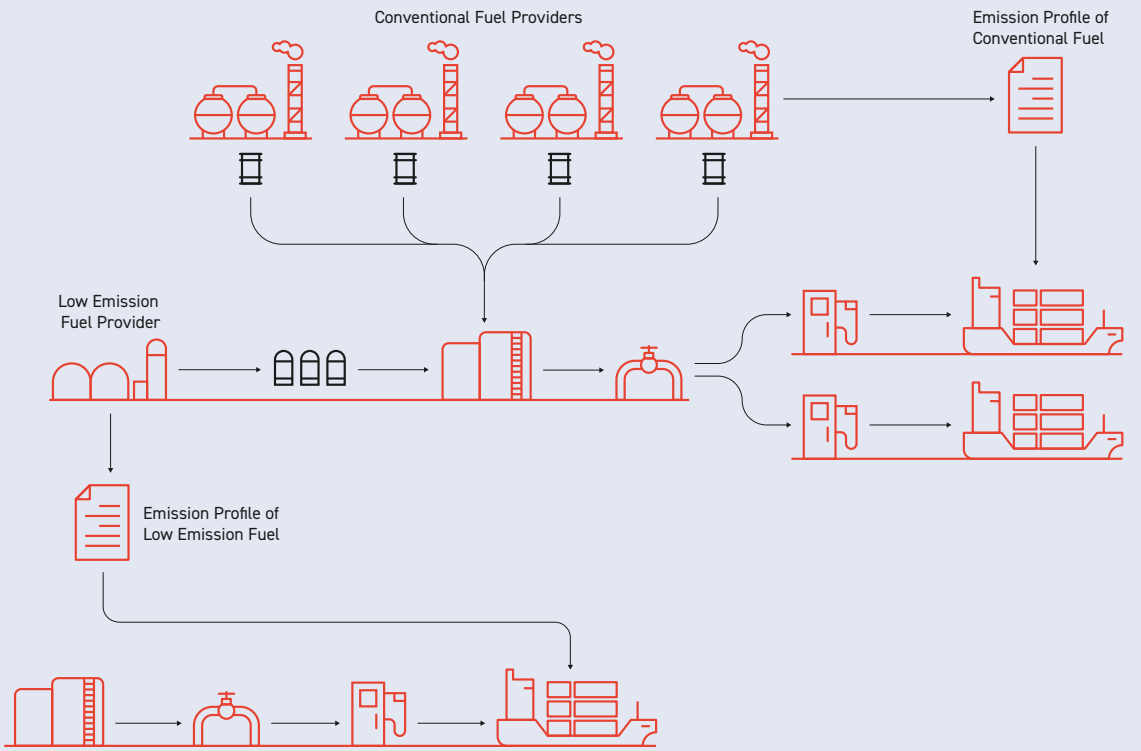
Book and claim

A book and claim chain of custody model allows the mixing of materials or products with certain characteristics with other materials or products as they move through a supply chain. The characteristics of the materials or products are tracked separately from the physical material or products – these characteristics are not connected to the physical flow of materials or products.

At some point after a material or product is generated, the characteristics of that material or product are decoupled from the physical material or product and cataloged in a tracking system, or "booked." Those characteristics may subsequently be "claimed" from the tracking system. The entity claiming the special characteristics of the material or product may have no physical involvement with the material or product with special characteristics.

Figure 4 shows an example of a book and claim chain of custody model for liquid fuels. The conventional fuel and low emission fuel are mixed. The emission profile of the low emission fuel is tracked separately from the emission profile of the conventional fuel. The proportion of conventional fuel in the distribution system is not accounted for separately from the proportion of low emission fuel in the distribution system. The organization that claims the emission profile of the low emission fuel may not physically receive any low emission fuel.

Figure 4. A book and claim chain of custody model



Chains of custody for products and for services

4

Chains of custody for products and for services

Chain of custody systems for products

The three examples in the previous section describe chain of custody models for a physical product, liquid fuel.

Any of the three chain of custody models described above (physical separation, mass balance, or book and claim) may be viable for tracking physical fuels and their characteristics, depending on the configuration of the fuel distribution network. In some cases, fuel suppliers can track fuel and its attributes by mass balance, in others, by book and claim, and in certain cases, low emission fuels are physically separated from conventional fuels.

For the purposes of this document, the characteristics of fuels that are tracked through a chain of custody system include the[7]:

1. Energy content, mass, or volume of the fuel.
2. Life cycle GHG emission factor of the fuel (see Section 10 for more on emission factors).
3. Feedstocks (including the percentage of biogenic material in the feedstock, where applicable) and production processes for the fuels.

There are numerous other attributes of low emission fuels that may be of interest. For example, whether a fuel was produced in a manner to protect soil and water, or if a fuel was produced in a way that protects land with high biodiversity value or cultural values. These other attributes, while important, are not addressed in this framework.

Chain of custody systems for services

A physical product, like a low emission fuel, is different from a transportation service. A transportation service is a certain amount of mode-specific (or transport operation category-specific)[8] transportation activity (i.e., the amount of freight transported and the distance that freight was transported)[9].

A transportation service is not a physical product. A transportation service may be conducted using a physical product.

As defined in Section 2, shippers and forwarders purchase or facilitate the provision of transportation services. Similarly, as defined in Section 2, carriers sell transportation services (they do not sell physical products).

A mass or volume of a low emission fuel, in and of itself, may be of very little value to a shipper or a forwarder. A shipper or a forwarder does not need a mass or volume of fuel. A shipper or forwarder needs freight transportation activity. Similarly, the value of a mass or volume of fuel for a carrier

7 The three characteristics represented here are the minimum characteristics necessary to enable the calculation of GHG emission inventories as described later in this framework, and for purchasers of the characteristics of the fuel to have information that allows them to understand the general origins of the fuel.
8 See Section 7 for more information on transport operation categories.
9 See Section 10 for more information on transport activity.

stems from the fuel's ability to be used in generating transportation activity.
As such, this framework must address more than chain of custody models for physical products like low emission fuels. This framework must also address the allocation of the characteristics of transportation services.

A chain of custody approach may be applied to the characteristics of a transportation service. In this approach, the characteristics of the transportation service are tracked (rather than the characteristics of a physical product).

For example, a carrier may move freight with trucks powered by a low emission fuel. The carrier's trucks are using a physical product (i.e., a low emission fuel) to conduct a LETS. The characteristics of this LETS could then be tracked with a chain of custody system through a transportation supply chain.

For the purposes of this framework, the characteristics of transportation services that are tracked through a chain of custody system include the:

1. Mode of transportation associated with the service (see Section 7 for more on transportation modes).
2. The amount of transportation activity conducted (see Section 10 for more on transportation activity).
3. The GHG emission intensity of the LETS (see Section 10 for more on emission intensities).
4. The total GHG emissions resulting from the amount of transport activity conducted.
5. Where applicable, the transportation operation category of the service (see Section 7 for more on transportation operation categories).

A book and claim chain of custody system for transportation services

The flexibility of a book and claim model addresses the constraints on transport decarbonization described in Section 1. That is, a book and claim chain of custody model for a transportation service:

- Permits a purchaser of freight transportation services to contribute to and report the GHG emission profile of a LETS, even if that service does not directly involve the transportation assets that physically transport their freight.
- Permits a provider of freight transportation services or a solution provider to assign the emission profile of a low emission solution or of a LETS to the organizations that pay a premium for the LETS or solution, even if those organizations' freight is not always physically transported on a low emission transportation asset or using a low emission solution.

A book and claim chain of custody model is therefore preferred for tracking LETS.

Applying chain of custody concepts to transport supply chains

Applying chain of custody concepts to transport supply chains

Booking and claiming transportation solutions and services

Carriers, LSPs, shippers, and solution providers have different roles in transportation supply chains. They also have different roles in booking and claiming LETS or the solutions that make LETS possible.

There are several ways each category of organization listed above can book and can claim, and different things that they can book and claim, in book and claim chain of custody systems for low emission solutions and LETS.

A key distinction between the ways each category of organization books or claims is whether there is:

- Direct generation of a LETS by a carrier conducting transport activity with a low emission transportation solution; or
- Indirect generation of a LETS by a carrier, shipper, or LSP that calculates an emissions footprint based on the profile of a low emission solution, even though that solution may not have been applied by their fleet or by the carriers in their supply chain.

Direct generation

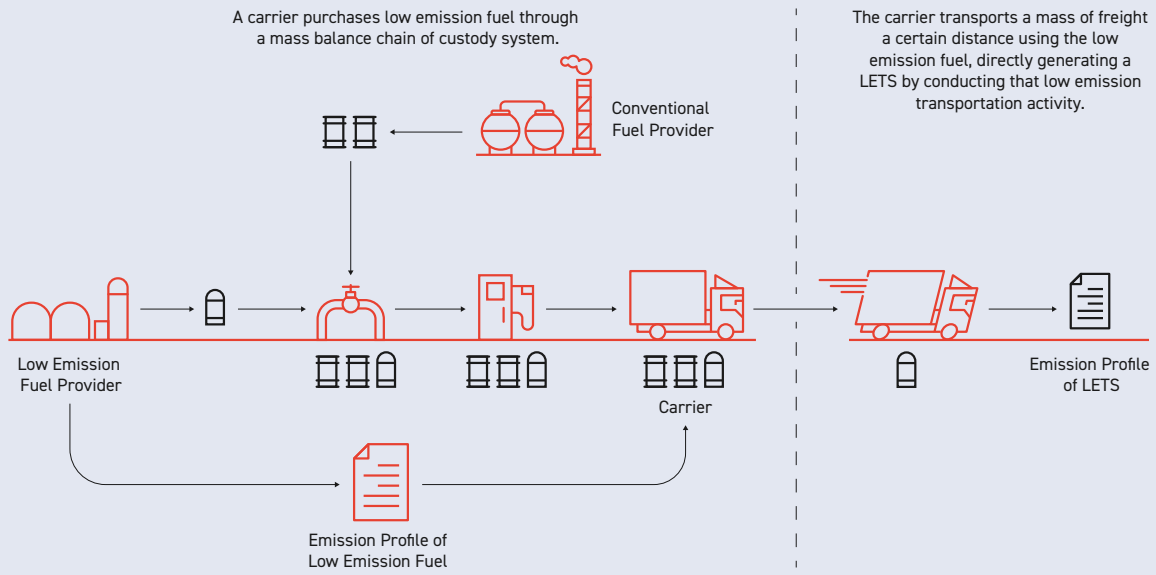
In direct generation scenarios, there is a physical tie between a low emission solution and the carrier generating the LETS. That is, the carrier generating the LETS actually uses or deploys the low emission solution in that carrier's owned or operated fleet.

For example:

- A carrier purchases low emission fuel that is provided to the carrier through a physical separation chain of custody system. The carrier, based on the definition of physical separation chain of custody systems for products outlined above, physically receives low emission fuel. There is a physical tie between the carrier and the solution. Low emission fuel molecules are combusted in the carrier's transportation assets in conducting transport activity.
- A carrier purchases low emission fuel that is provided to the carrier through a mass balance chain of custody system. The carrier, based on the definition of mass balance chain of custody systems for products outlined above, physically receives low emission fuel. Although this low emission fuel may be mixed with conventional fuel, over a certain period of time, the fuel provider can demonstrate that the carrier physically received a certain amount of low emission fuel. There is a physical tie between the carrier and the solution. Low emission fuel molecules are combusted in the carrier's transportation assets in conducting transport activity.

See Figure 5 for a depiction of a direct generation scenario. The carrier physically receives low emission fuel. The carrier conducts transport activity, at least in part, using that low emission fuel. There is a physical tie between the solution (i.e., the low emission fuel) and the carrier. The carrier has directly generated a LETS using a low emission fuel.

