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ACLCA Guidance and Guardrails for Accounting Mass Balance Chain-of-Custody Approaches in Life Cycle Assessments (LCAs) and Environmental Product Declarations (EPDs)

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Abstract

The mass balance (MB) model is a chain of custody (CoC) model in which materials or products with a set of specified characteristics are mixed or co-processed according to defined criteria with materials or products without that set of characteristics, resulting in a claim on a part of the output, proportional to the input (ISO 22095, 2020). According to a NIST study, MB is a tool used to incentivize shifts in the supply chain to support more sustainable and environmentally beneficial technologies or capabilities that are initially economically disadvantageous (Beers, 2022). Although MB has been utilized to trace sustainable and societal benefits for agricultural products, forest products, aluminum, chemicals, biofuels, etc. in the value chain for decades, it is now being considered for applicability in LCAs and EPDs.

International consensus standards on the application of MB CoC in LCA and EPD are beginning to emerge but are not sufficiently developed. One significant new development in 2026 was the revision of ISO 14025 "Environmental statements and programmes for products – Environmental product declarations" (ISO 14025, 2026) which includes acknowledgement and some high-level guardrails for integrating MB CoC approach into EPDs. The 2026 revision of ISO 14021 "Environmental statement and programmes for products – Self-declared environmental claims" also includes new guidance on MB CoC in environmental claims. However, there is currently a lack of sufficiently detailed guidance for Life Cycle Assessment (LCA) practitioners and Environmental Product Declarations (EPD) program operators and verifiers on how to consider MB in LCAs and EPDs. For example, other leading international standards on LCAs, Environmental Footprints, Product Carbon Footprints (PCFs), and Product Category Rules (PCRs) (including ISO 14020:2022, ISO 14026:2017, ISO 14040:2006, ISO 14044:2006, ISO 14067:2018, ISO

21930:21930, EN 15804+A2:2019)[1] do not currently provide any mention or detailed guidance or guardrails on the use of MB CoC in LCAs or EPDs. ISO/TC 207/SC5 is currently working to develop ISO 14077 to provide guidelines for CoC approaches in LCA (ISO/CD 14077, 2026) with a publication target of mid-2028

The purpose of this ACLCA PCR Open Standard addendum is to provide guidance on the integration of MB approaches into LCA methodology and EPDs for use until additional and updated guidance becomes available in international standards. This ACLCA PCR Open Standard addendum may need to be revised in the future as ISO standards evolve and emerge.

Another purpose for this ACLCA PCR Open Standard addendum a is to summarize the benefits and challenges associated with mass balance, including potential for greenwashing, issues with data quality, and the complexity of certification and attributions. Given the pros and cons, the ACLCA PCR Open Standard Addendum Working Group on mass balance aims to provide a balanced perspective by developing recommended guidelines and guardrails for audiences who are considering the incorporation of mass balance approach when performing LCAs and reporting results via EPDs.

The core guidance in this addendum is contained in a set of guardrails for credible application of MB in LCA/EPD, a set of communication requirements, and a set of informative methodology examples.

MB CoC includes two implementation methods- the rolling average percentage method and the credit method. This document provides guidance on both, but with a primary focus on the credit method.

Definitions

Attribution- Assignment of credits (for mass balance credit method) or specified characteristics (mass balance rolling average method) to outputs or parts of outputs (ISO 22095-2, 2026).

Chain of custody- Process by which inputs and outputs and associated information are transferred, monitored, and controlled as they move through each step in the relevant supply chain (ISO 22095, 2020).

[1] Explicit guidance on MB CoC was assessed by ACLCA mass balance working group in these standards and was not found. See Annex A for interpretation assessment of these standards. See Works Cited for citations.

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Conversion factor- ratio which is used to determine the quantity of output or part of the output with specified characteristics that can be obtained from the quantity of the input with specified characteristics, taking into account any losses (ISO 22095-2, 2026).

Credit- representation of quantity of units available for attribution with entitlement to claim the ownership of specified characteristics (ISO 22095-2, 2026).

Credit account- system used by organizations to record and track the credits associated with specified characteristics (ISO 22095-2, 2026).

Double counting- accounting for inputs or outputs or specified characteristics more than once (ISO 22095-2, 2026).

Environmental product declaration (EPD)- Type III EPD is an environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information. The predetermined parameters are based on ISO 14040 and 14044. Additional environmental information may be quantitative or qualitative (ISO 14025, 2026).

Like-for-like- a requirement that mass balance credits shall only be attributed to the output or part of the output which is 'similar in nature' to the input with specified characteristics (ISO 22095-2, 2026).

Mass balance model- chain of custody model in which materials or products with a set of specified characteristics are mixed co-processed according to defined criteria with materials or products without that set of characteristics. The proportion of the input with specific characteristics might only match the initial proportions on average and will typically vary across different outputs. The mass balance model establishes the relation between inputs and outputs with specified characteristics via attribution (ISO 22095-2, 2026).

Product category rule (PCR)- set of specific rules and guidelines for developing Type III environmental product declarations for one or more product categories. (ISO 14025, 2026)

Similar in nature- material, products, or concepts that share common characteristics e.g. functionalities, qualities, composition, or attributes, making them alike in fundamental aspects (ISO 22095-2, 2026).

Specified characteristic- set of product characteristics and/or production characteristics that the chain of custody is designed to maintain (ISO 22095, 2020).

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Technically feasible- following an existing and operable route to obtain the output or part of the output from the input(s) with specified characteristics within the system boundary (ISO 22095-2, 2026).

Acronyms

ACLCA – American Center for Life Cycle Assessment

CoC – Chain of Custody

EPD – Environmental Product Declaration

EU – European Union

ISO – International Standards Organization

LCA – Life Cycle Assessment

MB- Mass Balance (chain of custody using the mass balance model)

MB-CM – Mass Balance Credit Method

NIST – National Institute of Standards and Technology

PCR – Product Category Rule

1.0 Introduction and Background

1.1 Why is this needed?

Mass Balance is a chain-of-custody model used for tracking the specified characteristics of products as they move through supply chains and are mixed or co-processed with products without those specified characteristics. Specified characteristics are often associated with sustainability aspects related to the origin of products, raw material characteristics, and production practices (Schumacher, 2024). Common examples include sustainable agriculture, sustainable forestry, use of recycled materials, or use of biobased materials. MB has been applied in sectors including timber, food (cocoa, coffee, tea, sugar, palm oil), cotton, biofuels, plastics, and metals (Beers, 2022; ASI, 2026). According to Cefic, the European chemical industry trade association, MB is key to accelerating circular economy solutions such as chemical recycling which are needed to meet Europe's climate and circularity targets (Cefic, 2023). Per Cefic, MB enables a smooth and rapid transition to use of more sustainable feedstocks by leveraging existing infrastructure that can, for example, co-process recycled and virgin feedstock in large-scale installations that take advantage of existing economies of scale. MB can be more affordable and practical for

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companies as compared to setting up a segregated supply chain (Rainforest Alliance, 2023). The use of MB in lower carbon supply chains is evolving, for example with the tracking of low carbon and conventional ammonia in mixed supply chains (Rathi, 2025). However, the reader should be aware that some products are covered by jurisdiction regulation and methodologies which can restrict the use of mass balance methodologies in LCA/EPD related attributes.

