Book and Claim for Cement and Concrete

Comprehensive framework outlining key functions and components for a book and claim chain of custody model in the cement and concrete sector

Version 1, Adopted January 2026

A partnership between

GMA RMI

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1. Introduction

Cement and concrete are responsible for approximately 8% of global greenhouse gas emissions, yet many of the technologies needed to decarbonize the sector remain in the early stages of deployment. Accelerating their adoption will require strong demand signals and new mechanisms to channel investment beyond traditional procurement. A book and claim system addresses these needs by enabling a broader set of stakeholders to support the production of low-carbon materials, while ensuring through rigorous tracking and verification that investments correspond to actual emissions reductions. By mobilizing demand, book and claim can serve as a critical catalyst for sector-wide decarbonization.

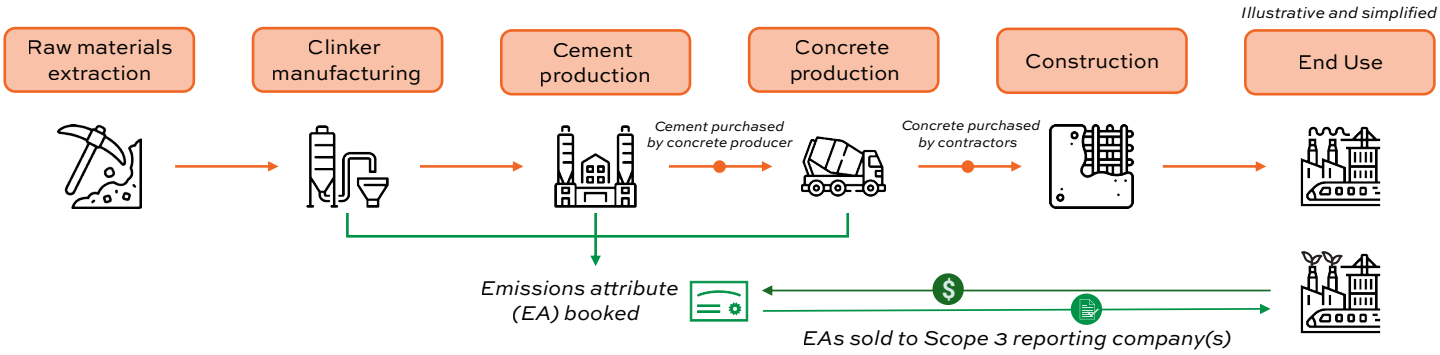
To advance this opportunity, in December 2024, the Center for Green Market Activation (GMA) and RMI (founded as Rocky Mountain Institute) gathered a group of stakeholders to inform the development of a book and claim market for the industry. GMA and RMI, the "Organizers," worked with the participants of the Working Group to outline the core principles and design components for how book and claim should operate. The intent of this framework is to inform book and claim transactions, environmental attribute certificate (EAC) issuance, and digital registry tracking rules.

1.1 What is "book and claim"?

Book and claim is a chain of custody model that allows environmental attributes (such as carbon intensity) to be decoupled from a physical product or service that carries those attributes. Through this model, a certificate representing the product's environmental attributes (known as an EAC) is issued and then sold and transferred to a buyer without direct access to the lower-carbon product in the physical value chain, enabling them to financially support decarbonization efforts and claim the associated environmental benefits towards their Scope 3 inventory reporting.

For book and claim to function effectively at scale, strong credibility and sustainability guardrails are essential. Inaccurate measurement, lack of transparency, or variability in approach can limit scalability or risk the credibility of the entire system and market.

Exhibit 1: Illustrative book and claim model in cement and concrete



Source: GMA and RMI

For producers, book and claim offers a way to expand market reach of low-carbon products without the need to physically ship products beyond traditional boundaries, which is particularly important in the cement and concrete sector, where market activity is mostly regional due to high transport costs. By decoupling environmental attributes from the physical product, producers can monetize low-carbon production even in markets where local customers are not yet willing or able to pay a premium. This creates new revenue streams and enables long-term offtake agreements that can help de-risk investments in low-carbon technologies such as alternative binders and carbon capture, utilization, and storage (CCUS).

Buyers, on the other hand, engage in book and claim to meet Scope 3 emissions reduction targets when low-carbon products are not locally available for physical procurement or when intermediaries in the value chain are unwilling or unable to manage logistics or incremental costs associated with procurement of low-carbon materials. It enables buyers to overcome supply chain limitations, aggregate procurement across projects or regions, and catalyze the market for future growth.

Although new to concrete and cement, book and claim is well established in other sectors. The most notable examples of book and claim are in the renewable energy and sustainable aviation fuel (SAF) markets. In renewable energy, renewable energy certificates (RECs) or guarantees of origins (GOs) are issued and sold to corporate buyers seeking to reduce their Scope 2 emissions who may not have access to renewable sources on the grid or on site. In the aviation market, corporate travelers and air freight shippers use book and claim to fund SAF and claim the benefits toward their climate targets. Since these buyers typically are unable to directly procure from fuel producers, book and claim is among the few mechanisms for corporate customers to invest in and reduce their aviation emissions, short of reducing flying. Each of these systems provide guidance and best practices that can be leveraged for the development of a book and claim system for the cement and concrete industry.