Figure 5. Direct generation of a LETS using a fuel procured through a mass balance chain of custody system



Indirect generation

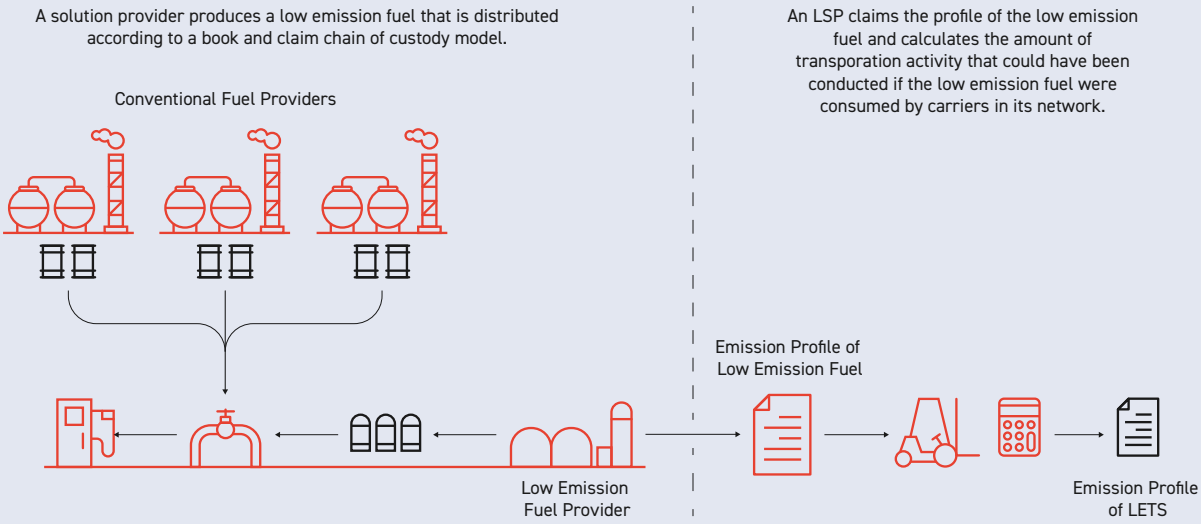
In indirect generation scenarios, a physical tie cannot be made between a solution and a LETS. Instead, a carrier, shipper, or LSP calculates an emissions footprint as if a low emission solution was used in their owned-operated fleet (carriers) or by the carriers in their supply chain (shippers and forwarders).

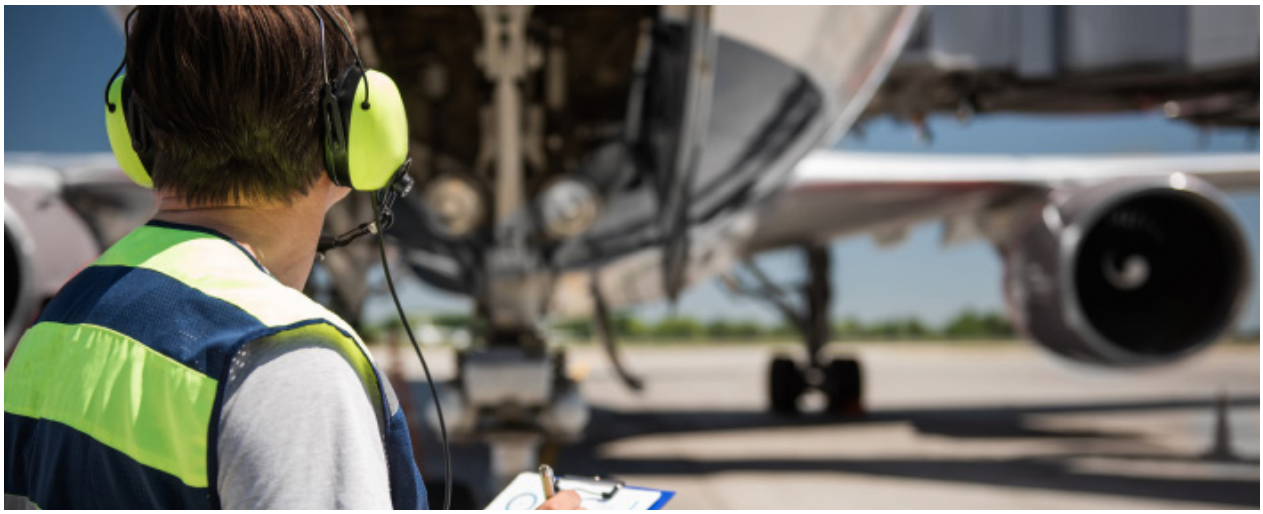
For example:

- A carrier purchases the characteristics of a low emission fuel through a book and claim chain of custody system. The carrier, based on the definition of book and claim chain of custody systems for products outlined above, may not physically receive any low emission fuel. There is no physical tie between the carrier and the solution. It cannot be demonstrated that low emission fuel molecules were combusted in the carrier's transportation assets in conducting transport activity.
- An LSP purchases the emission profile of a low emission fuel directly from a fuel provider. There is no guarantee that the low emission fuel provider physically provided low emission fuel to the LSP's contracted carriers. There is no physical tie between the LSP and the solution. The low emission fuel may not be combusted in transportation assets owned or operated by carriers that the LSP has contracted with to conduct transport activity.

See Figure 6 for a depiction of an indirect generation scenario. The LSP's contracted carriers do not necessarily physically receive low emission fuel. The LSP generates a LETS using the emission profile a low emission fuel that may not have actually been burned by the LSP's contracted carriers. There is no physical tie between the solution (i.e., the low emission fuel) and the LSP. The LSP has indirectly generated a LETS based on the profile of a low emission fuel.

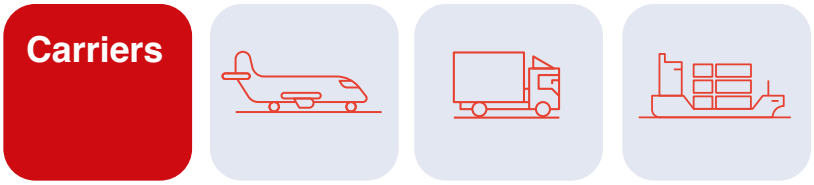
Figure 6. Indirect generation of a LETS using the profile of a fuel purchased through a book and claim chain of custody system





Booking and claiming the profiles of solutions and LETS

Different types of booking and claiming, classified by category of organization, are as follows.



Direct book

A carrier conducts a LETS by directly applying a low emission solution to the transportation of freight, using the carrier's owned or operated transportation assets. The carrier books an emission profile for the transport activity on the LETS. For example:

- A carrier uses a low emission fuel in the carrier's owned or operated assets. The carrier secures the fuel, a solution, either through a physical separation or a mass balance chain of custody system. The carrier's transportation assets consume the low emission fuel when conducting transportation activity.
- A carrier deploys electric trucks in its fleet. The electric trucks, either owned or operated by the carrier, are conducting transportation activity moving cargo for the carrier's customers.

Indirect book

A carrier generates a LETS by applying the emission profile of a solution as if the solution were used by the carrier. That is, the carrier claims the emission profile of a solution from a solution provider and books a LETS based on that solution's profile – even though the carrier does not physically deploy the solution in the carrier's owned or operated fleet.

For example, a carrier purchases the emission profile of a low emission fuel and substitutes this emission profile for the profile of the fuel consumed in the carrier's owned or operated assets. The carrier secures the emission profile of the low emission fuel through a book and claim chain of custody system. The carrier may not actually consume any low emission fuel in the carrier's transportation assets when conducting transportation activity.

Claim and rebook

A carrier claims a LETS directly generated by another carrier and books that service. The claimed LETS become *indirect* transportation services for the claiming carrier (because the claiming carrier is not physically conducting a LETS itself).

LSP

Indirect book

An LSP generates a LETS by applying the emission profile of a low emission solution as if the solution were used by the LSP's contracted carriers. The LSP books an emission profile for a certain amount of transport activity associated with the LETS.

For example, an LSP purchases the emission profile of a low emission fuel and substitutes this emission profile for the emission profile of the fuel consumed by carriers conducting transportation activity on behalf of LSP. The LSP secures the emission profile of the low emission fuel through a book and claim chain of custody system. The LSP's contracted carriers may not actually consume any low emission fuel in these carriers' transportation assets when conducting transportation activity.

Direct claim and rebook

An LSP claims a LETS directly generated by a carrier in the LSP's contracted carrier network and books that service for claiming by the LSP's customers.

Indirect claim and rebook

An LSP claims a LETS indirectly generated by a carrier in the LSP's contracted carrier network or a LETS directly generated by a carrier outside of the LSP's contracted carrier network and books that service for claiming by the LSP's customers.

Shippers

Book

Shippers do not book LETS or solutions. Instead, shippers apply the characteristics of LETS or solutions to their GHG emission inventories. That is, the shipper is not “booking” these characteristics for “claiming” by another organization.

Direct claim

The shipper claims:

1 A LETS directly generated by a carrier in the shipper’s contracted carrier network.

2 A direct generation claim and rebook from one of the shipper’s contracted LSPs.

Indirect claim

The shipper claims a LETS:

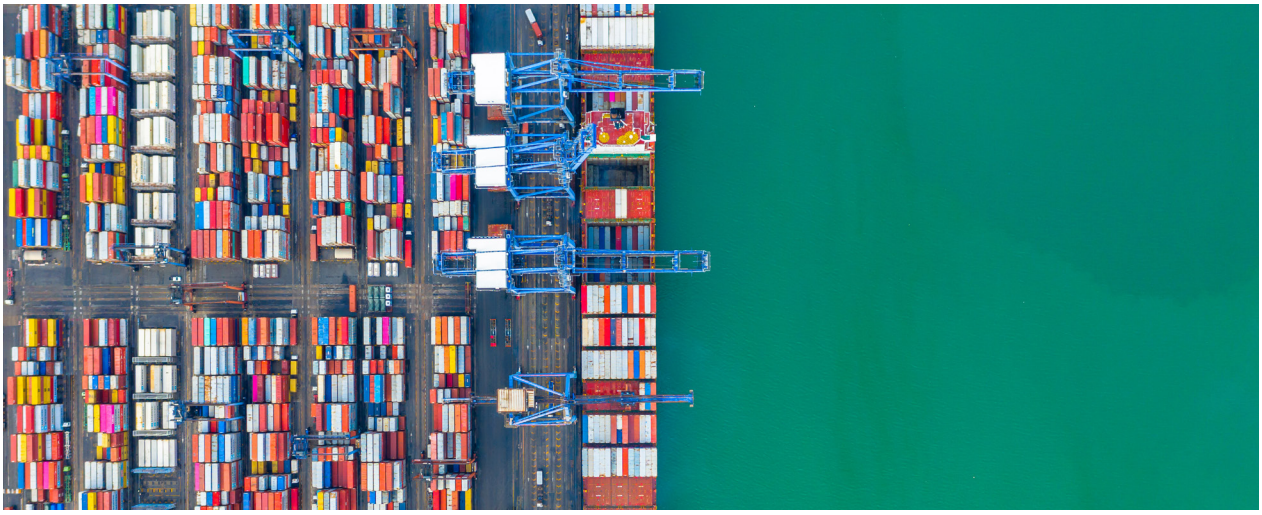
1 From a carrier that indirectly generates the LETS.

2 From a carrier that has claimed and rebooked a LETS.

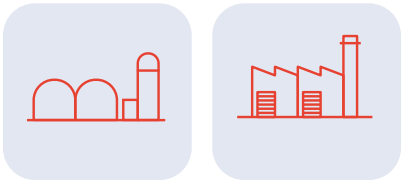
3 Indirectly generated or indirectly claimed and rebooked by an LSP.