Different chain of custody systems are available for different purposes and types of systems. According to ISEAL, chain of custody systems can allow sustainability systems to do the following (ISEAL, 2025):

- Ensure that volumes of certified material sold do not exceed volumes of certified material produced or purchased
- Generate demand for certified materials in complex supply chains, enabling transformation of sectors towards more sustainable production
- Connect producers with sourcing companies and consumers, often with the ability to open up markets for sustainable producers
- Enable incentives, premiums, and price differentials to be transferred through the supply chain
- Improve transparency in the supply chain
- Support compliance with voluntary corporate commitment and mandatory regulations that include specific traceability requirements
- Allow access to reliable data on sustainability metrics

Where mass balance chain of custody is used, it enables organizations to make the best use of existing infrastructure and to avoid the introduction of additional costs and complexity that would otherwise discourage the sourcing of certified materials (ISEAL, 2025).

CoC standardization completed an important first step with the publication of ISO 22095 in 2020 which defined a unified framework, terminology, and general requirements for CoC systems across all materials and products (ISO 22095, 2020). In 2026 ISO published ISO 22095-2 to provide detailed requirements and guidelines for the MB CoC model (ISO 22095-2, 2026). Additionally, ISO published an amendment in 2026 to ISO 22095 to update a key Figure and its associated text (ISO 22095:2020 Amd 1:2026, 2026). These ISO 22095-series standards do not provide any guidance on applications of CoC in LCAs or EPDs.

The growth in application of MB has highlighted a lack of guidance about if and how a mass balance certification would affect the LCA and EPD guidelines and standards. The lack of

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guidance has resulted in challenges to consistently incorporate MB into LCA and in potential hesitancy to include MB at all.

There was some emergence of international standards guidance on MB in EPDs and environmental claims in 2026. ISO 14025, the core document for EPD programs, was updated in 2026 to include acknowledgement and high-level guidance on MB CoC in EPD programs (ISO 14025, 2026). Likewise, ISO 14021 was updated to include guidance on MB CoC in self-declared environmental claims (ISO 14021, 2026). As the current ISO 14040 and 14044 standards were published in 2006 (ISO 14040, 2006) (ISO 14044, 2006), fourteen years prior to ISO 22095:2020, the topic of mass balance chain of custody was not referenced or considered in the 2006 ISO LCA standards. A leading effort focused on CoC guidance for LCA is ISO 14077, which is currently a committee draft in progress with a target publication in mid-2028 (ISO/CD 14077, 2026). One example of a private third-party certification for MB in product carbon intensity claims was published in 2025 by SCS Standards (SCS standards, 2026). At the time of this writing, standards 14020:2022, ISO 14026:2017, ISO 14040:2006, ISO 14044:2006, ISO 14067:2018, ISO 21930:21930, and EN 15804+A2:2019 are silent about chain of custody[2].

ACLCA has a unique opportunity to help fill the gap in consensus-based guidelines and guardrails via this addendum to the Open PCR standard. This ACLCA document is intended to provide guidance in the interim for LCA/EPD practitioners, EPD program operators, and verifiers who may be considering how to apply MB.

1.2 Chain-of-custody (CoC) models

ISO 22095: 2020 defines the following five CoC models. (ISO 22095, 2020)

- Identity Preserved (IP)
- Segregated
- Controlled Blending (CB)
- Mass Balance (MB), including two implementation methods: rolling average percentage method and credit method
- Book & Claim (B&C)

In addition to physical connectivity requirements in certain models, IP and segregated models require that products with specified characteristics are not mixed or combined (chemically or physically) with products without the specified characteristics through the

Commented [JP1]: Comment from Poonam: Consider adding a table of examples that could include headers such as, sector where MB-CM it is applied, Reference standard followed, key assumption, limitation etc.

[2] See Works Cited (ISO 14020, 2022) (ISO 14026, 2017) (ISO 14040, 2006) (ISO 14044, 2006) (ISO 21930, 2017) (European Committee for Standarization, EN15804+A2, 2019)

supply chain. CB, MB, and B&C models allow mixing. CB allows for products with specified characteristics to be mixed with products without that set of characteristics resulting in a known and constant proportion of specified characteristics in the final output. MB allows for products with specified characteristics to be mixed with products without that set of characteristics in a variable manner. B&C is a model in which the administrative record flows (i.e. certificates) are not necessarily connected to the physical flow of product throughout the supply chain. B&C is also referred to as "certificate trading" (ISO 22095, 2020).

IP, Segregation, and Controlled Blending are straightforward to approach in LCAs and EPDs as they are related to either the direct physical flows or constant proportional flows. No special guidance is needed for these first three CoC models. Guidelines, guardrails, and Pro's/Con's to consider the MB CoC model in LCAs and EPDs are the focus of this ACLCA document.

Application of B&C in LCAs is complex and beyond the scope of this ACLCA document. Likewise, the combination of B&C with MB approaches is not addressed by this guidance.

Two common applications of B&C are renewable electricity certificates (RECs) and carbon offsets. With reference to ISO 14067 (ISO 14067, 2018), RECs are accepted in carbon footprint and LCA practice, and there is an ACLCA guideline on Quantifying Renewable Electricity Instruments in Environmental Product Declarations (ACLCA, 2023). Carbon offsets are required to be excluded from product carbon footprints and EPDs (ISO 14067, 2018) (ISO 14025, 2026) (ISO 21930, 2017) (European Committee for Standarization, EN15804+A2, 2019).

ISO 22095, 2020 defines two implementation methods for mass balance chain of custody: 1) rolling average percentage method, and 2) credit method. The rolling average percentage method is defined to be based on the use of a fluctuating proportion of input bearing specified characteristics entering the organization over a defined claim period, allowing a claim of an average percentage to be made for the output over the claim period (ISO 22095, 2020). A common feature of both rolling average percentage and credit method mass balance is that neither provides a guarantee of the physical presence of specified characteristic in any batch of outputs, due to a recognized "physical presence is variable" as defined in ISO 22095 Amd 1, 2026, Figure 1 (ISO 22095 Amd 1, 2026).

An illustrative numerical example of the rolling average percentage method is depicted in Figure 1. ISO 22095-2 provides detailed requirements and guidelines for mass balance chain of custody (ISO 22095-2, 2026).