1.2 Difference between book and claim and mass balance chain of custody models

Mass balance and book and claim are both chain of custody models used to allocate environmental benefits. However, they manage the relationship between physical products and environmental attributes differently. While book and claim enables the separation of environmental attributes from the physical product, mass balance maintains a physical linkage but defines how environmental attributes can be assigned across multiple outputs. More information about mass balance is available in Appendix 9.3.

1.3 Framework interaction with the broader ecosystem

This document aims to generate a representative, sector-specific perspective on how book and claim should be applied in the cement and concrete industry. It lays out core principles and foundational guidance that reflect input from a diverse set of stakeholders. With shared rules and expectations, market actors can engage in this emerging space with greater confidence in the credibility of certificates to help reach climate goals and the bankability of long-term certificate offtake agreements.

This work does not exist in a vacuum. It was developed with an explicit goal of aligning with and contributing to broader ecosystem efforts. During the writing of this document, the Science Based Target Initiative (SBTi) and Greenhouse Gas Protocol (GHGP) are both undergoing revisions to their standards, including new approaches to the treatment of market-based mechanisms. ISO has also recently published ISO 22095-3 requirements and guidelines for book and claim.

GHGP and SBTi have not historically accepted the use of market-based measures, including book and claim certificates, for Scope 3 inventories or targets, but both bodies are signaling strong indication toward their acceptance in ongoing revisions. SBTi released an updated V2 draft of its Corporate Net Zero Standard in November 2025 clearly stating the need and incorporation of indirect mitigation instruments such as book and claim. A final version of the standard is expected sometime in 2026. At the same time, GHGP has assembled a group of experts into the Actions and Market Instruments (AMI) technical working group to develop a standard or guidance that outlines how companies can account for and report the impacts of market instruments such as book and claim certificates. Discussions within the AMI working group are ongoing and the final standard or guidance is not expected until 2028. This process attempts to reflect the latest developments and anticipated direction from those bodies.

Concurrently, GMA is a co-organizer of the Advanced and Indirect Mitigation Platform (AIM Platform) alongside Gold Standard and C2ES. At the time of drafting, the AIM Platform has published its first draft of the AIM Platform Intervention Quality, Accounting, and Reporting Standard (AIM QAR), one of two outputs (along with the Association Test) of its complete Standard and Guidance, to bring cross-sectoral consistency and alignment to Scope 3 value chain interventions, including those using book and claim. This framework leverages concepts and guidance outlined in the draft AIM QAR published in 2025 and may be updated to reflect adjustments in the final document. The cement and concrete framework in this document will complement the AIM standard, providing more detailed, sector-specific guardrails and components where needed. However, it does not seek to cover all topics outlined in the AIM QAR.

This framework is an important starting place from which the Organizers and industry stakeholders will build subsequent components of a robust book and claim ecosystem. This includes the development of a detailed rulebook and digital registry that can transparently track the issuance, transfer, and retirement of certificates. Lastly, individual companies and buyers' alliances like the Sustainable Concrete Buyers Alliance (SCoBA) can go beyond this framework to define additional specific attribute purchasing criteria in a way that aligns with their sustainability and business objectives. This framework sets the foundation for future transactions but should not constrain buyers from layering in their own purchasing criteria in addition to the requirements contained in the document.

1.4 Guiding principles of framework design

At the beginning of the design process, the Working Group agreed that an effective book and claim system should be:

- **Credible**: Credible from an environmental standpoint, driving high-integrity atmospheric benefits
- **Usable**: Straightforward and usable to facilitate scalable market transactions for low-carbon cement and/or concrete attributes
- **Compatible**: Compatible with existing regulatory and non-regulatory frameworks and best practices
- **Comprehensive**: Comprehensive across a range of decarbonization solutions to ensure the book and claim system can support multiple viable pathways to low-carbon cement and concrete
- **Unifying**: Designed to serve diverse geographic regions and markets, minimizing fragmentation and promoting geographic equity in access to decarbonization opportunities
- **Adaptable**: Designed for longevity and adaptability for future low-carbon technologies

1.5 Framework contribution and consultation

The Working Group was comprised of the Organizers, GMA and RMI, alongside approximately 30 organizations including asset owners, developers, construction companies, cement and concrete producers, nongovernmental organizations, and others.

The working group included, but was not limited to, individuals from the following organizations:

Amazon
Boston Consulting Group
Brimstone
CarbonCure Technologies
CarbonBuilt
Carbon Leadership Forum
Cemex
Building Transparency
Deloitte
Cementis
First Movers Coalition
Fortera
Google
Heidelberg
Holcim
Meta
Microsoft
Mission Possible Partnership
Mundys
National Ready Mixed Concrete Association
New Climate
Ozinga
Prologis
Ryan Companies
Sublime
The Climate Pledge
Trammell Crow
Turner Construction

The Organizers and Working Group participants held monthly meetings with additional sub-topic discussions to inform the development of this framework. The goal of the Working Group was to achieve broad consensus on all key system design criteria contained in this framework.