Alternatively, a shipper can claim the emission profile of a solution from a solution provider and generate a LETS by applying the emission profile of the solution as if the solution were actually used by the shipper’s carriers.

For example, a shipper purchases the emission profile of a low emission fuel and substitutes this low emission fuel’s profile for the emission profile of the fuel consumed by carriers conducting transportation activity for the shipper. The shipper secures the emission profile of the low emission fuel through a book and claim chain of custody system. The carriers transporting the shipper’s freight may not consume any low emission fuel in these carriers’ transportation assets.



Solution provider



Book

Solution providers cannot book LETS.

Solution providers can book the profiles of solutions. The emission profiles of these solutions can be claimed by carriers, shippers, or LSPs to indirectly generate LETS.

Provide

Solution providers can also provide a solution to a carrier who directly generates a LETS using that solution.

Tracking book and claim activity

Organizations in transportation supply chains may rely on independent registries for tracking book and claim activity. Registries already exist to track the profiles of solutions like sustainable aviation and marine fuels (see Section 2).

Registries that track the profile of solutions do not necessarily serve as tools to track the profiles of LETS generated from the solutions.

For example, an LSP claims the profile of a mass or volume of sustainable aviation fuel (SAF) that is tracked in a SAF registry. The LSP may need to implement their own system to track the LETS that the LSP indirectly generates based on the profile of the SAF. That is, the SAF registry may contain information on the SAF as a product, but not contain information on the transport activity that could be conducted if the SAF were consumed by the LSP's air carriers to generate a LETS.

In this example, the LSP could claim a SAF profile from a SAF registry and still need to book a LETS (based on the SAF profile) for claiming by the LSP's customers. The latter booking and claiming, of the LETS profile, may be separate from the former booking and claiming, of the SAF profile.

Additionality of indirect generation low emission transportation services

6

Additionality of indirect generation low emission transportation services

Organizations booking or claiming direct generation of a LETS can demonstrate a physical connection between their supply chain and a LETS. That is, in all direct generation book and claim scenarios, a LETS was actually generated somewhere within in the booking or claiming organization's transportation supply chain.

The same cannot be said for indirect generation of LETS. In indirect generation book and claim scenarios, a LETS was assumed to be generated or a solution assumed to be applied somewhere – but not necessarily by the booking or claiming organization or by that organization's contracted transportation service suppliers.

Calculation of the emission profile of a LETS for indirect generation scenarios therefore requires an organization to make assumptions about what transportation activity could be conducted with a solution. In indirect generation scenarios, the booking and claiming organizations likely do not know what transportation activity actually was conducted with the solution.

Because of these assumptions inherent in indirect LETS generation scenarios, it is reasonable to impose constraints on indirect generation scenarios to ensure that the flexibility afforded by a book and claim framework is driving additional decarbonization of the transport sector. All indirect LETS must therefore be additional.

Defining additionality

Additionality is defined here as a criterion for assessing whether a solution or a LETS are required by regulation.

This definition of additionality is different from, but not necessarily inconsistent with, the definition of additionality applied in the Greenhouse Gas Protocol. The Greenhouse Gas Protocol defines additionality as a criterion for assessing whether a project has resulted in GHG emission reductions or removals in addition to what would have occurred in the project's absence (7). The Greenhouse Gas Protocol definition of additionality, then, addresses additionality from a project perspective.

Another way to consider additionality is in the context of activities associated with outputs from projects. For example, a project may involve the construction of a facility that produces low emission electrofuels. The output of that project is the low emission electrofuel produced at the plant.

The framework outlined in this document addresses the emission profile associated with solutions and LETS as opposed to the emission profiles of projects. Continuing the example above, this framework addresses the allocation of the emission profile of fuel produced at the electrofuels plant, not the emission reductions theoretically made possible by construction of the plant.

Regulation and additionality

Regulation can be a powerful tool to accelerate the deployment of LETS. Regulation can overcome the barriers to decarbonization described in Section 1, and do so without a voluntary framework. For indirect generation scenarios (i.e., where a physical connection cannot be established between a low emission solution and an organization's supply chain), this document focuses on facilitating the uptake of LETS *beyond* regulatory requirements.

Assessing additionality

Additionality needs to be assessed on a case-by-case basis for a specific LETS or solution as it relates to a specific regulatory requirement. A case-by-case assessment is necessary because regulations vary broadly across modes and geographies and because their applicability varies across the categories of organizations addressed in this document (i.e., shippers, LSPs, carriers, and solution providers).

Another variable across different regulations is the way regulatory requirements are framed. Some regulations prescribe a specific action. Some regulations prescribe a certain outcome.

An example of a regulation that prescribes a specific decarbonization action could be a fuel blending mandate. Regulators require fuel suppliers (i.e., solution providers) to implement the action of blending a certain amount of low emission fuels in with the conventional fuels that the supplier provides.

An example of a regulation that prescribes a certain decarbonization outcome could be an operational carbon intensity requirement. Regulators require carriers to realize a certain carbon intensity for their assets, an outcome that could be achieved by many combinations of specific actions (e.g., efficiency retrofits, changes in how the asset is deployed or operated, or use of low emission fuels).

Requirements for a particular action

If a regulation prescribes a specific LETS or solution, then to the extent that a LETS or solution achieves that regulatory requirement, the LETS or solution are not additional. Use of a solution or deployment of a LETS beyond the regulatory requirement could still be additional.

For example, if a regulation requires a fuel supplier to include 2% low emission fuel in all fuel provided in a certain region, volumes of low emission fuel that go to meet that 2% blend mandate are not additional. Volumes of low emission fuel provided in that region beyond the 2% blend mandate, however, would be additional with respect to the 2% blend mandate regulatory requirement.

Requirements for an outcome

If a regulation prescribes a certain outcome and does not specify a particular solution or associated LETS, then:

- To the extent that a specific LETS or solution's contribution to the achievement of a required outcome can be quantified by regulation and to the extent that the quantified LETS or solution is applied towards achievement of an outcome requirement, the solution or associated LETS is not additional.
- When the contribution of a specific LETS or solution to the achievement of a required outcome cannot be quantified under the regulation, or when the LETS or solution are not applied towards achievement of the outcome requirement, the solution and associated LETS are additional.

For example, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) outlines offsetting requirements for certain aircraft operators. These offsetting requirements may be reduced if the aircraft operator claims emission reductions from the use of CORSIA eligible fuels. Volume IV, Chapter 3 of Annex 16 to the Convention on International Aviation includes a formula for calculating aircraft operator claims for emission reductions from the use of CORSIA eligible fuels (8). An air carrier's use of SAF towards achievement of the CORSIA offsetting requirement, then, can be quantified by a method established under the regulation. Similarly, there is a process by which an air carrier can claim a quantitative reduction in the offsetting requirement based on the use of SAF. Therefore, SAF applied by a carrier in such a claim for reduced offsetting requirements under CORSIA is not additional.

In another example, Annex VI of the International Convention for the Prevention of Pollution from Ships outlines operational carbon intensity requirements for certain vessels. These carbon intensity requirements may be achieved by any number of activities, including the use of low emission fuels. While the impact of the use of low emission fuel on operational carbon intensity can theoretically be quantified, there is not a method for assessing the relative contribution of the use of low emission fuels to the achievement of operational carbon intensity requirements under Annex VI. There is also not a process by which an ocean carrier can claim a quantitative reduction in its carbon intensity requirements based on the carrier's use of a low emission fuel. Until a method to determine the contribution of using a low emission fuel as solution towards achieving a vessel's operational intensity requirements is established under Annex VI, and until vessel operators could claim the use of low emission fuel as a means to reduce their carbon intensity requirements, the use of the low emission marine fuel in generating a LETS is additional with respect to Annex VI operational intensity requirements.

10 See Section 7 for more on transportation modes

Additionality and cross modal opt-in schemes

An additionality analysis can be complicated by situations where regulations allow organizations providing a solution for one mode of transport to voluntarily create "credits" that may be applied towards achievement of a regulatory requirement for another mode of transport[10]. In these situations, deployment of a voluntary solution for one mode could allow for reduced deployment of a required solution for another mode.

If a solution is assessed to be additional for one mode of transport, and generates credits applied towards achievement of regulatory requirements for another mode of transport, the solution is still additional. However:

- When booking the emission profile of such a solution, the solution provider must disclose the extent to which the solution for one mode is generating credits towards requirements for another mode.
- Organizations that claim the emission profile of solutions for one mode of transport, when those solutions generate credits towards compliance with regulatory requirements for another mode of transport, must clearly and explicitly disclose the extent to which LETS they generate are based on a solution that is used to meet compliance obligations for another mode of transport.

Jet fuel and the California Low Carbon Fuel Standard

One example of a situation where a voluntary solution for one mode can generate "credits" towards achievement of a regulatory requirement for another mode involves California Low Carbon Fuel Standard (LCFS) system credits for low emission jet fuel.

Conventional jet fuel is not subject to LCFS regulations. However, low emission jet fuel may be used to generate LCFS credits that a low emission jet fuel supplier could sell to a supplier of a fuel that is subject to LCFS regulations. As such, an organization that supplies a low emission jet fuel to the California market could generate credits that it then sells to an organization that needs to meet regulatory carbon intensity benchmarks for gasoline or diesel. That is:

- Low emission jet fuel supplied to the California market could be considered additional if assessed in isolation. There is not a requirement for a fuel supplier to bring low emission jet fuel to the California market.
- If that low emission jet fuel generates LCFS credits that are then sold to an organization towards achievement of gasoline or diesel intensity benchmarks, the low emission jet fuel LCFS credits are allowing for reduced deployment of low emission intensity gasoline or diesel. The low emission jet fuel LCFS credits allow an organization with gasoline or diesel carbon intensity benchmarks to not supply low emission gasoline or diesel that the organization would otherwise be obligated to supply.

Marine fuel and Dutch renewable energy units

Another example of a situation where a voluntary solution can generate "credits" towards achievement of a regulatory requirement involves Dutch hernieuwbare brandstofeenhede (HBE) and low emission marine fuel.

Fuel suppliers who supply more than 500,000 liters of fuel to the Dutch market are required to have a certain number of HBEs in the Dutch Energy for Transport Registry at the end of a regulatory accounting period. The number of HBEs that must be in the registry is calculated based on the amount of energy a supplier provided to the Dutch road energy market during the accounting period.

An organization that generates more HBEs than that organization must have in the registry may sell those excess HBEs to other organizations. HBEs can be generated by providing renewable energy to the Dutch road transport sector. HBEs may also be generated by providing renewable marine fuels to ports in the Netherlands.

As such:

- Low emission marine fuel supplied to the Dutch market could be considered additional if assessed in isolation. There is not a requirement to generate HBEs in association with marine fuels delivered to Dutch ports. The requirement for a fuel supplier to have a certain number of HBEs registered is based on the amount of energy the supplier provides to the Dutch road market, not the amount of marine fuel the supplier provides to the Dutch marine market.
- If a fuel supplier generates HBEs by providing renewable marine fuels to Dutch ports and sells those HBEs to another fuel supplier towards that other fuel supplier's HBE registration requirement for road fuels (or uses those HBEs towards the fuel supplier's own HBE registration requirement for road fuels), the renewable marine fuel HBEs are allowing for reduced deployment of renewable road fuels. That is, the renewable marine fuel HBEs allow an organization with a road fuel-based HBE registration requirement to not supply renewable road fuel that the organization would otherwise be obligated to supply.

Summary

A voluntary solution for one mode of transport may generate credits that are applied towards achievement of a regulatory requirement for another mode of transport. When assessed within the constraints of a transportation mode, the voluntary solution could be considered additional. When assessed within the constraints of transport GHG emissions, the voluntary solution would not be additional.