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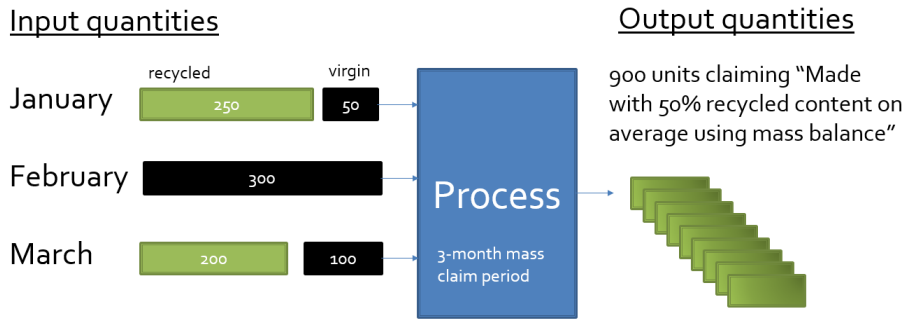
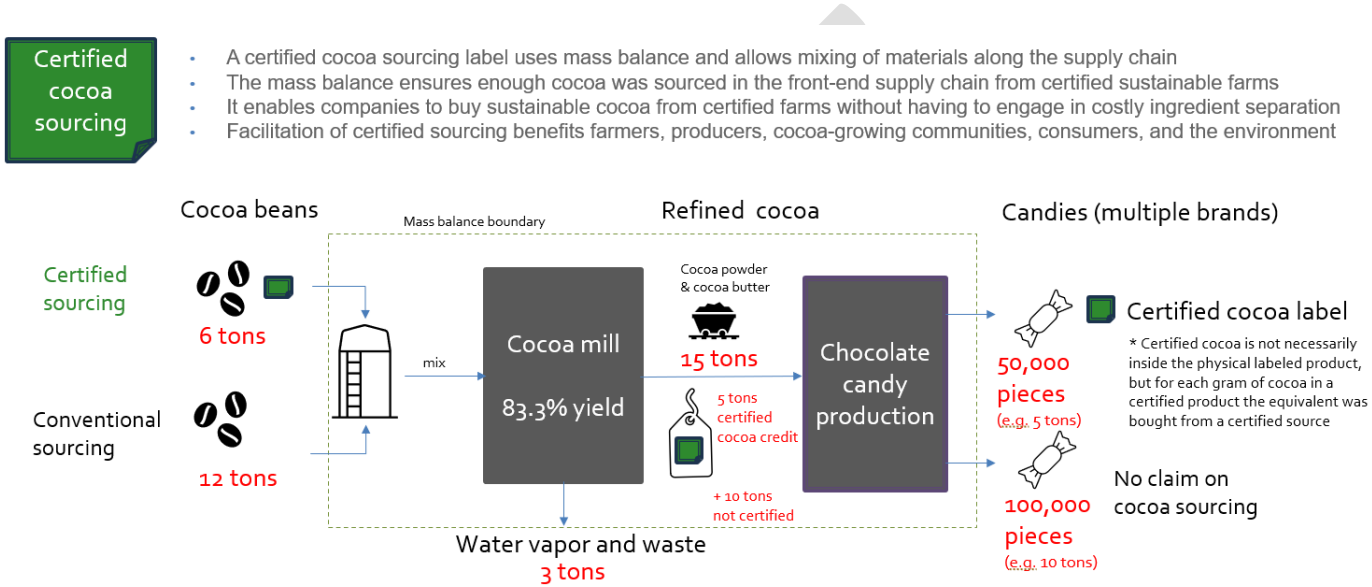


Figure 1: Example of the rolling average percentage method

The mass balance credit method is applicable when materials or products with specified characteristics are mixed or co-processed with materials or products without some or all of these characteristics and attribution of credits to outputs or parts of the outputs is intended (ISO 22095-2, 2026). An illustrative example of the mass balance credit method is depicted in Figure 2. Cocoa beans with a specified characteristic (certified sustainable sourcing in the example of Figure 2) are mixed with cocoa beans that do not have the specified characteristic. The specified characteristic is attributed to a portion of the system outputs. The attributed quantity is based on conversion factors (based on actual yields) for the system and is managed via a credit account. The credit account balance is calculated for each balancing period and shall be equal to or greater than zero at the end of each balancing period (ISO 22095, 2020).

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Mass balance ensures that the mass of certified cocoa bean inputs is balanced with the mass of certified outputs at end of each balancing period

Figure 2: Illustrative example of mass balance credit method, NOTE: numbers are for illustration only and do not reflect any actual company or process data. This hypothetical example is adapted from ISEAL and Rainforest Alliance publications (ISEAL, 2025) (Rainforest Alliance, 2023)

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For both the rolling average percentage method and credit method, the physical presence of inputs with specified characteristics is not guaranteed in the outputs (ISO 22095-2, 2026; ISO 22095 Amd 1, 2026).

The rolling average percentage method is based on averages and is an approach currently typically used in LCA modelling. The method straightforward in its approach to conventional LCA and EPD methodologies provided that the system boundary is based on the geographical area of single site, single process, or transportation. However, a rolling average with multi-site system boundary requires special consideration as provided in section 3.0 of this document.

The primary focus of these ACLCA guidelines is for application of mass balance credit method (MB-CM) in LCA and EPD.

1.3 Acceptance, Benefits, and Challenges of Mass Balance Credit Method in LCAs

The application of MB-CM for labeling and marketing purposes is well established in multiple sectors and may utilize a variety of third-party certifications as a chain of custody method used for making claims related to specified characteristics of products. Some examples of third-party certifications across diverse product categories include Rainforest Alliance, Aluminum Stewardship Initiative, Better Cotton Initiative, ISCC PLUS, Roundtable on Sustainable Palm Oil (Rainforest Alliance, 2023) (Aluminum Stewardship Initiative, 2026) (ASI, 2026) (Better Cotton Initiative, 2026) (International Sustainability and Carbon Certification (ISCC), 2023) (Roundtable for Sustainable Palm Oil, 2026). However, the application of MB-CM in LCAs and EPDs is nascent.

There are published examples of LCA studies involving MB-CM which make comparative assertions and have completed critical review by panels of experts to verify conformance to the prominent LCA standards ISO 14040, 14044 and 14067(Horlacher, 2024) (Russ, 2020). These critical reviews required interpretation by the critical review panel because the ISO 14040 and 14044 standards do not explicitly mention chain of custody or MB-CM. MB-CM has also been applied to overcome the limitations of mass and economic allocation in LCA of carbon dioxide removal systems while following ISO 14040 and 14044 (Rodriguez-Garcia, 2024).

ISO 14067 carbon footprint standard requires contractual instruments (such as Renewable Energy Certificates and Guarantees of Origin) to be used for grid electricity purchases and in product carbon footprints (ISO 14067, 2018). These well-accepted contractual instruments are typically managed by a Book & Claim chain of custody, which provides no guarantee of physical presence of specified characteristics in the certified outputs. For widely used REC certification standards in North America, such as Green-e® Energy-

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certified RECs, the eligible renewable electricity generation must be grid-connected and deliverable to the regional grid serving the customer's electricity consumption (Center for Resource Solutions, 2026).

Voluntary sectoral guidances and certifications for applying mass balance in product carbon footprint are emerging and have been published (Catena-X, 2025) (TfS, 2024) (SCS Standards, 2025). Although not adopted industry wide, a chemical industry consortium has published a proposed set of guidelines for Digital Material Passports, including use of MB-CM, to be used to fulfill Digital Product Passport requirements under the European Ecodesign for Sustainable Products Regulation (Chem-X, 2026) (European Union, 2024).

The application of MB-CM to LCAs and EPDs has both benefits and challenges as outlined below.

Commented [PK2]: The list of both benefits and challenges appear more descriptive and indirect. WG participants could help in revising/updating the both.

- Benefits of MB-CM in LCAs and EPDs
    a) Many consider that there is a need in industry for sustainable solutions enabled by mass balance to account for and claim their associated benefits in LCA and EPD (The Consumer Goods Forum, 2022). For example, the substitution of conventional inputs with more sustainable inputs can result in a tangible reduction in environmental life cycle impacts, but these benefits can be greatly diluted (due to physical material dilution) in mixed co-processing systems (EPDLA, 2022).
    b) Various industry groups and individual companies have advocated for the importance of EPDs to reflect MB. Arguments are made that MB is critical to avoid restrictions to market access for construction material supplies, to use existing infrastructures that will contribute to European Union Green Deal ambitions, and to pave the way for future circular models in other sectors (EUMEPS, 2022).
    c) Many stakeholders desire to understand how inputs of products with specified characteristics will influence the relative environmental impacts of attributed products. The co-processing of inputs with specified characteristics can correspond to real differences in environmental impacts in the system even if those specified characteristics aren't guaranteed to be physically present in the product(s) receiving attribution. Stakeholders who buy and sell products with specified characteristics want to understand and communicate the environmental impacts for those products. There is benefit in aligning product claims with life cycle impact assessment to communicate the linkage to use of products with specified characteristics.