1.6 How to use this document

The terms “shall” or “must” are used throughout this framework to indicate a requirement for book and claim certificate issuance, transactions, and/or tracking. The term “should” indicates a recommendation, but not a requirement, and “may” indicates an option that is permitted or allowed. This document in its current form should not be used as a normative standard, nor should it be used as the basis for an audit. Rather, this document should be considered a broad set of principles and best practices for establishing a book and claim system in the cement and concrete sector.

This document is organized as a series of elements that together constitute the book and claim framework for the concrete value chain. Each element is accompanied by a rationale intended to provide helpful context, including justification and considerations.

Please note that this document assumes an advanced understanding of greenhouse gas accounting and familiarity with standards such as Greenhouse Gas Protocol (GHGP), Science-based Targets initiative (SBTi), and Advanced and Indirect Mitigation (AIM) Platform, and product category rules (PCRs) for cement and concrete, among others. Appendix F includes additional resources related to these topics.

2. Book and Claim Functional Units

The functional unit of a certificate is the building block of the system that determines what is being booked, transferred, and claimed and how to ensure environmental integrity. This framework takes an approach that promotes flexibility in the market, while also reducing risk of over-crediting emissions impacts.

2.1 Eligible functional units for book and claim certificates

EACs may be generated at three stages of the value chain

1) Clinker: the intermediate product and primary ingredient to make a binder for traditional hydraulic cement, typically produced by heating limestone to ~1450°C
2) Cement: hydraulic cement that sets and hardens by chemical reaction with water (hydration) and is capable of doing so under water (cements conforming to ASTM C150, ASTM C595, ASTM C1157, AC529, or EN 197-1)
3) Concrete: a composite material that consists of a mixture of cement, aggregates, and water, with or without admixtures, fibers, or other cementitious materials to be used as the final construction product (concrete conforming to ASTM C94 or CSA A23.1/A23.2)

Decarbonizing the cement and concrete industry includes intervening at various steps in the value chain. Multiple functional units are included in the system to enable different pathways for supplier involvement and scaling of innovative solutions. Technologies and solutions targeted to leverage this chain of custody model include those that both reduce the emissions intensity of clinker, the most carbon intensive component of the industry, and reduce the use of clinker altogether. With several available functional units, a greater array of solutions can be utilized to channel investments.

In addition to greater technology pathways, multiple functional units plan for multiple accounting pathways. Revised standards from bodies such as GHGP, SBTi, and others are still in development and may impact the future viability and feasibility of certain functional units. Therefore, designing for multiple units provides flexibility and dynamism amid potential uncertainty.

In the current version of this framework, SCM producers seeking to engage in the book and claim market must either (1) achieve ASTM or EN certification as described in the cement functional unit or (2) integrate the SCM into a blended cement or concrete mix to issue the respective functional unit EAC. SCM producers may partner with the downstream entities to issue environmental attribute certificates under mutually agreeable terms.

SCMs that do not meet applicable cement certifications must be combined with other cementitious materials, namely OPC or clinker, to produce effective concrete mixes. As such, these SCMs are not functionally equivalent to OPC. The proportion at which these SCMs can be blended with OPC or clinker varies meaningfully by SCM type and use case. As a result, EACs representing SCMs would have to be adjusted to reflect their feasible replacement rate for OPC.

Such a replacement rate could be used to convert a volume of SCM to the representative volume and environmental attribute of a cement product, enabling an SCM producer to issue an EAC. However, the replacement rate for a given SCM is typically specific to the mix, use case, and environment of the downstream concrete. While significant testing data points to indicative or potential replacement rates, no standard currently exists to establish a consistent replacement rate for an SCM in a verifiable or assurable manner.

While the Organizers recognize the important role that SCMs are likely to play in decarbonizing the cement and concrete sector, further research is needed to establish robust replacement rate data and related accounting guidance before high-integrity EACs can be credibly issued by SCM producers. The Organizers will establish a process to research potential pathways to establish such data and methodologies to determine whether a robust pathway can be established to enable SCM producers to issue EACs. The Organizers shall present recommendations, including a potential methodology for direct SCM issuance, to the Steering Committee of this framework by the end of Q2 2026.

3. Eligibility Criteria for EAC Issuance

In the novel and developing market for book and claim certificates, environmental integrity and adherence to existing best practices are paramount to market adoption and deployment. Several criteria have been developed to ensure revenue from the system is directed toward high impact areas and is consistent with best practice from other markets such as for SAFc and RECs.