As discussed further in the next section, this framework attempts to accelerate decarbonization across all modes of transport. Therefore, the assessment of additionality in cross modal opt-in schemes is bound by mode. This framework also attempts to facilitate transparency in GHG emission accounting. Therefore, the framework requires organizations to disclose the extent to which solutions or LETS that are voluntary for one mode generate credits towards achievement of requirements for another mode.

Facilitating decarbonization across transport modes

7

Facilitating decarbonization across transport modes

Modal constraint

One aspect of the heavy transport decarbonization challenge is scaling decarbonization across all modes of transportation. Modes of transportation, as defined here, include all the modes of transportation described in the GLEC Framework[11].

The maturity, availability, and cost of solutions can vary significantly across modes of heavy transportation. Although the challenges and costs associated with decarbonizing transportation vary by mode, all modes of heavy transport must be decarbonized to decarbonize heavy transportation in its entirety.

It is for this reason that the mode of transportation associated with a LETS must be tracked in a book and claim chain of custody system for LETS. It is also for this reason that LETS are bound by mode[12]. This constraint precludes an organization from assigning the emission profile of LETS in one mode of transportation towards the emission footprint of other modes of transportation.

Transportation operation categories

Transportation operation categorization is a way of classifying transportation activity that provides organizations the ability to declare transportation emission information at a level of resolution not possible if all transportation activity is aggregated at the modal level.

A transportation operation category (TOC) is defined here as a group of transportation operations with similar characteristics (e.g., transportation asset type and size, load factor, or geography of operation) that correspond to how transportation services are provided and procured.

Some organizations face material differences in the challenges to decarbonization within a mode (e.g., decarbonization of a particular mode is significantly more difficult in one geography than in another) in their transportation supply chains. These organizations may voluntarily choose to constrain the booking and claiming of the characteristics of LETS by TOC rather than by mode alone. Application of a TOC level constraint, rather than a modal constraint, is one way to focus decarbonization efforts on specific challenges within a transportation mode.

11 Currently, these modes are air, inland waterways, logistics sites, rail, road and sea-ocean. The number of modes described in the GLEC Framework is subject to change.
12 The applicability of a low emission solution may not be bound by mode, to the extent that the solution is the same across modes. For example, renewable natural gas molecules could be consumed in an ocean going vessel or in a heavy duty truck. The solution itself is the same for both modes. So long as the solution is the same across modes and there is a link between the solution as provided and the relevant mode of transport (e.g., renewable natural gas molecules provided only to industrial facilities could not be treated as a transportation solution, while renewable natural gas molecules provided to a distribution network that feeds transport and industrial facilities could be treated as a transportation solution), the solution is not necessarily bound by mode.

Vintage requirements for solutions and low emission transportation services

Vintage requirements for solutions and low emission transportation services

Ambiguity about when a solution was provided or when a LETS was generated can undermine trust in a book and claim chain of custody system for transport decarbonization. Lack of documentation about when solutions were provided or LETS generated may also confuse assessments of LETS additionality as regulatory requirements change with time. A vintage constraint can help address these potential challenges.

For details on the vintage requirements associated with each type of book and claim scenario, see Table 1.

Summary of book and claim scenarios and constraints

9

TYPE OF ORGANIZATION	TYPE OF BOOK OR CLAIM	DIRECT OR INDIRECT	DESCRIPTIONS	ADDITIONALITY CONSTRAINT	MODAL CONSTRAINT	VINTAGE CONSTRAINT	NOTES
Carrier	**Book**	Direct	Carrier generates LETS, applying a solution within their owned-operated fleet	Does not Apply	Applies	LETS profile booked within 12 months of generation	The LETS may or may not reflect decarbonization already required by law. The purchaser of the LETS is encouraged to clarify with the booking carrier whether or not the LETS is additional.
	Book	Indirect	Carrier generates LETS using the profile of a solution, as if the solution was used in their owned-operated fleet	Applies	Applies	LETS profile booked within 12 months of booking of profile of solution associated with LETS profile	–
	Claim and Rebook	Indirect	Carrier claims a LETS directly generated by another carrier, re-books the LETS	Applies	Applies	LETS profile booked within 12 months of booking of LETS that was claimed	–
LSP	**Book**	Indirect	LSP generates LETS using the profile of a solution, as if the solution was used by the LSP's contracted carriers	Applies	Applies	LETS profile booked within 12 months of booking of profile of solution associated with LETS profile	–
	Claim and Rebook	Direct	LSP claims LETS directly generated by a carrier, then books that LETS for claiming by LSP customers	Does not Apply	Applies	LETS profile booked within 12 months of booking of LETS that was claimed	The LETS may or may not reflect decarbonization already required by law. The purchaser of the LETS is encouraged to clarify with the rebooking LSP whether or not the LETS is additional.
	Claim and Rebook	Indirect	LSP claims a LETS indirectly generated by a carrier, then books that LETS for claiming by LSP customers	Applies	Applies	LETS profile booked within 12 months of booking of LETS that was claimed	–
Shipper	**Claim**	Direct	Shipper claims LETS directly generated by a carrier	Does not Apply	Applies	LETS profile included in shipper inventory within 24 months of the year of booking of LETS profile	The LETS may or may not reflect decarbonization already required by law. The shipper is encouraged to clarify with the booking carrier or LSP whether or not the LETS is additional.
	Claim	Indirect	Shipper claims LETS indirectly generated by an LSP or carrier (including Carrier Claim and Rebook LETS), or claims the profile of a solution from a solution provider	Applies	Applies	LETS profile included in shipper inventory within 24 months of the year of booking of LETS profile	–
Solution Provider	**Book**	Indirect	Solution provider books the profile of a low emission solution	Applies	Applies	Solution profile booked within 12 months of production[13] of solution	–
	Provide	Direct	Solution provider provides a solution to a carrier that directly generates a LETS using the solution	Does not Apply	Applies	Not applicable	The LETS may or may not reflect decarbonization already required by law. The carrier is encouraged to clarify with the solution provider whether or not the solution is additional.

13 "Production," as defined here, will vary by solution type. For fuels, "production" may be the date on which the fuel was tested as conformant with fuel quality and safety standards for its intended use.

Calculating the emission profile of solutions and low emission transportation services

10

Calculating the emission profile of solutions and low emission transportation services

Users of book and claim chain of custody systems to facilitate transportation decarbonization must be able to calculate and disclose the GHG emission profile of LETS. If an organization cannot calculate its GHG footprint based on the emission profile of a LETS, that organization has less incentive to pay extra for the LETS.

An organization can determine the GHG emission profile of a LETS or solution, as applied to their organization, by following three steps:

1. Determine the organization's mode-specific transport activity.
2. Determine the energy consumption or emission intensity associated with the mode-specific transport activity.
3. Apply the GHG emission factor or emission intensity of a solution or LETS to the organization's transport activity for each mode.

Organizations can use several metrics to conduct these three steps, principally, transportation activity, energy intensity, GHG emission intensity, and GHG emissions factors.

Transportation activity

Transportation activity is the product of the amount of freight[14] transported and the distance that freight was transported:

$$\textit{Freight Transport Activity} = \textit{Amount of Freight Transported} \times \textit{Distance that Freight was Transported}$$

Freight transportation activity is often quantified in terms of mass multiplied by distance, such as tonne kilometers (tonne km). In specific circumstances, transport activity may also be quantified in terms of volume multiplied by distance, such as twenty foot equivalent unit (TEU) km.

Energy intensity

Energy intensity is the amount of energy consumed in conducting a certain amount of transport activity:

$$\textit{Energy Intensity} = \frac{\textit{Amount of Energy}}{\textit{Transport Activity}}$$

14 This framework focuses principally on freight. However, transportation activity can also be calculated for passenger transportation (e.g., passenger kilometers). A passenger specific example is also provided accordingly.

GHG emission intensity

GHG emission intensity is the amount of GHG emissions generated for a certain amount of transport activity.

$$\textit{Greenhouse Gas Emission Intensity} = \frac{\textit{Mass of Greenhouse Gases Emitted}}{\textit{Transport Activity}}$$

GHG emission factor

The emission factor of an energy source is the mass of GHG emitted per unit of energy[15]:

$$\textit{Emission Factor of Energy} = \frac{\textit{Mass of Greenhouse Gases Emitted}}{\textit{Unit of Energy}}$$

As described in the GLEC Framework:

- Emission factors must incorporate emissions resulting from all United Nations Framework Convention on Climate Change Kyoto Protocol GHGs (currently, CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3))[16]. Emission factors must be expressed in units of carbon dioxide equivalent (CO_2e).
- The boundary for calculating GHG emission factors must include emissions associated with the entire life cycle of the production and use of an energy source.

Examples of how to apply these metrics in calculating the emission profile of a LETS or solution are included below.

15 Examples of "units of energy," as described here, include mass or volume of fuel.
16 Global Warming Potential (GWP) is a factor to convert from the mass of a non-CO_2 gas released to the atmosphere and the equivalent mass of CO_2. When calculating CO_2 equivalents: 1. The source of the GWP (e.g., which Intergovernmental Panel on Climate Change Assessment Report) must be clearly stated and consistently used; 2. One hundred year GWPs (not including climate-carbon feedback) are recommended; 3. An explanation for deviations from the use of one hundred year GWPs must be provided.

Example: Low Emission Marine Fuel and Ocean Freight Transportation

A shipper wants to apply the GHG emission profile of a low emission marine fuel towards the organization's ocean freight transportation footprint. A fuel supplier offers to sell the shipper the emission profile of a low emission marine fuel. The low emission marine fuel has a GHG emission factor of 0.400 kg CO_2e/kg fuel.

Step 1

The shipper calculates its ocean freight transport activity for an emission reporting period according to the steps described in the GLEC Framework. The shipper was responsible for 5,000,000 TEU km of ocean freight transport activity.

Step 2

The shipper does not have primary data to determine the amount of fuel consumed for each TEU km of ocean transport activity conducted on its behalf.

The shipper does, however, have global average ocean container transport emission intensity information published through the Clean Cargo program. That intensity is 0.0664 kg CO_2e/TEU km.

The shipper does not know the combination of fuel types that were used by carriers whose data led to the 0.0664 kg CO_2e/TEU km intensity. However, the shipper is aware that most of its ocean cargo is carried in vessels burning marine gas oil (MGO). The GLEC Framework shows an average emission factor for MGO of 3.92 kg CO_2e/kg fuel.

The shipper calculates a fuel consumption factor of 0.01694 kg fuel/TEU km:

$$\frac{0.0664 \ {}^{kg\ CO_2\ e}/_{TEU\ km}}{3.92 \ {}^{kg\ CO_2\ e}/_{kg\ fuel}} = 0.01694 \ {}^{kg\ fuel}/_{TEU\ km}$$

The shipper was responsible for approximately 84,700 kg MGO consumption during the reporting period:

$$0.01694 \ {}^{kg\ fuel}/_{TEU\ km} \times 5{,}000{,}000\ TEU\ km = 84{,}694\ kg\ MGO$$

The gravimetric energy density (mega joule (MJ) energy per kg fuel) of MGO, however, is 5% higher than the gravimetric energy density of the low emission fuel. As such, the shipper would need to burn a greater mass of the low emission fuel than MGO to conduct the same amount of transportation activity. The shipper would be responsible for 88,929 kg of low emission fuel during the reporting period:

$$84{,}694 \text{ kg MGO} \times 105\% = 88{,}929 \text{ kg low emission fuel}$$

Step 3

The shipper wants to apply use of low emission fuel towards the shipper's entire ocean freight emissions for the reporting period. As such, the shipper purchases the GHG emission profile associated with 88,929 kg of low emission fuel from the fuel provider.