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d) Including MB-CM in LCA and EPD allows industry to quantify and monetize environmental benefits without the need to install additional facilities to segregate materials. MB-CM can also allow the use of existing logistical pathways and assets, typically offering the lowest cost for developing value chains.
e) MB-CM outputs can have the same performance characteristics as the products made without those inputs with SCs, simplifying modeling for use and end of life phases and as drop-in solutions, there is easy adoption in broad markets.
f) Manufacturers are investing in building capability and capacity to utilize alternative feedstocks and energy sources. MB-CM enables the transition and the communication of relative environmental impacts via LCAs and EPDs helps to support the growth and to meet customer needs.

- Challenges of MB-CM in LCAs and EPDs
  a) MB-CM involves mathematical attribution of specified characteristics to outputs and can be interpreted as not adhering to the conventional LCA approaches of focusing on physical flows, average flows, natural science basis, and allocation methodologies. (ISO 14040, 2006); (ISO 14044, 2006) (Holzapfel, 2025).
  b) The focus of attributional LCA has historically been centered around physical reality, but MB-CM chain of custody systems introduce a market-based aspect. The goal of MB-CM in LCA may be to assess and communicate the relative environmental performance of a sustainability intervention. In literature this has been described as a market-based or "message-based" LCA approach (Finkbeiner, 2025).
  c) Some large EPD program operators and networks do not allow the use of mass balance approach in EPDs currently. A typical explanation is due to lack of international consensus and that MB criteria do not require physical presence of specified characteristics in outputs they are attributed to and therefore do not follow EN 15804 and related standards (ECO Platform, 2023) (International EPD System, 2025); (European Committee for Standarization, EN15804+A2, 2019). However, an exception is that at least one European EPD program operator follows the ECO Platform requirements but allows MB product information to be communicated in a separate document if verified by an independent third party because they "do not want to counteract this approach and the resulting transformation of the industry to achieve climate targets" (IBU, 2023).

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d) MB has not been commonly applied in LCAs and may face limited understanding by LCA practitioners and stakeholders.
e) MB can face challenges with consumer understanding for both its chain of custody claims and LCA-related claims. Use of MB chain of custody in EPDs has been viewed by some entities as greenwashing (ECOS, 2025).
f) Some policies and regulations may have associated restrictions related to MB-CM. For example, the 2026 European Union Single Use Plastics Directive Implementing Act accepts MB-CM for calculating recycled content in single use PET beverage bottles in Europe but does not allow for site-to-site credit transfer(European Commission, 2026). As another example, fuel regulations in Europe may have country of origin requirements for crude oil which restrict the use of MB-CM (European Commission, n.d.).
g) Lack of international consensus standards with explicit guidance on how to approach MB in LCAs and EPDs.
h) When calculating separate impact profiles for outputs with and without specified characteristics, it is possible that mass balance leads to a reduction in environmental impacts of the mass-balanced output with specified characteristics compared to a conventional product while the total environmental impacts of the production system nevertheless increase as an effect of adding the input with desired characteristics

1.4. ACLCA Position on Balancing Benefits and Challenges

The American Center for Life Cycle Assessment (ACLCA) published an Issue Brief in 2024 stating their acceptance of the practice of including MB chain of custody in LCAs and EPDs, provided that the following principles are in place (ACLCA, 2024):

- The use of MB across supply chains is designed to support a sustainable and circular economy, and
- The LCA/EPD report is available and includes disclosure of impacts with and without mass balance, and
- Transparency is provided in how the addition of the material with specified characteristics impacts the overall environmental burden, and
- There are robust safeguards and management systems to prevent double counting, and
- The mass balance is certified according to widely recognized 3rd party certification schemes, and
- The resulting claims on the product(s) are truthful, accurate, and not misleading.

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In late 2024, ACLCA formed a working group to further build upon these principles and to develop this Open PCR Addendum Guidance. A description of this working group is provided in Section 8.0. ACLCA acknowledges both the benefits and challenges of applying MB in LCAs and EPDs, and has developed the analyses, guidelines, and guardrails in this document to support LCA practitioners, EPD Program Operators, and third-party verifiers, who chose to perform LCAs and reporting results via EPDs.

These guidelines and guardrails are additionally intended to help inform certification development and to serve as an input for consideration in international consensus-based standardization such as ISO.

1.5 Assessment of conformance to existing international standards

The ACLCA mass balance working group, hereafter referred to as MB WG, completed a detailed assessment of leading international standards for LCA, product carbon foot printing, EPD, construction PCRs, and environmental statements. These included:

EN15804 (European Committee for Standarization, EN15804+A2, 2019)

ISO 14020 (ISO 14020, 2022)

ISO 14025 (ISO 14025, 2006)

ISO 14026 (ISO 14026, 2017)

ISO 14040 (ISO 14040, 2006)

ISO 14044 (ISO 14044, 2006)

ISO 14067 (ISO 14067, 2018)

ISO 21930 (ISO 21930, 2017)

Within these eight existing key standards, the team identified twenty-nine requirement clauses which could be interpreted to challenge the application of MB-CM in LCA and EPD. The findings of the team were that all twenty-nine requirements are open to interpretation. Every clause had differing expert opinions that could either support or that oppose MB-CM application as being in conformance to the standards. A polling survey within the team concluded that the majority of participants believed that MB-CM with appropriate guardrails can achieve conformance to all of these existing standards. The team's level of concurrence was greater for conformance to the LCA standards as compared to the EPD/PCR standards such as EN15804 and ISO 21930. Majority consensus was achieved in this assessment, but the conclusion was not unanimous.

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A summary of the clause-by-clause analysis is provided in the supplemental document "ACLCA Assessment of Mass Balance Credit Method Conformance to International and EPD Related Standards". The ACLCA working group survey results are at the end of the supplemental document.

After the ACLCA MB working group completed this standards assessment, ISO 14025:2026 was published (ISO 14025, 2026). This new revision to the 2006 edition includes the following mentions of CoC and MB:

- Section 3.3.17 provides definitions for 'chain of custody', 'chain of custody model', and 'chain of custody system'
- Section 5.2.2 requires programme operator general process instructions for an EPD programme to specify whether MB-CM or B&C chain of custody models are allowed within the EPD programme or PCRs. (Note that MB rolling average does not require specification)
- Section 7.2.1.1(r) provides EPD content requirements if MB-CM or B&C CoC models are incorporated in LCA
- Section 7.5.3(c) allows possible EPD comparability if Life Cycle Inventory characteristics with usage of MB-CM and B&C under certain conditions

2.0 Guardrails needed for credible application of MB-CM in LCAs and EPDs

In the context of this paper, a guardrail is a deliberate constraint or boundary built into the standards development process to prevent misuse, misinterpretation, or unintended outcomes, while still allowing flexibility and innovation. The following guardrails (in green shaded boxes) shall be adhered to for incorporation of MB-CM into PCRs which establish the guidelines for the LCAs that support the EPD studies for that product category. These guardrails only apply to mass balance credit method.

2.1 Naming & Clear Differentiation from Conventional LCAs and EPDs

LCAs and EPDs which involve products using mass balance credit method approach shall be transparently communicated. For instance, labeled with "Chain of custody EPD using mass balance credit method".

This guardrail enforces the transparent differentiation of LCAs and EPDs using MB-CM versus conventional product LCAs and EPDs practices. Even though a majority of the MB WG believed that MB-CM can be interpreted to conform to existing standards in Section

1.5, it is important for users of LCA and EPD information to be informed if and when a MB-CM chain of custody is applied with the underlying LCA.