3.1 Product emissions intensity threshold

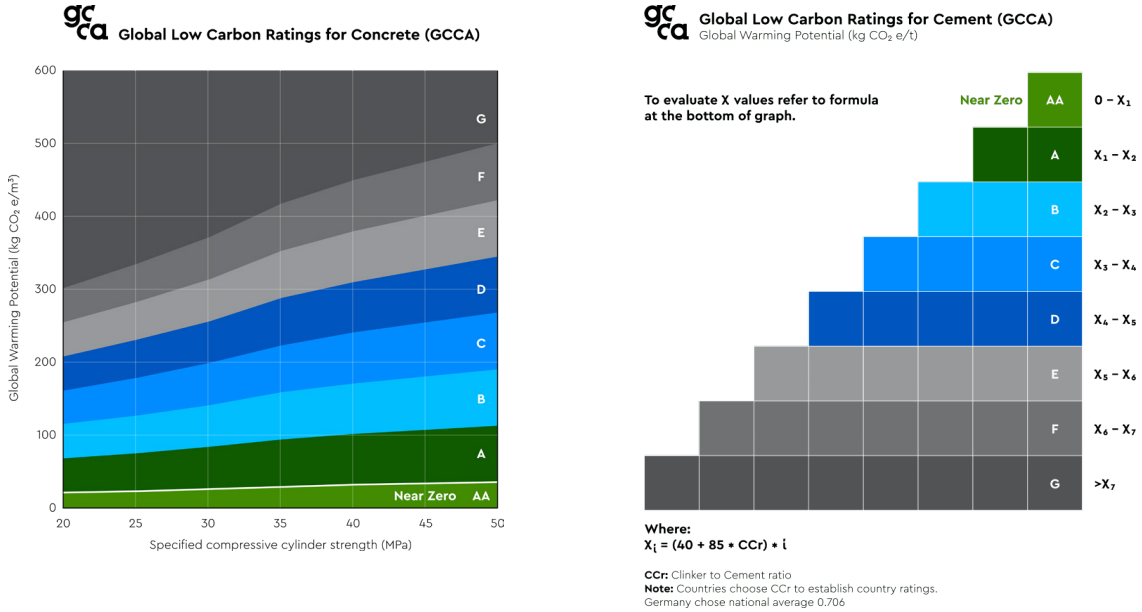
From 2025 to 2030, the EAC-generating product must have a minimum rating of 'C' as defined by the GCCA low-carbon ratings for cement and concrete for the specific production region.

Beginning in 2030 and thereafter, EAC-generating products much achieve a rating of 'B' or better. The threshold rating is a floor for credible environmental attribute certificate issuance under this framework. Buyers or other stakeholders may also provide additional eligibility criteria or emissions reduction requirements for specific transactions.

To calculate the regionalized GCCA ratings, the designated country clinker-cement ratio should be used when possible. If unavailable, the clinker ratio should be identified using GCCA's GNR database when coverage is greater than 50% of the country's volume. If coverage for a given country is less than 50%, the global clinker ratio from GNR may be used. GCCA bands should be normalized to reflect local standards, following additional guidance from GCCA once available. Appendix 9.3 illustrates the rating bands as of January 2026 for select countries, without any further normalization, as a reference (note that these figures will change and EACs must match eligibility at time of issuance).

The Global Cement and Concrete Association (GCCA) in 2024 released the Global Low Carbon Ratings for Cement and Concrete, which developed a standardized system to categorize and compare products. The rating is designed to be dynamic based on the market and adjust over time as average clinker factors decrease.

Exhibit 2: GCCA Low-Carbon Ratings



Source: GCCA, GCCA Global Low Carbon Ratings for Cement and Concrete

The regional specificity and variability of the rating system helps to ensure that book and claim is pushing decarbonization relevant to the market. If a particular market's cement or concrete products have lower carbon intensity to begin with, the threshold will be lower accordingly, increasing ambition for book and claim and directing the additional revenue toward catalytic activities that are not readily available for that specific market.

A phased approach is taken in this framework to (1) maintain global consistency, (2) acknowledge varying levels of market maturity, and (3) drive deep decarbonization and ambition in the medium to long term. In markets where C-rated products may exist today, purchasers and producers should not use the EAC system and should, instead, focus on direct procurement of those products. In markets where C-rated products are unavailable, EAC issuance over the next four years can be catalytic to increasing availability of higher ambition products and maturing novel technologies so that they may reach a rating of B or better by 2030.

The Organizers recognize the need for deep decarbonization and net-zero products to meet the internationally recognized science targets. As such, the Organizers may reevaluate the minimum system eligibility threshold over time.

3.2 Disclosure of all applicable regulations

EAC-generating products and the associated environmental attributes must disclose all regulations that are applicable to the EAC issuer or upstream products that impact production or emissions of the material, facility, or producer. Transparency of all regulations enables purchasers to determine and track compliance with regulatory surplus requirements or preferences.