The shipper's ocean freight emission footprint for the reporting period is 35,571 kg CO_2e.

$$88{,}929 \text{ kg fuel} \times 0.400 \ {}^{\text{kg } CO_2 e}/_{\text{kg fuel}} = 35{,}571 \text{ kg } CO_2e$$

Constraints

This is an indirect generation claim scenario. The shipper does not know where the low emission marine fuel will be consumed, or the actual transportation activity conducted with that fuel.

The shipper claimed the emission profile of a solution from a solution provider. The solution may not have been applied anywhere in the shipper's contracted marine transportation supply chain.

As such:

- The shipper must consider the additionality of the marine fuel whose profile the shipper purchased (additionality constraint).
- The shipper may only apply the emission profile of the fuel only to the shipper's marine transportation emission footprint (modal constraint).
- The solution provider (i.e., the fuel provider) may not book the emission profile of the fuel that was allocated to the shipper for claiming by another customer (controls to avoid double counting, see Section 11).

Example: Low Emission Aviation Fuel and Air Passenger Transportation

An organization wants to apply the emission profile of a low emission aviation fuel towards the organization's business air travel footprint. A fuel supplier offers to sell the organization the emission profile of a Fischer-Tropsch processed agricultural residue aviation fuel with a life cycle emission factor of 0.33 kg CO_2e/kg fuel.

Step 1

The organization calculates its transport activity at 1,000,000 passenger km (pkm) on regional aircraft, 4,000,000 pkm on narrow body aircraft, and 2,000,000 pkm on wide body aircraft.

Step 2

The organization has been provided a fuel consumption intensity factor of 0.05 kg fuel/pkm by its regional air carrier. The organization's other air carriers do not provide fuel consumption intensity to the organization. As such, the organization calculates narrow and wide body fuel consumption intensities of 0.026 kg fuel/pkm (narrow body) and 0.027 kg fuel/pkm (wide body) based on International Council on Clean Transportation data (9).

The organization was responsible for 208,000 kg of fuel consumption during the reporting period:

$$(1{,}000{,}000\ \text{pkm})\left(0.05\ {}^{\text{kg fuel}}/_{\text{pkm}}\right) + (4{,}000{,}000\ \text{pkm})\left(0.026\ {}^{\text{kg fuel}}/_{\text{pkm}}\right) + (2{,}000{,}000)\left(0.027\ {}^{\text{kg fuel}}/_{\text{pkm}}\right) = 208{,}000\ \text{kg fuel}$$

Step 3

The organization decides to apply use of low emission aviation fuel towards only a portion of the organization's air freight emissions and purchases the emission profile associated with 100,000 kg of low emission fuel from the fuel supplier. The low emission fuel has an energy content comparable to that of conventional aviation fuel and, as such, one unit mass of the low emission fuel can be treated as generating the same propulsive force in a jet engine as one unit mass of conventional aviation fuel. Emissions associated with the remaining fuel can be calculated using the conventional aviation fuel life cycle emission factor of 3.891 kg CO_2e/kg fuel. The organization's air passenger GHG emission footprint for the reporting period was 453,228 kg CO_2e:

$$(100{,}000\ \text{kg fuel})\left(0.33\ {}^{\text{kg } CO_2e}/_{\text{kg fuel}}\right) + (208{,}000\ \text{kg fuel} - 100{,}000\ \text{kg fuel})\left(3.891\ {}^{\text{kg } CO_2e}/_{\text{kg fuel}}\right) = 453{,}228\ \text{kg } CO_2e$$

Constraints

This is an indirect generation claim scenario. The claiming organization does not know where the low emission aviation fuel will be consumed, or the actual transportation activity conducted with that fuel.

Instead, the organization claimed the emission profile of a solution from a solution provider. The solution may have not been applied anywhere in the claiming organization's business travel supply chain.

As such:

- The organization must consider the additionality of the aviation fuel whose profile it purchased (additionality constraint).
- The organization must apply the emission profile of the fuel only to the organization's air transportation emission footprint (modal constraint).
- The solution provider (i.e., the fuel provider) may not book the emission profile of the fuel that was allocated to the organization with a business travel footprint for claiming by another customer (controls to avoid double counting, see Section 11).

Example: Electrification of Road Transportation

A shipper wants to apply the emission profile from the use of electric trucks for road transportation towards the organization's road freight footprint. The shipper procures truck transportation services through an LSP.

The shipper's LSP contracts for road transportation with many carriers, some of whom operate electric trucks.

Step 1

The shipper is responsible for 8,000,000 tonne km of road transport activity over the reporting period. The LSP contracts for 1,000,000,000 tonne km of road transport activity over the reporting period, 15,000,000 tonne km of which is conducted by electric trucks.

Step 2

Energy as electricity is not converted to transport activity in an electric motor by the same means that energy as diesel fuel is converted to transport activity in an internal combustion engine. Stated differently, a mass of diesel fuel with an energy content of one MJ cannot be assumed to generate the same propulsive energy in an internal combustion engine that one MJ of electricity generates in an electric motor. As such, energy consumption in the form of diesel burned in internal combustion engines needs to be expressed in terms comparable to electricity consumed in electric motors. Emission intensity can be used to enable this comparison across propulsion technologies.

The LSP collects data from its electric truck-operating carriers that shows that the GHG emission intensity of its 15,000,000 tonne km of contracted electric trucking activity for the reporting period is 0.080 kg CO_2e/tonne km (this emission intensity was reported by the carriers based on the principles in the Greenhouse Gas Protocol Scope 2 Guidance for purchased electricity).

The shipper determines that the overall average emission intensity for its road transportation footprint, as described in the GLEC Framework, is 0.150 kg CO_2e/tonne km.

Step 3

The LSP has booked 15,000,000 tonne km of a road LETS at 0.080 kg CO_2e/tonne km.

The shipper decides to apply use of the electric trucks towards only a portion of the organization's road freight emissions and claims 5,000,000 tonne km of its LSP's 15,000,000 tonne km electric truck LETS from the LSP (leaving 10,000,000 tonne km of electric truck LETS remaining in the LSP's books).

The shipper's road transportation emission footprint for the reporting period is 850,000 kgCO_2e:

$$\left(0.080\ {}^{kg\ CO_2e}/_{tonne\ km}\right)(5{,}000{,}000\ tonne\ km) + \left(0.150\ {}^{kg\ CO_2e}/_{tonne\ km}\right)(8{,}000{,}000\ tonne\ km - 5{,}000{,}000\ tonne\ km) = 850{,}000\ kg\ CO_2e$$

Constraints

This is a direct generation booking scenario for the carriers, a direct claim and rebook scenario for the LSP, and a direct claim scenario for the shipper.

The carriers are generating an electric truck LETS by applying a solution (electric trucks) within their owned-operated fleets.

The LSP is claiming an electric truck LETS directly generated by carriers in the LSP's contracted carrier network. The LSP has information from its carriers regarding the emission intensity of the electric trucking activity actually conducted in association with the LETS.

The shipper is claiming an electric truck LETS that has been claimed from a carrier by the LSP and rebooked by the LSP for claiming by the LSP's customers.

As such:

- An additionality assessment is not required. The electric trucking LETS was directly generated in this carrier-LSP-shipper network (additionality constraint).
- Neither the LSP nor the shipper may apply the electric trucking LETS emission intensity towards transportation activity in non-road modes of transport (modal constraint).
- Neither the electric trucking carriers nor the LSP may book the emission profile of the electric trucking activity that was allocated to the shipper for claiming by another customer (controls to avoid double counting, see Section 11).

Booking and claiming without erroneous double counting

11

Booking and claiming without erroneous double counting

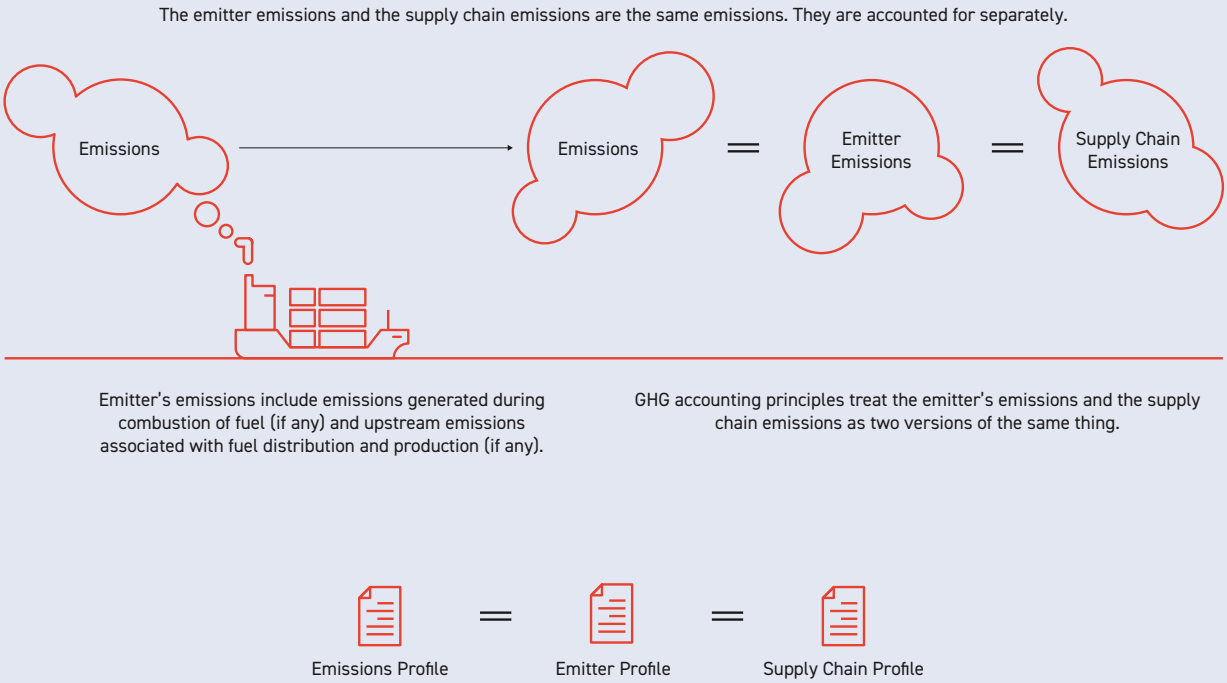
Proper booking and claiming of the emission profiles of solutions and LETS is necessary to avoid erroneous double counting. Double counting is defined here as two or more reporting companies taking ownership of the same GHG emissions or emission profile (7).

Not all double counting is erroneous. Because one organization's direct emissions are often indirect emissions for another organization, there are two facets of the emissions associated with transport activity:

1. The "emitter's emissions," or the emissions as they apply for the carrier conducting the transport activity.
2. The "supply chain" emissions, or the emissions as they apply for the organization on whose behalf the transport activity was conducted.

While counting both emitter's emissions and supply chain emissions separately may be appropriate, LETS are bound by mode (or TOC)-specific transportation activity. Allocating the GHG emission profile of a LETS to more transportation activity than was conducted in that LETS will result in erroneous double counting of the emission profile of the LETS. That is, a solution used to either directly or indirectly generate a LETS generates a transport activity limited LETS.

Figure 7. Emitter's emissions, supply chain emissions, emitter emission profiles, and supply chain emission profiles



Principles to avoid incorrect double counting

Controls on who can book and who can claim can be a useful tool to avoid erroneous double counting.

Solution providers may book the profile of solutions:

- Bundled. In a bundled booking, the solution provider books the profile of the solution associated with the emitter's emissions together with the profile of the solution associated with the supply chain emissions.
- Unbundled. In an unbundled booking, the solution provider books the profile of the solution associated with the emitter's emissions separately from the characteristics of the solution associated with the supply chain emissions.