2.2 Reporting of Results in Chain of Custody LCAs and EPDs

a) An EPD using MB-CM should report one set of results for the product reflecting its attribution of specified characteristics using MB-CM.

b) For the purpose of transparency, the LCA report underlying the EPD described in part a) shall also include the results for the corresponding product without attribution of specified characteristics. The LCA report should additionally include results using a mass balance rolling average percentage method if feasible.

c) When publishing an EPD for a product with attributed specified characteristics using MB-CM as described in part a), then an additional EPD for the corresponding product without the attribution of specified characteristics should also be published.

d) The LCA report underlying an EPD using mass balance credit method shall be made available upon request to all third parties to whom EPDs are communicated, in line with the requirements of ISO 14044:2006, clause 5.2.

It is important that Chain of Custody EPDs report one set of results based on MB-CM to avoid confusion of dual reporting, while providing an LCA third party report containing results with and without MB-CM results.

For the sake of transparency, it is vital for Chain of Custody LCAs using mass balance credit method to report results with and without attribution of specified characteristics. It is recommended that the results with attribution of specified characteristics be the primary reported results, and the results without attribution of specified characteristics to be presented as a sensitivity analysis. For additional transparency, results reflecting physical averages (such as mass balance rolling average percentage method) should be also published as a sensitivity analysis if feasible.

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2.3 Transparency of Environmental Burdens

a) For the organization which applies attributions of specified characteristics to products using MB-CM, transparency shall be provided in how the addition of the material with specified characteristics impacts the overall environmental burden in the scope of the LCA system boundary. Any trade-offs and impacts to the overall production process due to the introduction of the material with specified characteristics shall be accounted for in the LCA and reported at the level claimed.

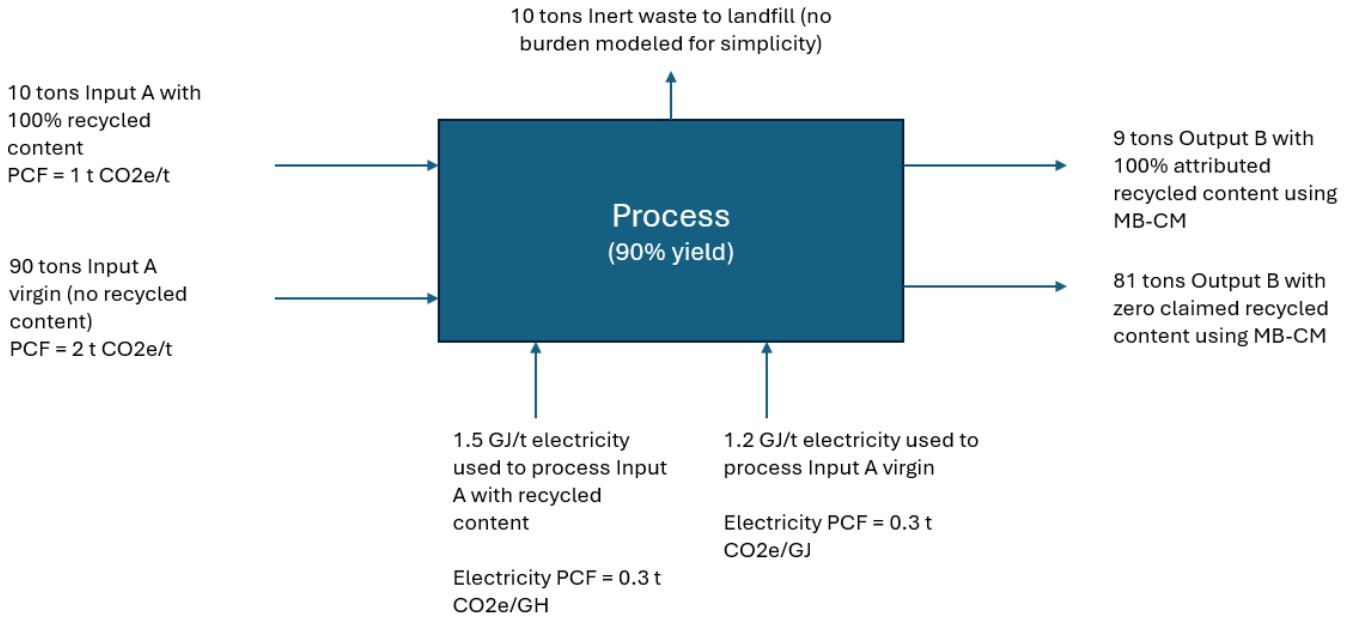
b) The conformity assessment shall verify that the resulting sum of the total footprint of the products, with and without attribution of specified characteristics, is equivalent to the total footprint of the combined system, over the LCA data collection period. The intent is to verify that no burdens are lost or double-counted.

This guardrail is needed due to possible situations in which the substitution of a legacy input by an input with specified characteristic may increase the overall environmental burden of the system. Any increase in environmental impacts due to the input with specified characteristic must follow the attribution of the specified characteristic to the output(s). This means that such increases in impacts are 100% attributed to the output(s) with the specified characteristics, whereas the output(s) without specified characteristics carry the same burden as before the input with specified characteristics was added. This is needed to prevent a situation in which a MB-CM could be used to claim a "greener" product from an LCA perspective when it is increasing the environmental footprint of the entire system.

Example: Figure 3 presents an example for Guardrail 2.3. In this hypothetic example, input A is a specific type of material that is sourced both with and without physical recycled content. The electricity consumption for process conversion of input A to output B varies depending on the recycled content in input A. The PCF calculation must account for the fact that the processing of input A with 100% recycled content consumes 1.5 GJ/ton A, while the processing of input A virgin only consumes 1.2 GJ/ton A.

Per Guardrail 2.3a, the conformity assessment shall verify that the differing amounts of electricity consumption burdens are appropriately assigned in the PCF calculations. Per Guardrail 2.3b, the conformity assessment shall verify that the sum of the PCF's of Output B with and without attributed recycled content multiplied by the quantities of Output B without and without recycled content is equivalent to the total PCF of the combined system.

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Output B PCF calculations

PCF Output B with 100% attributed recycled content = [(10 t * 1 tCO2e/t) + (10 t * 1.5 GJ/t *0.3 tCO2e/GJ)] / 9 t = **1.61 t CO2e/t**

PCF Output B with zero claimed recycled content = [(90 t * 2 tCO2e/t) + (90t * 1.2 GJ/t * 0.3 tCO2e/GJ)] / 81t = **2.6 t CO2e/t**

Figure 3: Example of Guardrail 2.3 implementation

2.4 Prevention of Double Counting

There shall be safeguards and management system(s) to prevent double counting per the ISO 22095-2 section 5.8 "Avoidance of double counting in mass balance systems" and per requirements of the chain of custody certification used. verifier shall confirm that the third-party chain of custody certification includes requirements designed to prevent double counting.

The prevention of double counting with MB-CM requires careful attention. Section 5.8 of ISO 22095-2 contains a requirement that the organization active in the chain of custody shall ensure that there is no double counting of credits or specified characteristics by having systems, safeguards, and reviews in place (ISO 22095-2, 2026).

One particularly challenging situation for double counting is when specified characteristics can be analytically measured, for example, the specified characteristic of originating from biobased carbon is measurable with radiocarbon testing[3]. Using MB-CM for bio-attribution requires careful and strict guidance for the products of a mass balance system which have and have not received attributions, since the attributed amount of specified characteristic can differ from the measured amounts in a sample.