The EAC should categorize what type(s) of regulations the issuer or upstream producers are subject to, using the following definitions:

Regulation Category	Description
1) Policy-free	Producer is not obligated by any policies or provided government incentives to decarbonize its products.
2) Incentive-driven	Producer or upstream products have received government incentives that facilitate the lower emissions intensity issued on the EAC.
3) Action-oriented mandates	Producer or upstream products are obligated to reduce emissions by taking specific actions or procure/produce materials with certain characteristics tied to the EAC. Relevant regulations include (but are not limited to) facility-level emission caps, product emissions-intensity limits, and production requirements tied to certain environmental attributes.
4) Market-based regulatory system	Producer or upstream products are regulated under market-based systems that mandate specific emissions outcomes or actions across all regulated parties. Relevant regulations include emissions trading schemes and economy-wide caps that regulate total emissions but do not require specific actions by individual entities.

Regulatory surplus is the characteristic of an intervention or associated product attribute that demonstrates whether the emissions outcome achieved was beyond those mandated or incentivized by regulations. Regulatory surplus — also called regulatory additionality — has been a core component of many EAC markets and certifications to provide purchasers confidence that their investment led to emissions impact that otherwise would not have occurred.

Transparency into all applicable regulations that the EAC issuer and upstream suppliers are subject to allows the purchaser to track the adherence to any regulatory surplus requirement provided through the contractual agreement. The categorization further demonstrates typical ways in which buyers may evaluate the impact of these regulations, making it clearer and more easily digestible in the event that an EAC is subject to multiple types of regulations.

This framework follows best practice in other book and claim standards and registry rulebooks by requiring regulation disclosure. Namely, RSB's *Book and Claim Manual* outlines a similar characterization of regulation types. Standards and frameworks such as AIM QAR and SBTi will provide additional guidance on regulatory surplus eligibility. Additionally, industry buyers alliances, such as the Sustainable Concrete Buyers Alliance (SCoBA), may set their own perspectives and best practices for evaluation of regulatory surplus.

Note, demand-side regulations, such as building codes and procurement policies, are not tracked because specific buyer details may not be known at point of EAC issuance. In addition, these codes and policies are not relevant for determining regulatory surplus as the physical product recipient must not utilize the low-carbon attribute of the product that has sold its EAC separately (see Section 8 for more details).

3.3 Catalytic procurements

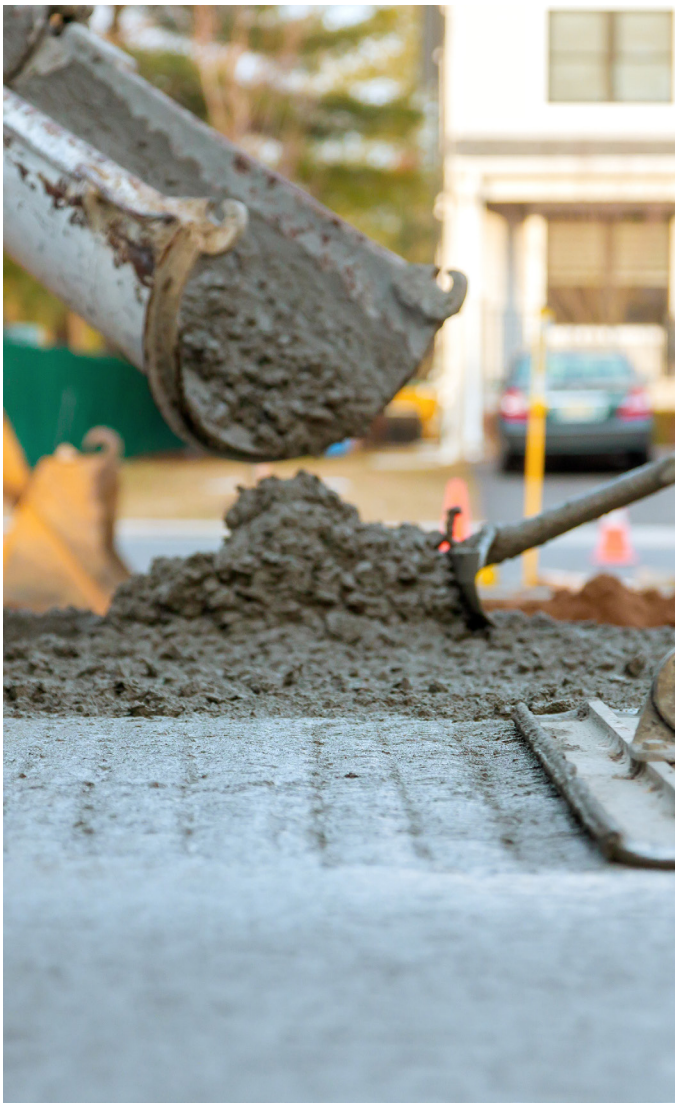
Purchasers should prioritize EAC procurement from technologies and products that require the additional revenue stream from the environmental attribute to reach investment viability (i.e., financial additionality). Each purchaser or set of buyers may determine their own approach for evaluating technology and product needs for EAC procurement.

Financial additionality is a subset of broader additionality tests that evaluate revenue and costs of an intervention to determine whether investment would have been financially viable without the added revenue from commercialization of the environmental attribute.

While the intent of financial additionality has high integrity and ambition, financial additionality evaluations in the carbon market space have been subject to criticism due to the large number of assumptions present in financial models and the subjective judgment required to evaluate whether financial additionality has been reasonably proven. Project developers can often manipulate assumptions or claims to demonstrate financial additionality and create a false sense of accuracy.