The solution provider must clearly distinguish between bundled and unbundled solutions when booking solutions.

Solution providers may book bundled emission profiles for claiming directly by shippers or forwarders, without the booking going through a carrier.

Solution providers may allow a shipper or an LSP to claim the supply chain profile of an unbundled booking even if the solution provider does not have a carrier arranged to purchase the emitter profile of the unbundled booking. In these circumstances, the solution provider may either:

- Allow a carrier to claim the emitter profile associated with the supply chain profile that has already been claimed by the shipper or LSP, if a carrier is found to claim the emitter profile within 12 months of the claim of the supply chain profile.
- Retire the emitter profile without the emitter profile being claimed by a carrier. Any unclaimed emitter profiles that are retired by a solution provider must be documented by the solution provider. Retired emitter profiles must be traceable.

See Figures 8-13.

Unbundling can increase the risk of double counting if a carrier that has not purchased the rights to the supply chain emission profile were to:

1. Unknowingly book a LETS
2. Report a lower emitter profile and customers with direct data access (e.g. supplier engagement programs) were to then claim associated scope 3 reductions.

This risk is acknowledged and possible mitigation approaches are presented in the subsequent section "Declaring Different GHG Emission Information To Different Stakeholders". The extent of the risk will depend on the effectiveness of the book and claim registries that are in place.

Carriers

Carriers can book a direct generation LETS only for the amount of transport activity they conducted with the solution applied to generate the LETS.

Carriers can book an indirect generation LETS only for the amount of transport activity they could have conducted if the solution were applied to generate the LETS in their owned-operated fleet.

If a carrier books a LETS and that LETS is claimed by another carrier, the booking carrier can no longer disclose an emission profile based on the LETS that it booked.

A carrier may claim the profile of either a bundled or unbundled solution from a solution provider.

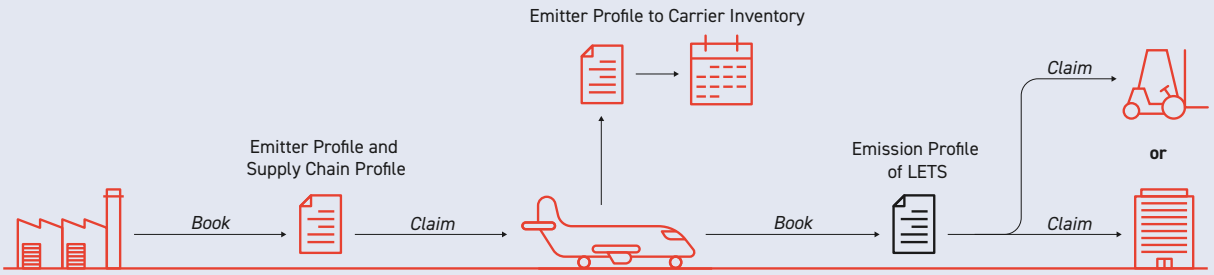
If the carrier claims the profile of a bundled solution (see Figure 8):

- The carrier may report emissions based on that profile towards its own GHG emission footprint.
- The carrier may book a LETS, either directly or indirectly, based on the profile of the solution.

If the carrier claims the profile of an unbundled solution (see Figure 9):

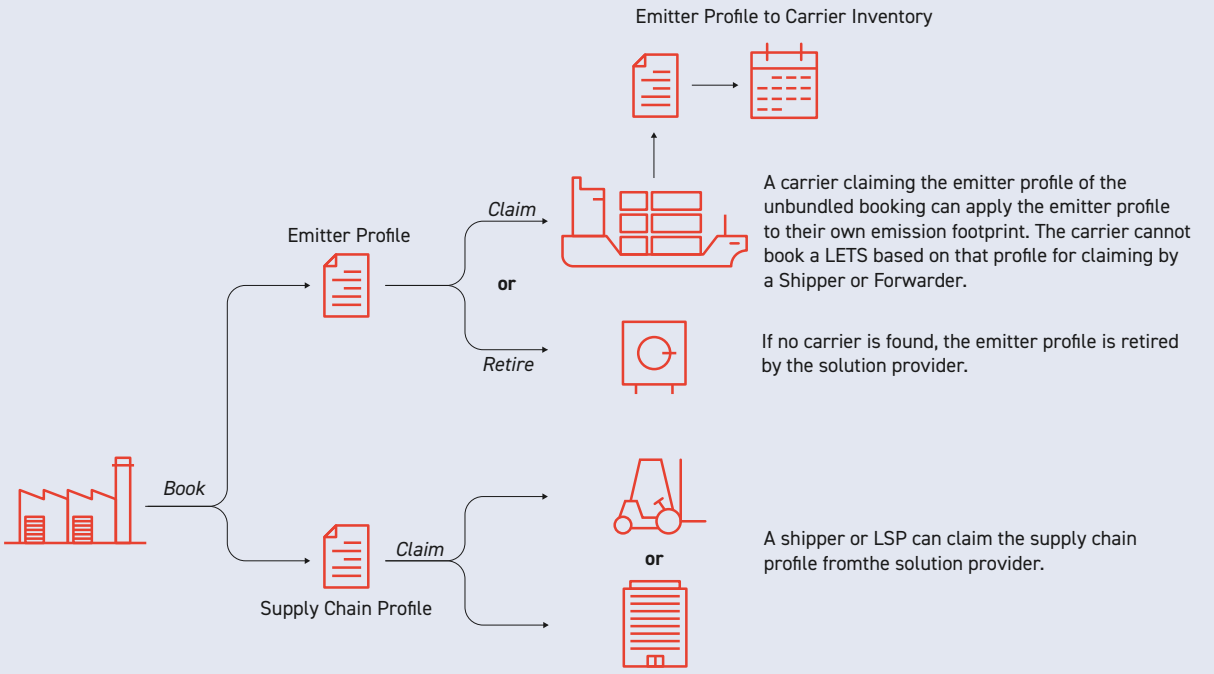
- The carrier may report emissions based on that profile towards its own GHG emission footprint.
- The carrier may not book a LETS, either directly or indirectly, based on the profile of the solution.

Figure 8. Bundled booking



A carrier claims a bundled booking from a solution provider. The carrier applies the emitter profile of the solution to their own emission inventory, and generates and books a LETS based on that profile. A shipper or forwarder can then claim the profile of the LETS from the carrier.

Figure 9. Unbundled booking



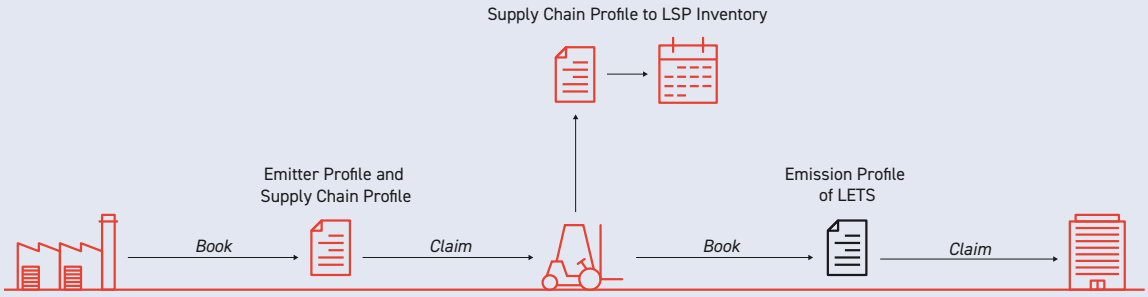
LSP

LSPs can book indirect generation LETS only for the amount of transport activity that their carriers could have conducted if the solution were applied to generate the LETS by the LSP's carriers. LSPs can claim and rebook LETS only for the amount of transport activity directly or indirectly generated by the carrier that generated the LETS.

An LSP may claim the profile of either a bundled (see Figure 10) or unbundled (see Figure 11) solution from a solution provider. If the LSP claims the profile of either a bundled or unbundled solution:

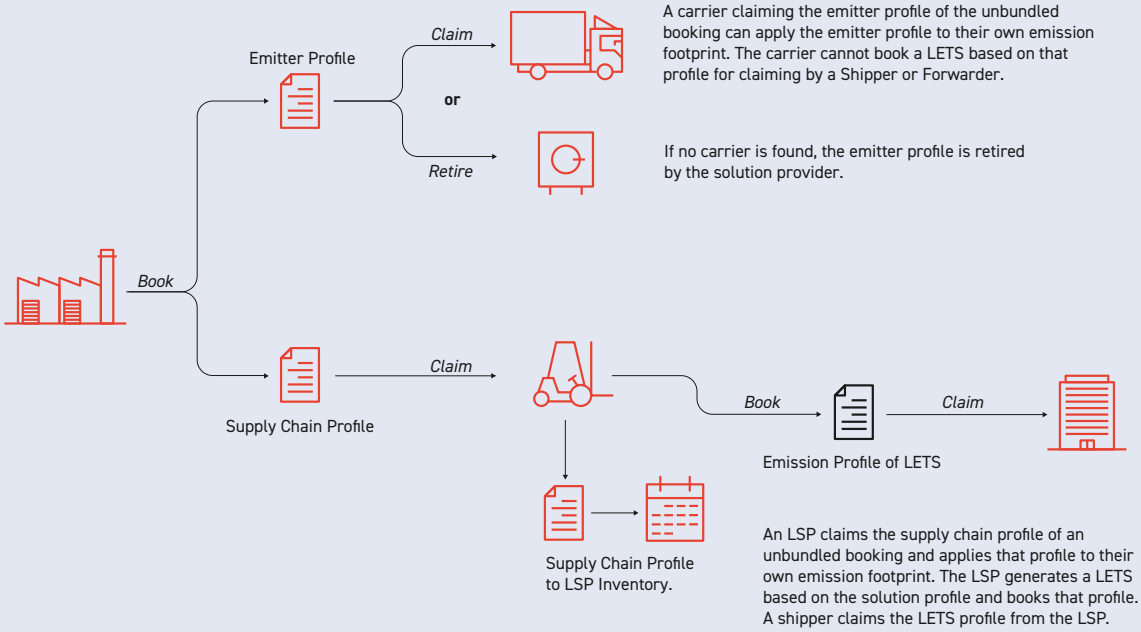
- The LSP may report emissions based on the solution's profile towards its own GHG emission footprint.
- The LSP may indirectly generate and book a LETS based on the emission profile of the solution.

Figure 10. Bundled booking



An LSP claims a bundled booking from a solution provider. The LSP can apply the supply chain profile to their own emission footprint and book a LETS

Figure 11. Unbundled booking



Shippers

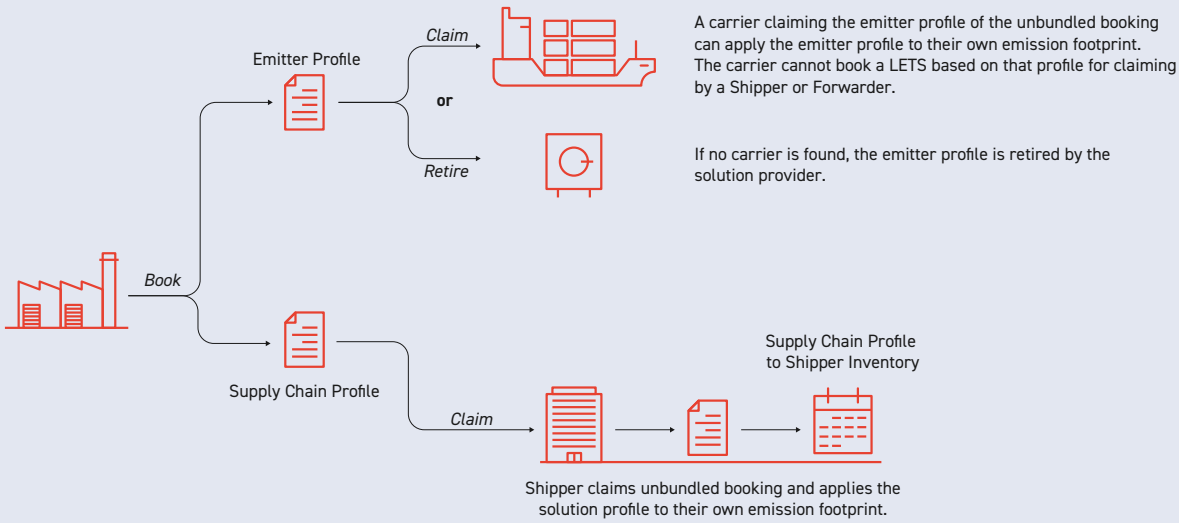
Shippers can claim LETS only for the amount of transport activity actually conducted to generate the LETS or that could have been conducted by the shipper's carriers or through the shipper's LSPs.