Additional requirements for avoidance of double-counting beyond ISO 22095-2 may be needed for credible application of MB-CM into LCAs and EPDs. Such guidance may be specific to sectors and/or categories of specified characteristics. Appropriate guidance is to be included where applicable in relevant PCRs and third-party chain of custody certification systems.

2.5 Third Party Chain of Custody Certification

The mass balance chain of custody shall be certified and/or verified via a third-party conformity assessment to a publicly available standard from a requirements setter.

It is critical for application-specific mass balance chain of custody requirements to be detailed by requirement setters and associated certification systems. Auditing and conformity assessment by third parties is essential for credibility and verification of the claimed quantities of materials with and without specified characteristics. Auditing can be a layer of protection to prevent against double counting.

[3] Radiocarbon methods such as ASTM D6866-24 can be used to determine physical biobased content of materials

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2.6 Truthful Claims and Communication

a) The resulting environmental claims on the product(s) shall be truthful, accurate, and not misleading.
b) The organization participating in the chain of custody shall ensure that all applicable laws and regulations related to product marketing and green claims are in compliance for all regions in which the products are marketed and sold.
c) Guidance in ISO 22095-2 on business-to-business and business-to-consumer communications for MB chain of custody shall be followed.

For example, environmental claims related to a Chain of Custody LCAs or EPDs using MB-CM shall be transparent that MB-CM was utilized.

ISO 14021 (ISO 14021, 2026) provides requirements for self-declared environmental claims. This standard was revised in 2026 including accommodation for mass balance credit method chain of custody. For example, section 8.5.3.1 declares that recycled content claims may be made using a variety of chain of custody models including mass balance. Furthermore, section 8.5.3.3 provides communication requirements when using mass balance chain of custody for recycled content claims.

2.7 Technically Feasible and Possibility of Physical Presence

The requirement of technically feasible defined in ISO 22095-2 or in the specific mass balance scheme utilized for 3rd party verification shall be met. The possibility of physical presence as defined in ISO 22095-2 shall be required.

In addition, mass balance credit method attributions shall respect product quality and fundamental processing limitations

The requirement of technical feasibility is an important aspect of ISO 22095-2 to support the credibility of the mass balance credit method.

Examples include:

1.) If a process is only able to use 30% recycled fiber to achieve printing quality characteristics in paper due to performance limitations, then MB-CM shall not attribute over 30% recycled fiber in the paper product.

2.) For products made from multiple inputs and if specified characteristic is only associated with one of the inputs, then the MB-CM shall not attribute specified characteristic to the portions of the products that are comprised of or converted from the inputs without specified characteristic.

3.) When claims are made on the substitution of an incumbent input with an input with specified characteristics, then the MB-CM attribution shall be limited to replacing the claimed amount of incumbent input.

2.8 Data Collection Period

The data collection period of the LCA shall be completely covered by one or more complete certified mass balancing periods as defined in ISO 22095-2 and further specified by the requirements setter.

Per ISO 22095-2, mass balancing periods are used for MB-CM. It is important for one or more mass balancing periods and claim periods to match up with the LCA data collection periods because the end of the balancing periods is when the mass balance systems shall be reconciled. For example, at the end of every MB-CM balancing period the credit balance shall be greater or equal to zero.

2.9 Use of Designation System

Summary information for the implementation details of the utilized mass balance system(s), per the ISO 22095-2 Annex C designation system, shall be reported in the underlying LCA. This designation system information should be reported in the EPD considering both the foreground system and its supply chain.

Designation system information may be reported in either the ISO 22095-2 numerical code or in text format.

The designation system in ISO 22095-2 is an abbreviated code which declares various options that have been applied to a mass balance chain of custody system. For example, this code includes data on chain of custody model, system boundary (geographic area, possibility of physical presence, physical link, balancing period), implementation method, attribution rules (proportional vs non-proportional), and any usage of site-to-site credit transfers. This information is important to convey to stakeholders as appropriate.

An example of a MB designation system disclosure is provided in Table 1.

Material Name	*xyz*
Chain of custody model	*Mass Balance*
Mass Balance Implementation Method	*Credit Method*
Geographic area of mass balance boundary	*Site*
Possibility of Physical Presence	*Yes*
Physical Link	*Yes*
Balancing period	*Quarterly*
Attribution rules of specified characteristics	*Non-proportional*
Site-to-site credit transfer	*No*

Table 1: Example of designation system disclosure based on ISO 22095-2

Alternatively, this could be condensed into a numerical code per ISO 22095-2. For the example in Table 1, the code would be ISO 22095-2, 4,2,1,1,2,2,1.

2.10 Value Chain Transparency

a) MB claims used and verified in the supply chain shall be transparently reported.
b) It shall be reported whether LCA studies by upstream organizations involving mass balance credit method were verified to conform to the ACLCA CoC MB guidance and guardrails or not.

Per ISO 22095 Amendment 1 (ISO 22095:2020 Amd 1:2026, 2026), if a mass balance chain of custody is used at a point in a supply chain, then all downstream organizations shall only make claims reflecting mass balance chain of custody (or book and claim chain of custody, if implemented). If an LCA practitioner is performing an LCA for a product involving MB-CM, and the MB-CM chain of custody is first performed upstream of the foreground product, then the LCA practitioner shall verify that the upstream organization(s) who have implemented MB-CM have provided Chain of Custody LCA information in conformance to the guidelines presented in this ACLCA document.

2.11 Attribution validity period

Mass balance credit attribution shall remain constant for a defined product during its EPD validity period. If the mass balance credit attribution changes, a Chain of Custody EPD using Mass Balance shall be updated within the required timeline for the EPD program.

The results of a Chain of Custody EPD using MB-CM are dependent on the mass balance attribution. If there are changes in the mass balance attribution after such an EPD is

published, then the EPD shall be updated within the timeline required by the EPD program operator. In other words, a change in attribution creates a change in product definition and specification, and the EPD must be updated accordingly.

2.12 Transparency on contribution of mass balanced inputs

The following information shall be transparently reported in both the underlying LCAs and in EPDs for products with MB-CM attribution of specified characteristics:

a) The mass percentage of material with specified characteristics attributed using a mass balance credit method chain of custody system that is contained in the product shall be reported in both the underlying LCA report and the EPD.

b) The use of mass balance credit method for allocation of energy instruments to the product shall be quantified, managed, and reported according to all requirements as specified in the ACLCA PCR Open Standard – Guidance for Quantifying Renewable Electricity Instruments in EPDs.

c) The mass percentage reported per Guardrail 2.12(a) shall be reported separately from any energy instrument reporting per Guardrail 2.12(b)

Application example of guardrail 2.12:

An original equipment manufacturer (OEM) makes a product XYZ consisting of two categories of components: 1) metal parts, and 2) plastic parts. The various parts are sourced from the OEM's supply chain. The OEM buys the parts and assembles them into a finished product XYZ.

Each unit of product XYZ contains 3 kg of metal and 2 kg of plastic. The sourced plastic components are certified as 50% attributed recycled material using a mass balance credit method chain of custody in their supply chain. The OEM also participates in the mass balance chain of custody certification. The consumer facing claim on product XYZ is that the plastic components in product XYZ are 50% attributed recycled material using mass balance credit method.

The OEM also purchases, retires, and allocates 12 MJ of renewable electricity certificates (RECs) in their manufacturing operation for each unit of finished XYZ product.

Requirements for underlying LCA report and an EPD for product XYZ:

a) Guardrail 2.12(a) requires the LCA and EPD shall disclose that 40% of the mass of product XYZ has attributed specified characteristics of 50% recycled plastic using mass balance credit method.
b) Guardrail 2.12(b) requires that the LCA and EPD shall follow all reporting requirements of the 2022 ACLCA Guidance for Quantifying Renewable Electricity Instruments in EPDs, including Tables 2, 3, and 4 for REC certificate and allocation ledger details.