As such, a clear and objective financial additionality test has not been put forward by any other comparable book and claim system for environmental attributes specifically focused on Scope 3 emissions activities. For example, no financial additionality test exists for EAC buyers alliances or standards including the Sustainable Aviation Buyers Alliance, RSB Book and Claim Manual, and Green-e Certification.

Instead of a formal requirement for financial additionality, it is expected that purchasers of EACs seek to assess their procurement opportunities and strive to direct offtake toward products that drive innovation and require additional revenue or commercialization to reach investment. For example, using non-beneficiated or non-activated fly ash from coal-fired power plants and ground granulated blast furnace slag (GGBFS) in blended cement or concrete are common practice today and are often blended to 35% and 50%, respectively. These products, however, often carry no green premium, or may even be less expensive than traditional cements. As a result, EACs should not be issued for blended cements or concretes for which non-beneficiated or non-activated traditional SCMs, defined as fly ash from coal-fired power plants or GGBFS, represent the primary driver of emissions reductions relative to the appropriate baseline for the cement or concrete mix. These limits will help direct EAC procurement toward materials that are otherwise unable to achieve cost parity and drive innovation and decarbonization beyond what is available today.



4. Emissions Intensity Measurement Methodology

Chain of custody models outline the flow of information from a product down the value chain, originating at the producer and passing through several hands until the product reaches its final destination or use. Existing transactions for cement and concrete predominantly use a direct, physically segregated chain of custody model: the environmental attribute of the physical product is tracked through each intermediary until it reaches the end state, providing the information on the specific product environmental attributes. In this model, environmental product declarations (EPDs) that follow the product category rule (PCR) guidance have been instrumental to sustainability measurements in the market.

For alternative chain of custody models such as book and claim, the measurement and boundaries of the product's attribute should not change. What changes is the path that the information takes to get to its final end user. The measurement methodology for book and claim leverages the existing EPD standards, creating consistency with direct, physical product reporting and accounting. This limits burden on suppliers, verifiers, and purchasers.

While EPDs can be used for 5 years from issuance, there is currently no monitoring system to validate that the input materials and processes reported within the EPD based on the historical assessment period remain consistent during the subsequent 5-year period during which the EPD is valid. Many low-carbon products require ongoing procurement of decarbonized inputs or process operations to produce a product with low global warming potential (GWP) (e.g., renewable fuels and electricity, carbon capture). As such, more frequent EPD issuance or additional third-party auditing is necessary to provide increased assurance to the buyers that the EACs they purchase reflect accurate product emissions. To ensure accuracy of the EPD, the EPD must either (1) be conducted within 12-months of when an EAC is eligible to be issued, or (2) achieve third-party verification that the underlying EPD practices have been maintained.

4.1 Clinker intensity measurement

For an EAC issued from a clinker product, the emissions intensity must be calculated consistent with the applicable PCR of the production jurisdiction and demonstrated with a third-party verified product-specific Type III EPD. Given the absence of a clinker EPD, clinker products may use the applicable cement PCRs with a 100% clinker ratio.

To ensure accuracy of the EPD, the EPD must either (1) be conducted within 12 months of when an EAC is eligible to be issued, or (2) achieve third-party validation that the underlying EPD practices have been maintained.

Applicable cement PCRs include ISO 14025 + ISO 21930:2017, EN 16908, EN 16757:2017, EN 15804+A2, Smart EPD® Part B PCR for Cements for Construction 1000-010, v4.0, PCR for Slag Cement v2.0, and Part B PCR for Supplementary Cementitious Materials Standard 1000-002.

Matching the clinker measurement with a cement EPD increases consistency and ensures matching boundaries to the how the PCR is defined. This enables comparability between a clinker EAC and the clinker in their inventory that is measured through the cement EPD.

4.2 Cement and concrete intensity measurement

For EACs issued from cement and concrete products, the emissions intensity must be calculated consistent with the applicable PCR of the production jurisdiction and demonstrated with a third-party-verified product-specific Type III EPD.

To ensure accuracy of the EPD, the EPD must either (1) be conducted within 12 months of when an EAC is eligible to be issued, or (2) achieve third-party verification that the underlying EPD practices have been maintained.

Applicable cement PCRs include ISO 14025 + ISO 21930:2017, EN 16908, EN 16757:2017, EN 15804+A2, Smart EPD® Part B PCR for Cements for Construction 1000-010, v4.0, PCR for Slag Cement v2.0, and Part B PCR for Supplementary Cementitious Materials.

If cement product category rules are not defined in the production jurisdiction, an LCA aligning with the system boundaries and methodologies of EN 16908:2022+A1 or Smart EPD® Part B PCR for Cements for Construction 1000-010, v4.0 may be used.

If concrete product category rules are not defined in the production jurisdiction, an LCA aligning with the system boundaries and methodologies of EN 16757:2022 or NSF 1112-19 PCR for Concrete v2.3 may be used.