A shipper may claim the profile of either a bundled (see Figure 12) or unbundled (see Figure 13) solution from a solution provider. If the shipper claims the profile of either a bundled or unbundled solution, the shipper may report emissions based on the solution's profile towards its own GHG emission footprint.

Figure 12. Bundled booking

A shipper claims the bundled booking from the solution provider and applies the solution profile to their own emission footprint.

Figure 13. Unbundled booking



Shipper claims unbundled booking and applies the solution profile to their own emission footprint.

Declaring different GHG emission information to different stakeholders

When an organization books the GHG emission profile of LETS and that profile is claimed by another organization, the booking organization may need to report GHG emission intensity information *differently* in their GLEC Declaration to External Stakeholders and in their GLEC Business to Business Declarations (for more on these different types of declarations, see the GLEC Framework (10))[17].

For example, Carrier A has two customers, Shipper 1 and Shipper 2. Carrier A generates a LETS over the span of a reporting period. Carrier A books the emission profile of the LETS. Shipper 1 claims the LETS emission profile. Shipper 2 does not claim any of the LETS emission profile.

When reporting on GHG emissions, Carrier A's:

- GLEC Declaration to External Stakeholders, as captured in Carrier A's annual sustainability report, will show an overall average transport emission intensity resulting from transport activity associated with the LETS as well as transport activity not associated with LETS.
- GLEC Business to Business Declaration to Shipper 1 will include a transport emission intensity that is lower than the emission intensity shown in Carrier A's Declaration to External Stakeholders. The Declaration to Shipper 1 includes the effect of the LETS, and less of the effect of non LETS transport activity than is reflected in the Declaration to External Stakeholders.
- GLEC Business to Business Declaration to Shipper 2 will include a transport emission intensity that is higher than the emission intensity shown in Carrier A's Declaration to External Stakeholders. The Declaration to Shipper 2 represents the emission intensity of transport activity not associated with the LETS.

Because an organization may report different transport emission intensities in a GLEC Declaration to External Stakeholders and in its GLEC Business to Business Declarations, it is important for the reporting organization to be clear about the appropriate uses of the intensity information provided in each type of declaration. As such, organizations that book the emission profile of LETS for claiming by specific organizations (i.e., the profile of the LETS is not provided to all of the booking organization's customers equally) may include a statement in their GLEC Declarations as follows.

17 The framework described in this document builds on GHG emission calculations as described in the GLEC Framework. GHG emission reporting consistent with the GLEC Framework (e.g., the GLEC Declaration to External Stakeholders and the GLEC Business to Business Declaration) continues to represent the foundation for organizational freight GHG emission reporting. The GLEC Framework is supplemented, not replaced, by the principles provided in this document.

Business to business declaration

The GLEC Business to Business Declaration can include a statement that reads:

> **"The greenhouse gas emission intensity information presented here reflects calculations that account for allocation of low emission transport activity to selected customers. The emission intensity here applies to your organization directly and may be different from emission intensity information in other public or general reporting. Please use the greenhouse gas emission intensity information presented here for transportation activity associated with our organization in your greenhouse gas emission calculations."**

Declaration to external stakeholders

One approach to transparency about use of GHG emission intensity information provided in external stakeholder declarations is to clarify that the average intensity is not meant for organization-specific use. For example:

> **"The greenhouse gas emission intensity information presented here reflects calculations that account for allocation of low emission transport activity to selected customers. The emission intensity presented here is therefore not appropriate for use in customer specific greenhouse gas emission calculations. Customers are encouraged to contact us directly for information on the emission intensity appropriate for use in their greenhouse gas emission calculations for transportation activity associated with our organization."**

Another approach to transparency about the use of emission intensity information provided in external stakeholder declarations is to clarify that the average intensity is not meant for organization-specific use and to provide an alternative emission intensity. For example:

> **"The greenhouse gas emission intensity information presented here reflects calculations that account for allocation of low emission transport activity to selected customers. The emission intensity presented here is therefore not appropriate for use in customer specific greenhouse gas emission calculations. Unless we have provided your organization directly with greenhouse gas emission intensity information, please assume a greenhouse gas emission intensity of [insert emission intensity] for transportation activity associated with our organization in your greenhouse gas emission calculations."**

Additional considerations regarding GHG emission information declarations

Third party verifiers of emission declarations are encouraged to assess these declarations to ensure that the declarations are transparent, not only in situations where a booking organization must report GHG emission intensity information differently in their GLEC Declaration to External Stakeholders and in their GLEC Business to Business Declarations, but also with respect to transparency about additionality of solutions. See, in particular, the section regarding additionality and cross modal opt-in schemes in Section 6.

Determining the emission profile of non LETS activity

Organizations that report different GHG emission profiles to different stakeholders may need to calculate emission information for transportation activity that:

- Includes the effect of LETS for some stakeholders.
- Does not include the effect of LETS for other stakeholders.

The section above on calculating the emission profile of a LETS provides steps to determine GHG emission information for transportation activity associated with LETS. Emission information for transportation activity not associated with LETS can be calculated based on two approaches, one using primary data and the other using secondary data[18]. As described in the GLEC Framework, the use of primary data is preferred over the use of secondary data wherever practicable.

18 As used here, the term "secondary data" includes either modelled or default emission intensity values for the non-LETS transport activity.

Primary data

Some organizations may have primary data to use in calculating emission information to provide to customers that have not claimed the emission profile of a LETS.

For example, an ocean container carrier operates most of its fleet on MGO and purchases low emission marine fuel for a selection of voyages. The carrier books the LETS generated through the use of the low emission marine fuel and a selection of specific shippers and LSPs claim the profile of the LETS. The carrier needs to report on its emission intensity to other customers who did not claim the profile of the LETS.

The carrier may use actual data on voyages not associated with the LETS to determine the emission profile of its non-LETS transportation. This emission profile can be provided to customers that did not claim the LETS emission profiles.

Secondary data

Many organizations may not know the actual emission profile of transportation activity not conducted in association with a LETS. These organizations can use secondary information for the activity most likely replaced by the LETS.

For example, an LSP is responsible for securing 10,000,000 tonne km of road freight transportation activity for its customers. The LSP purchases the GHG emission profile for 1,000,000 tonne km of electric truck LETS and calculates and allocates the emission profile of the electric trucking as described in Section 10 above.

The LSP does not have carrier data for the remaining 9,000,000 tonne km of transportation activity. The LSP assigns the appropriate emission intensities from the GLEC Framework to this 9,000,000 tonne km of transport activity.

Conclusion

12

Conclusion

The challenge of decarbonizing heavy transportation is not an easy one to overcome. However, this challenge must be overcome if organizations with heavy transportation GHG emission footprints are to contribute meaningfully to the rapid acceleration of decarbonization required for the achievement of global climate goals. Heavy transport decarbonization can be accelerated by mechanisms to share the cost of decarbonization across LSPs, shippers, and carriers and by mechanisms that increase access to LETS for LSPs, shippers, and carriers.

Cost sharing and increased access can be enabled by a framework that:

- Permits a purchaser of freight transportation services to contribute to and report the benefits from LETS, even if those LETS do not directly involve the transportation assets that physically transport their freight.
- Permits a provider of freight transportation services or a provider of a low emission transportation solution to allocate the emission profile of the solution or LETS to the organizations that contribute to the emission abatement cost, even if those organizations' freight is not always transported using the LETS or solution.
- Is consistent with established freight transportation GHG accounting methods.

This document describes a framework based on a book and claim chain of custody approach to meet these needs.

While the framework outlined here can help facilitate transport decarbonization, this framework is only one of a many tools to bring decarbonized heavy transportation to scale. Different tools and requirements address other pieces of the voluntary freight decarbonization challenge. And of course, beyond voluntary action, robust regulatory requirements for heavy transportation decarbonization can create a level playing field for carriers generating LETS and reduce the need for reliance on voluntary collaboration schemes to avoid the worst impacts of climate change.

It also bears noting that this framework, like other tools to scale freight transportation decarbonization, will likely evolve as it is implemented by organizations and as the framework's strengths and weaknesses are revealed in practice.

The need for freight transportation decarbonization is hard to dispute. The barriers to achieving this decarbonization are real but they are not insurmountable. There is no time to waste. The remaining carbon budget for a 1.5°C world is quickly dwindling and "now is the only time there ever is to do a thing" (11).

Annexes

Annex 1

Applying the framework to the mail and parcel sector

The GLEC Framework identifies the mail and parcel sector as a sector that warrants special guidance regarding GHG emission inventory calculations. Unique characteristics of the mail and parcel sector, as described in the GLEC Framework, are also relevant to the accounting framework outlined in this document.

For example, in mail and parcel networks, there are a large number of individual shipments, many of these shipments being small volume consignments. A dynamic mix of modes and routes is applied to transport these individual consignments from their point of origin to their final destination. As such, it is not always possible to:

- Predict which route (and the mix of modes to be used on that route) an individual consignment will take through a mail and parcel network.
- Determine, after a shipment has occurred, which route an individual consignment actually took through a mail and parcel network.

Because of these characteristics of mail and parcel networks, it is often not practicable to calculate mail and parcel transport activity as defined in Section 10 (i.e., mass or volume of freight multiplied by the distance that mass or volume of freight was transported).

Instead, the GLEC Framework outlines a process for calculating mail and parcel GHG emissions based on the number of consignments (items) processed through a mail and parcel network. Under the GLEC Framework, the emissions associated with a specific shipment are calculated by dividing the total mail and parcel network emissions by the total number of items processed through the network during a defined period of time.

The example in this Annex describes a way of applying the GHG emission calculation methods outlined in Section 10 to a mail and parcel network, considering the GLEC Framework approach to mail and parcel networks.

Example: Biogas and Heat Pumps in a Mail and Parcel Network

A mail and parcel network operator wants to apply the emission profile of heat pumps powered by renewable electricity and trucks powered by biogas towards the emission footprint of letters processed through the operator's sorting facilities and road transport operations on behalf of a specific shipper.

Step 1

The mail and parcel network operator transported one billion letters during a one-year emission reporting period.

The shipper (i.e., the shipper whose letters will be allocated the emission profile of the heat pumps and biogas) shipped ten million letters[19] through the mail and parcel network operator's network during the one-year emission reporting period.

19 Provided that the shipper only used the mail and parcel network operator described in this example, ten million letters serves as the equivalent of the mail and parcel transport activity constraint for this shipper during the reporting period.

Step 2

While mail and parcel tracking technologies are rapidly improving, the mail and parcel network operator does not yet have the ability to calculate item-level emissions based on the characteristics of a specific shipment.