For review and discussion only within ACLCA Committees

3.0 Multi-site Mass Balance

ISO 22095-2 allows an option for MB-CM credits to be transferred between credit accounts of different sites of an organization which are geographically separated, without the physical transfer of material so long as certain conditions are met (ISO 22095-2, 2026). The pre-requisite conditions are that: 1) credit accounts of the two sites shall be under same control or management system of one organization, 2) transfer credits shall only be allowed for material or product groups that are similar in nature, and 3) geographical eligibility shall be defined by the requirements setter and documented. Third-party certifications may have stricter requirements, for example ISCC PLUS. (International Sustainability and Carbon Certification (ISCC), 2023).

The topic of site-to-site credit transfers was contentious within the ACLCA MB WG. The group could not reach consensus regarding whether or not site-to-site credit transfers could be acceptable in LCA/EPD with guardrails in place. Survey results are shown in Figure 3. Due to lack of consensus, a neutral stance is taken, and the risks and benefits of site-to-site credit transfer application are summarized Annex A. The recommended usage or prohibition in LCA and EPD is left up to the discretion of EPD Program Operators and PCRs until international consensus is reached in ISO 14077. In the absence of clear guidance on performing multi-site mass balance in an EPD from the applicable PCR or EPD Program Operator, the EPD should not allow multi-site MB-CM credit transfers.

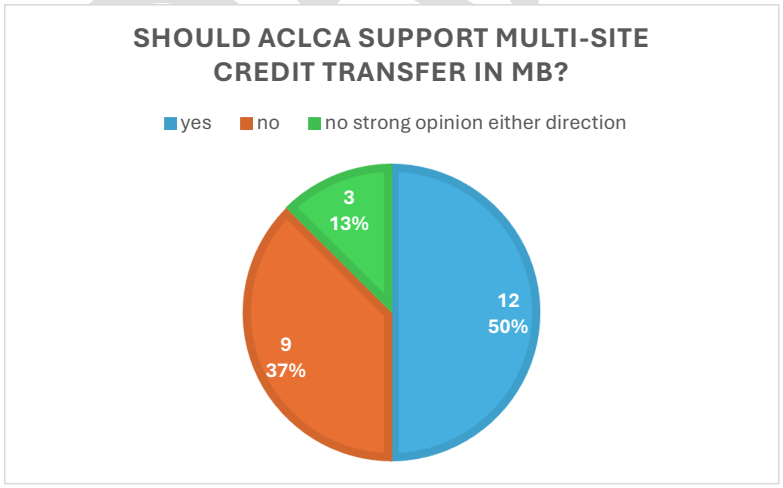


Figure 3: Survey results from ACLCA Mass Balance Working Group on the topic of Site-to-site Credit Transfers [Note: this survey included approximately 50% participation by the working group members. Only one response was allowed per organization.]

If an EPD Program Operator chooses to allow site-to-site credit transfers in LCA calculations, then it is recommended for the organization commissioning the MC-CM LCA to disclose to the Program Operator that: 1) the application of site-to-site credit transfer is certified as part of a 3rd party chain of custody certification scheme, 2) application of site-to-site credit transfer is clearly disclosed in the LCA study and EPD report, and 3) a clear explanation is provided as to why site-to-site credit transfer is needed. Acceptability may vary by market segment and region.

It may be more justifiable for LCAs to apply site-to-site credit transfers when the following factors are present:

1) The LCA study clearly assesses and communicates the environmental impacts benefits of the site-to-site credit transfer versus not using it. This includes demonstration from the commissioner of the study that producing the desired product (with attributed specified characteristics) regionally or shipping it from its current production site to a geographically different site is environmentally burdensome to a significant extent that would impair the environmental benefits of the desired product;
2) Impacts of elementary flows are assessed in the geographical regions in which they physically occur.
3) It is desirable that the study Commissioner demonstrates a commitment that financial savings from site-to-site credit transfer will be re- invested in additional actions for use of more sustainable materials.

It is considered less justifiable for LCAs to apply site-to-site credit transfers when any of the following factors are present:

1) If there is a very wide geographical boundary, such as a global boundary for supply chains or wide differences in sustainability practices and policies between site locations. PCRs and/or EPD Program operators should define specific requirements
2) If the material represented by the credit is not feasible to transport due to safety, technical, or other issues.
3) If there is no potential for future transition of the site receiving MB-CM credits transfers to physically process inputs with specified characteristics.

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4) Other factors may be present, and it is for the LCA practitioner to consider their relevance.

4.0 Communication and reporting in EPDs

ISO 22095-2 section 7.0 specifies mandatory communication requirements for mass balance chain of custody claims. Guardrails 2.2, 2.3, 2.6, and 2.9 of this ACLCA guidance align with ISO 22095-2 and provide additional communication and reporting requirements related to credible reporting of LCA and EPD results in product systems which utilize mass balance.

If a Chain of Custody EPD using MB-CM is subject to ISO 21930, then the report shall include a description of how the data was allocated according to the "shall" procedure outlined in ISO 21930 section 7.2.5.2 and justification if any "should" statements are not conformed to. It should be recognized that MB-CM attribution is different from allocation, and ISO 21930 does not provide attribution requirements. See Supplemental Information for further analysis.

5.0 Dissenting views

This document reflects the consensus positions and contributions of the ACLCA mass balance working group. However, it does not reflect unanimous support within the working group. Multiple individuals in the group expressed their concern about general acceptance of MB-CM into LCA and EPD practice and some individuals expressed concern about specific technical details. This section intends to summarize the main concerns that existed or currently exist in the working group at the time of writing.

1) Conformance to existing standards
    a) Some working group members interpret that MB-CM is not in conformance to existing LCA, carbon footprint of a product (CFP), PCR, and/or EPD standards. This is due to concerns such as:
        i) No guarantee of physical presence of specified characteristic when attributed to products
        ii) Not strictly limiting LCAs to following physical flows and natural sciences, but instead could be based on economic incentives
        iii) See Supplemental Information for more detailed analysis of opinion difference in standards conformance interpretations.
    b) Some group members expressed concern that, if MB-CM LCAs are viewed as non-conformant to the standards by the general public, then there will be a loss in confidence, by the general public, in all LCAs.
2) Working in parallel to ISO 14077

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a) Some individuals preferred that ACLCA not complete this work and recommended instead waiting for ISO 14077 to be published as the guidelines in this document may not align with the ISO standard when published.

3) Potential for Greenwashing
   a) Some individuals in the group had concerns that MB-CM can be a form of greenwashing due to lack of guaranteed physical presence of specified characteristics in outputs. This is aligned with certain external perspectives. (ECOS, 2025)
4) Risk of double counting
   a) Some believe that the risk of double counting is insurmountable, especially for attribution of bio-based characteristics, and therefore have concerns about the MB-CM chain of custody approach in its entirety.
5) Like-for-like (physical/functional) comparisons
   a) There are concerns regarding the desire to limit attributions beyond the Like-for-like requirements of ISO 22095-2. This could include limiting attributions to inputs based on functional equivalency, limiting attribution to specified characteristics which do not cause an increase in processing emissions relative to the legacy materials that they substitute for, equivalent functionality of products independent of any attribution, or attribution limited to products that are chemically identical or share a common processing pathway.
6) Mass balance in LCAs may be prohibited by some regulations, such as biofuels.
7) Based on a survey, a portion of the working group was opposed to consideration of site-to-site credit transfers in LCAs and EPDs.
8) There is a view among some practitioners and policymakers that mass balance chain-of-custody approaches are not a prerequisite for industrial transitions to circularity, and that progress can be driven through alternative measures such as material substitution, process redesign, and increased physical segregation of circular inputs.