Aligning with existing PCRs creates consistency with physical, direct offtake practices within a region. This mitigates discrepancies between what is claimed via the EAC and the physical product, supporting reliable accounting and fostering trust among buyers and supply chain participants.

Absence of regional guidance on PCRs should not preclude participation in the system. As such, several PCRs are named to enable adoption where otherwise not specified.

4.3 Additional considerations for carbon capture technologies

In accordance with sections 4.1 and 4.2, all materials issuing an EAC must have the requisite EPD. Currently, however, most PCRs do not outline explicit guidance for the treatment of carbon capture technologies for clinker or cement production. In jurisdictions that do not include PCR guidance to enable carbon capture technologies, producers may leverage rules outlined in other applicable PCRs to issue an adjusted EPD.

As of November 2025, the only known PCR to include carbon capture and storage (CCS) is Annex A of Smart EPD. The methodologies of Annex A can be used to generate the emissions intensity of the product, adjusted for any discrepancies in boundaries between PCRs.

Carbon capture is a critical technology to enable global cement production to reach net zero. Including the emissions savings of CCUS in the product's emission's intensity will enable the market to commercialize these attributes and drive further deployment.

The Organizers urge program operators and standard setters to issue guidance that enables the inclusion of carbon capture technology, enabling the physical value chain to mirror that of the book and claim chain of custody model. In the interim, however, permitting the book and claim certificate to leverage separate PCR guidance is acceptable for the purposes of this framework.

4.4 Additional considerations for carbon storage

Emissions intensity of products using CCS must consider all leakage and emissions associated with the distribution and storage of the carbon. CCS products must demonstrate permanent sequestration, defined as ensuring a minimum of 100-years of permanence, and include a third-party verified certificate of storage.

Storage certificates should include information such as, but not limited to, location, storage company, captured carbon emission, leaked emissions or leakage rate, emissions for transportation, emissions for storage, and final quantity of carbon stored.

Carbon capture is only an effective intervention if the carbon storage is permanent. Verification of storage certificates provides transparency and credibility to the capture system. Existing guidance on carbon storage practices and certification remains limited but should be leveraged wherever available. Emerging standards and guidance — such as ISO 27914 for geological storage and the EU's Carbon Removal Certification Framework — are beginning to define consistent methodologies for monitoring, verification, and permanence.

Many regulatory frameworks and certification programs recognize a 100-year storage duration as the threshold for "permanent" carbon storage, ensuring that stored carbon delivers a meaningful atmospheric benefit.

Additionally, the method of carbon transport — whether by pipeline, ship, truck, or other means — plays a critical role in estimating potential leakage rates and overall system integrity. Effective monitoring and verification of transport pathways are therefore essential to maintain the credibility and durability of storage claims.

4.5 Additional considerations for carbon utilization

The emissions intensity of products using carbon capture that is sold and utilized by a downstream customer must demonstrate atmospheric benefit and long-term sequestration.

Given the lack of long-term sequestration and negative co-impacts to global emissions, enhanced oil recovery may not be used to substantiate an emission reduction for carbon capture technologies.

As described by Smart EPD Annex A, carbon utilization falls outside the system boundaries for an EPD, therefore the captured emissions burden falls to the potential emitter — the downstream purchaser of the carbon — leading to no actual atmospheric benefit. To mitigate the potential for captured emissions to be released downstream, utilization is only eligible if leading to long-term sequestration.

To date, carbon mineralization within concrete is the only known utilization pathway to meet such criteria. While there may be appropriate use cases for carbon utilization beyond mineralization, until there is greater traceability of carbon, utilization must be limited to carbon mineralization for EAC generation. This bars, for example, the use of captured carbon for enhanced oil recovery.

5. EAC Issuance and Data Tracking

It is fundamental in a book and claim chain of custody model that the environmental attribute reflects the actual product introduced to the market and not any kind of ex-ante, or forward looking, expectation. Speculative emissions reductions and accounting expose the market to scrutiny and claims of greenwashing if the actual impact is less than the forecasted expectation. As such, guardrails are needed to ensure credibility of claims from the system and provide robust data tracking to enable transparency to the market.

It is expected and encouraged that buyers will enter long-term offtake agreements for EACs. These agreements can be fundamental to enabling project finance for large scale decarbonization projects, particularly if executed credibly by following the described guardrails for issuance and claiming of EACs. While the contracts may be signed prior to development, the EAC issuance and tracking may only occur when a physical product enters the market.

5.1 Cadence of EAC issuance

An EAC may only be issued after the physical product has either been deployed for its final intended use or shipped to the next step in the supply chain.

Some examples of documentation that may be used to prove imminent use include, but are not limited to, bill of lading, delivery ticket, invoice, or declaration of performance. Please see Appendix 9.2 for further details.

Production alone does not constitute eligibility for EAC issuance.