Instead, the mail and parcel network operator calculates its total network GHG emissions for the reporting period based on primary data collected from the operator's activities. The total network emissions for the reporting period are 500,000,000 kg CO_2e. Spread across ten billion shipments, this emission footprint equates to 50 g CO_2e per shipment:

$$\frac{500{,}000{,}000 \text{ kg } CO_2e}{10{,}000{,}000{,}000 \text{ Shipments}} = 50 \text{ g } CO_2e \,/\, \text{Item}$$

This 50 g CO_2e per item emission intensity is based on an emission footprint (500,000,000 kg CO_2e) that does not include biogas trucking or heat pump utilization. That is, the emission intensity represents operations before the mail and parcel network operator applied the biogas and heat pump solutions in its network. In subsequent reporting periods, the "baseline" emission footprint used to calculate the per shipment emission intensity:

- Will not change based on the influence of biogas trucking or renewable electricity heat pumps in logistics sites. The "baseline" emission footprint will be calculated as if the biogas trucks were operated as conventional fuel trucks, and as if logistics sites heating was provided by conventional heating systems.
- May change as general efficiency or other variables in the mail and parcel network operator's network change. For example, if changes in asset utilization, asset routing, or modal mix impact the overall emission intensity of the mail and parcel network's operations, this impact will be reflected in a revised baseline for each reporting period.

The mail and parcel network operator has determined that the 50 g CO_2e per item emission intensity, as it applies to the shipper, is associated with two modes of transport as follows:

- 40 g CO_2e per item from road transport
- 10 g CO_2e per item from logistics sites[20]

As such, the shipper's mode-specific[21] emission footprints for the reporting period are as follows:

$$10{,}000{,}000 \text{ Items} \times 40 \text{ g } CO_2e \,/\, \text{Item}_{\text{Road}} = 400{,}000 \text{ kg } CO_2e_{\text{Road}}$$

$$10{,}000{,}000 \text{ Items} \times 10 \text{ g } CO_2e \,/\, \text{Item}_{\text{Logistics Sites}} = 100{,}000 \; CO_2e_{\text{Logistics Sites}}$$

20 These emissions are comprised entirely of emissions associated with heating the logistics sites.
21 TOC-specific emissions could also be applied, if available. See Section 7.

These emission footprints may be converted to a mass or volume of energy based on GHG emission factors[22]. The shipper's share of energy consumption in the mail and parcel network operator's network is 126,183 L of diesel and 416,667 kWh of natural gas:

$$\frac{400{,}000\ \text{kg}\ CO_2e_{\ \text{Road}}}{3.17\ \text{kg}\ CO_2e\ /\ \text{L Diesel}} = 126{,}183\ \text{L Diesel}$$

$$\frac{100{,}000\ \text{kg}\ CO_2e_{\ \text{Logistics Sites}}}{0.24\ \text{kg}\ CO_2e\ /\ \text{kWh Natural Gas}} = 416{,}667\ \text{kWh Natural Gas}$$

These shares of energy consumption can be converted to a number of mode-specific assets:

- 126,183 L of diesel equates to seven diesel truck-years. This calculation is based on data collected by the mail and parcel network operator on their network that shows each truck in the network traveling an average of 58,909 km each year, and each truck consuming an average of 0.306 L diesel per km[23].

$$58{,}909\ \text{km}\ /\ \text{Truck Year} \times 0.306\ \text{L Diesel}\ /\ \text{km} = 18{,}026\ \text{L Diesel}\ /\ \text{Truck Year}$$

$$\frac{126{,}183\ \text{L Diesel}}{18{,}026\ \text{L Diesel}\ /\ \text{Truck Year}} = 7\ \text{Truck Year}$$

- 416,667 kWh of natural gas equates to 15 logistics site-years of heating capacity, based on data collected by the mail and parcel network operator on their network that shows each logistics site consumes an average of 27,000 kWh of heating energy per year.

$$\frac{416{,}667\ \text{kWh}}{27{,}000\ \text{kWh Heating Energy}\ /\ \text{Site Year}} = 15\ \text{Site Years}$$

22 The appropriate emission factor to apply in these calculations could be taken from the GLEC Framework.
23 The averages applied in these calculations must be realistic representations of the mail and parcel network into which the low emissions assets or activities are introduced.

Step 3

The mail and parcel network operator replaces seven diesel trucks with biogas trucks and replaces gas heating units at 15 logistics sites with heat pumps powered by renewable electricity.

The mail and parcel network operator's fuel utilization data shows that the biogas trucks emit a total of 60,000 kg CO_2e over the reporting period. These emissions equate to 15% of the emissions from the diesel trucks that the biogas trucks replaced:

$$18{,}026 \text{ L Diesel} / \text{Truck Year} \times 3.17 \text{ kg } CO_2e / \text{L Diesel} \times 7 \text{ Trucks} = 399{,}997 \text{ kg } CO_2e$$

$$\frac{60{,}000 \text{ kg } CO_2e}{399{,}997 \text{ kg } CO_2e} = 15\%$$

Use of the heat pumps is associated with 5,900 kg CO_2e over the reporting period, or 6% of the emissions generated by the natural gas-consuming heating units that the heat pumps replaced (the heat pumps are powered by renewable electricity with an emission factor of 14.1 g CO_2e per kWh):

$$27{,}000 \text{ kWh} / \text{Site Year} \times 0.24 \text{ kg } CO_2e / \text{kWh Natural Gas} \times 15 \text{ Sites} = 97{,}200 \text{ kg } CO_2e$$

$$\frac{5{,}900 \text{ kg } CO_2e}{97{,}200 \text{ kg } CO_2e} = 6\%$$

These emissions percentages can then be applied to the per shipment emission intensity of the shipper:

$$40\text{g } CO_2e / \text{Shipment}_{\text{Road}} \times 15\% = 6\text{g } CO_2e / \text{Shipment}_{\text{Road}}$$

$$10\text{g } CO_2e / \text{Shipment}_{\text{Logistics Sites}} + 6\% = 0.6\text{g } CO_2e / \text{Shipment}_{\text{Logistics Sites}}$$

The shipper's emission footprint is therefore 66,000,000 g CO_2e:

$$6\text{g } CO_2e / \text{Shipment}_{\text{Road}} + 0.6\text{g } CO_2e / \text{Shipment}_{\text{Logistics Sites}} = 6.6\text{g } CO_2e / \text{Shipment}_{\text{Total}}$$

$$6.6\text{g } CO_2e / \text{Shipment}_{\text{Total}} \times 10{,}000{,}000 \text{ Shipments} = 66{,}000{,}000 \text{ g } CO_2e$$

Annex 2
Glossary

Additionality: A criterion for assessing whether a solution or a low emission transportation service are required by regulation.

Book: The process of recording the characteristics of a solution or a low emission transportation service in a system for tracking these characteristics. A registry is an example of such a system.

Bundled Booking: A booking in which a solution provider books two sets of characteristics together with each other, the emitter's emission profile and the supply chain emission profile.

Carrier: An organization that operates transportation assets to conduct transportation activity in providing transportation services.

Chain of Custody System: A set of measures underlying the process by which materials or products (and information on those materials or products) are transferred, monitored, and controlled as they move through each step in a supply chain.

Claim: The process of securing the characteristics of a solution or a low emission transportation service from a system for tracking these characteristics. A registry is an example of such a system.

Direct Generation of a Low Emission Transportation Service: Conducting a transportation service using a low emission solution, where a physical tie can be established between the solution and the carrier generating the low emission transportation service. That is, the carrier generating the LETS actually uses or deploys the low emission solution in that carrier's owned or operated fleet.

Energy Intensity: The amount of energy consumed in conducting a certain amount of transportation activity.

Greenhouse Gas Emission Intensity: The amount of greenhouse gas emissions generated for a certain amount of transport activity.

Greenhouse Gas Emission Factor: The mass of greenhouse gasses emitted per unit of energy consumed.

Indirect Generation of a Low Emission Transportation Service: Generation of a low emission transportation service by a carrier, shipper, or LSP that calculates the transportation service's emissions footprint as *if* a low emission solution was used in their owned-operated fleet (carriers) or by the carriers in their supply chain (shippers and forwarders). In indirect generation scenarios, a physical tie cannot be made between a low emission solution and the low emission transportation service.

Logistics Service Provider (LSP): An organization that secures and facilitates transportation activity for shippers. LSPs, as defined here, do not operate their own transportation assets or conduct transportation activity. Instead, LSPs hire carriers to transport the LSPs' customers' freight. Note that some LSPs operate transportation assets. In these cases, the LSP would also be a carrier.

Product: An article or substance that is manufactured or refined for sale. A fuel is an example of a product.

Registry: A tool to register and track the transfer of the characteristics of a solution or service according to a transparent and verifiable registry standard.

Service: A piece of work done for a client or customer that does not involve manufacturing or producing goods. Transporting freight, or arranging the transportation of freight, are examples of services.

Shipper: An organization with freight that needs transportation. A shipper may retain a logistics service provider to arrange transportation of the shipper's freight. A shipper may also directly contract with carriers for freight transportation activity.

Solution: A product to decarbonize heavy transport. One example of a solution is a low emission fuel. Another example of a solution is a low emission transportation asset like an electric truck.

Solution Provider: An organization that provides a low emission material or product to the transportation market. Solution providers do not conduct transportation activity, nor do they contract for transportation activity on behalf of their customers. Instead, solution providers provide the materials or assets that make a low emission transportation service possible. One example of a solution provider is a supplier of a low emission fuel.

Sustainability Certification System: A tool to establish and track the sustainability profile of a fuel (including the fuel's greenhouse gas emission factor).

Transportation Activity: The product of the amount of freight transported and the distance that freight was transported.

Transportation Operation Category (TOC): A group of transportation operations with similar characteristics (e.g., transportation asset type and size, load factor, or geography of operation) that correspond to how transportation services are provided and procured.

Transportation Service: A certain amount of mode-specific (or transport operation category-specific) transportation activity.

Unbundled Booking: A booking in which a solution provider books the emitter profile of a solution and the supply chain profile of that solution separately.

Annex 3
References

1. **ITF.** *ITF Transport Outlook 2021.* Paris: OECD Publishing, 2021.

2. **Energy Transitions Commission.** *Mission Possible: Reaching Net-Zero Carbon Emissions from Harder-to-Abate Sectors by Mid-Century.* 2018.

3. **World Economic Forum.** Supply Chain & Transport industry statement of support for Green Demand Alliances and a Book & Claims Standard to accelerate decarbonization of the freight industry. 2021.

4. **Roundtable on Sustainable Biomaterials.** Book & Claim. [Online] 2023. https://rsb.org/book-claim/.

5. —. RSB Book & Claim Manual. 2023.

6. **International Organization for Standardization. I**nternational Standard 22095, Chain of Custody - General Terminology and Models. 2020.

7. **World Resources Institute and World Business Council for Sustainable Development.** The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. 2004.

8. **International Civil Aviation Organization.** Annex 16 to the Convention on International Civil Aviation. 2018. Vols. IV, Carbon Offsetting and Reduction Scheme for International Aviation.

9. **International Council on Clean Transportation.** *CO_2 Emission from Commercial Aviation: 2013, 2018, and 2019.* 2020.

10. **Smart Freight Centre.** Global Logistics Emissions Council Framework for Logistics Emissions Accounting and Reporting. 2019.

11. **Stowe, Harriet Beecher.** *Uncle Tom's Cabin*. 1852.

12. **World Resources Institute and World Business Council for Sustainable Development.** *Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Standard.* 2011.

13. **Energy Transitions Commission.** *Bioresources within a Net-Zero Emissions Economy: Making a Sustainable Approach Possible.* 2021.

Smart Freight Centre