6.0 Conclusion

Many consider that mass balance chain of custody is growing in importance as a possible enabler for industrial transition toward circularity and/or other sustainability goals.

ACLCA supports the inclusion of mass balance chain of custody into LCA calculations for the purposes of LCA and EPD communications, provided that the guardrails and requirements in this guidance document are conformed to and provided that it is not prohibited by the applicable standards. It is the intent of ACLCA to help promote

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sustainability solutions while also ensuring transparency and credibility of communications related to their environmental impacts via utilization of these guidelines.

ACLCA looks forward to the completion of ISO 14077 and believes that these ACLCA guidelines can be useful in the interim period.

7.0 ACLCA Mass Balance Working Group Description

ACLCA assembled a preliminary working group in November 2023 and wrapped up the initial phases of work in October 2024. The preliminary working group completed the deliverables as shown in Figure 8-1.



Figure 8-1: Accomplishments of 2023-2024 Preliminary ACLCA working group

A more focused effort to develop this ACLCA Open PCR standard mass balance guidance was kicked off in November 2024. The working group consisted of approximately 44 people from a mix of industries, consulting, academia, government, and individual LCA experts. The working group used survey polls to gather data on working group member opinions at vary decision points. The polls were limited to one respondent per organization represented.

Annex A – Informative viewpoints regarding consideration of MB-CM site-to-site credit transfers in LCAs and EPDs

The ACLCA mass balance working group formed two sub teams to summarize opposing points of view with regards to site-to-site credit transfers in LCAs and EPDs. Section A.1 summarizes the arguments in favor. Section A.2 summarizes the arguments opposed.

A.1 Viewpoints in favor of site-to-site credit transfers in LCAs and EPDs

Multisite Credit Transfer (MSCT) will be happening for chain of custody. Guidance and guardrails are needed for credible application in LCAs and EPDs.

Site-to-site credit transfer in certified chain of custody systems (such as ISCC PLUS, REDCERT2, FSC, Fairtrade, etc.) is used because it avoids unnecessary impacts and it creates value in the following ways:

- It allows companies who have sites which are geographically separated to invest where the source of the specified characteristic makes sense environmentally and logistically to get products using those specified characteristics to market, minimizing overall impact
- It enables tangible and impactful real-world benefits such as avoiding unproductive shipment of materials between sites (less emissions, less resource consumption, less cost, avoided logistics infrastructure impacts, safety).
- It is important as an interim solution to drive sustainable transformation for early movers to achieve economies of scale
- Improved costs due to site-to-site credit transfers allow more re-investment into productive change and creates a better business case for some more sustainable products.

Site-to-site credit transfers can be justified in LCA/EPD as follows:

- It is attributional accounting logic for environmental impacts occurring within the organizational system boundary
- MB-CM provides no guarantee of physical presence of specified characteristics whether there are site-to-site credit transfers or not
- Decoupling LCAs from specified characteristic chain of custody will disincentivize use of materials with specified characteristics. Customers who pay for attribution of specified characteristics expect the LCAs and EPDs to reflect it.

The following guardrail restrictions are needed for credible use of site-to-site credit transfer in LCAs and EPDs:

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1. Shall fulfill ISO 22095-2 requirements under control of one organization, transfer of credits for similar in nature products, defined geographical eligibility. As opposed to B&C, where credits are traded outside an organization's boundary.
2. Disclose multisite use with mandatory transparent reporting on system boundaries involving two or more sites
3. Both the residual product and product with credit attribution shall be reported
4. For both products, the production process shall be modeled at the location where it takes place. If regionalized impact assessment methods are used, these should refer to the location where the product is being made and the credit is from (site 2), not where the credit is used

A.2 Viewpoints opposed to site-to-site credit transfers in LCAs and EPDs

Key concerns regarding multi-site credit transfers, without physical transfer in Mass Balance CoC for LCAs and EPDs, were based on an overarching principle that the methodology shall be applicable and defensible across all industrial sectors and geographies.

Type 1: Compliance Concerns

1. Incompatibility with existing global LCA/CFP standards such as ISO 14040/14044:2006 and 14067:2018 (e.g., modeling lacks semblance to the physical reality and potential for inconsistent system boundaries)

a. Credit based multi-site transfer Mass Balance implements attribution of environmental characteristics with a credit that is separated from the physical material, which conflicts with standard LCA practices modeling physically connected and technically/chemically feasible representative systems.

b. The LCA system boundary (physically technical/feasible) is highly likely to be inconsistent with the multi-site transfer Mass Balance credit system boundary and can reduce transparency in related claims. Potential risk: Inability to substantiate LCA findings and product claims when using multi-site transfer Mass Balance credits

2. Non-Compliance with globally accepted Environmental Claims/EPD Requirements

EN 15804+A2 and ISO 14025:2006 require sites-specific input data, allocation of inputs, and documentation requirements. Transferring credits between sites can violate these requirements.

Potential risk: Inability to substantiate LCA findings and product claims when using multi-site transfer Mass Balance credits

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<u>Type II: Practical concerns</u>

3. Risk to integrity and credibility of LCAs

Standards like ISO 14040/14044:2006 and 14067:2018 stress alignment to physical systems and actual physical flows. Including a virtual transfer of flows opens the door to unsubstantiated or unverifiable green claims. Bio content complicates this further as the presence or absence of bio content is easily measured/tracked throughout the value chain via C14 testing and in certain jurisdictions is regulated.

Site to site credit transfer can result in possibility of physical presence as defined in ISO 22095-2. Possibility of physical presence is not a mandatory requirement but must be disclosed as part of the designation system and is a concern to some stakeholders.

Potential risk: Noncompliance with jurisdiction specific regulations and laws (e.g., low emission fuels) and Inability to substantiate LCA findings and product claims when using multi-site transfer Mass Balance credits

4. Risk of Double Counting of attributes, overestimation of benefits and burden shifting leading to increased potential for greenwashing and non-compliance with regulated markets (e.g. fuels, bio)

ISO 22095:2020 mandates that CoC systems using mass balance, implement checks/controls to ensure that credits are allocated within the same site and time period to prevent double counting. Multi-site transfers can make substantiation/verification difficult or impossible, introduce duplication risks and can undermine the credibility of sustainability claims.

Potential risk: Inability to substantiate LCA findings and product claims when using multi-site transfer Mass Balance credits. Eroded cost savings through additional tracking a verification effort.

5. Ignoring Geographic & Regulatory Contexts

Transferring credits between sites, especially across large distances, ignores the localized environmental impact of production (and may not be legal across jurisdictions), for instance the low emission benefit of a material processed in one region might be attributed to a product manufactured in a high-emission region.

Potential risk: Noncompliance with jurisdiction specific regulations and laws e.g. Emission Trading Scheme requirements

6. Increased Auditing Complexity

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ISO 22095:2020 requires clear spatial boundaries, site-level accountability, record-keeping, and documentation per site. Splitting credits across sites complicates audits and increases verification burden.

Implication: Increased burden on supply chain to manage CoC and credit use in LCAs/EPDs

7. Justification Complexities

It is unclear and complex as to who justifies, documents and transparently communicates the reason(s) for using mass balance multi-site transfers (e.g., the goal and scope writer, the LCA practitioner, or the downstream entities).

Potential risk: Conflict of interest

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