For a purchaser to claim that the EAC can be used to address their inventory activities or that the atmosphere has seen a positive impact, the physical, low-carbon product must be utilized in a construction project. Production of a low-carbon product does not alone reduce emissions in the atmosphere. However, requiring that the physical product is tracked all the way to final installation would significantly increase the data tracking burden to the EAC issuer, diminishing the efficiency and purpose of the book and claim chain of custody model.

Consequently, shipment or sale of the low-carbon product is the best proxy to ensure that the product will imminently be used and is the most closely matched milestone between the atmospheric impact and when the EAC can be claimed. While there may be some cases when a product is delivered then never used, this is not a sustainable business model and would not occur at scale.

Producers issuing EACs may make their own commercial decisions on how, when, and at what frequency to issue certificates. Two examples highlight how a producer could determine whether they want to decouple and sell the EAC or keep the EA with the physical product.

Example 1

Future offtake for full production capacity: A producer has a forward offtake agreement for EACs that covers 100% of the plant's production. Consequently, they do not anticipate passing along the low-carbon attribute to any physical customers. The producer would provide all physical recipients of the product with the baseline emissions intensity and supporting documentation on what to use for accounting (see section 8). To limit administrative burden, the producer could use quarterly verification and issuance periods, aggregating all invoices from the period and their associated low-carbon EPDs (and all other required data), to issue and transfer EACs from that period.

Example 2

Withholding environmental attributes with the physical product: The producer has an indication from their local market that several builders want to purchase the low-carbon product with the environmental attribute still coupled (not using the book and claim chain of custody model). They make the commercial decision to sell 50% of the plant capacity through book and claim forward offtake agreements, retaining 50% of the products to sell directly to local customers. The producer sells 50% of volumes with the low-carbon EPD still coupled to those local customers, and 50% receive the baseline value recorded on supporting documentation alongside the EPD to avoid double counting. At the end of the issuance period, the producer could issue certificates for only those volumes that did not retain the environmental attribute for the physical customer using the sale or bill of lading data as proof.

5.2 Registry tracking

EACs must be tracked on a digital registry and must not be issued simultaneously on multiple registries.

Digital registries provide a transparent, auditable record of EAC issuance, transfer, and retirement. They are the source of truth and ledger that is used to minimize risk of erroneous double counting, providing purchasers with assurance in the validity of their claims.

5.2.1 Registry operation and management

Digital registries should be managed by a third party operated without a conflict of interest and include a public-facing retirement statement.

Credibility and assurance come from the EAC tracking on the registry — without a credible and secure registry, the whole market is at jeopardy of greenwashing claims. As such, ensuring that the registry is governed with environmental integrity and transparency is core to the system. Registry operators may be enticed to design the system or obscure data to provide a competitive advantage and issue more EACs, increasing revenue at the expense of integrity. Conflicts of interest can be mitigated by the registry being managed by an impartial entity to any individual stakeholder in the market and/or by implementing a multilateral governance body to oversee registry decision-making and operations.

5.2.2 Information tracked in registry

The digital registry must track the following data on the EAC, but may include other components:

- Date of issuance
- Producer
- Production location
- Purchaser
- Date of sale/shipment
- Sale/shipment documentation
- Functional unit (clinker, cement, or concrete)
- Product compressive strength(s)
- Product certification (e.g., ASTM)
- Decarbonization solutions
- Applicable regulations and incentives
- Regulatory disclosure
- EPD
- EPD verifier
- Product emissions intensity
- Baseline emissions intensity
- GCCA Low-Carbon Rating label
- Source of baseline intensity
- Storage and/or utilization certificate(s)

The registry is used to validate and provide transparency that an EAC meets the framework eligibility but may also be used by buyers to ensure compliance with any additional preferences that are included in their individual contracts. The registry, therefore, needs to not only include all fields required to prove framework adherence, but also those that are most likely to be considered or tracked by buyers.

6. EAC Accounting

As stated in the introduction, the standards and guidance landscape regarding accounting for book and claim EACs is currently in development by the AIM Platform, GHGP, and ISO. GHGP is currently undergoing an extensive revision process of its corporate standards, and is considering, through its Actions and Market Instruments (AMI) technical working group, how "market instruments" such as book and claim should be reported in a multi-statement GHG Inventory report. This revision process, however, is likely not to be finalized until approximately 2028.

To continue moving forward this critical work, the AIM Platform has developed its own standard outlining accounting approaches that companies can use to claim book and claim certificate purchases. The first draft of the QAR, released in 2025, provides sufficient guidance for this framework to build upon. The complete AIM Platform Standard & Guidance, including chapters dedicated to value chain intervention quality, accounting, and reporting, is anticipated for publication in spring 2026. Given the evolving standard landscape from both AIM and GHGP, this framework may be adjusted as needed to enable conformance and interoperability with the updated standards.

The AIM QAR outlines extensive descriptions and guidance for several accounting approaches. To avoid duplicity, this framework highlights the fundamental components of two of the accounting approaches and provides further details where needed but directs readers to the AIM QAR for further examples and rationale.

6.1 Direct substitution

If using the direct substitution, the EAC-generating product must closely match the inventory line item to minimize inherent product or geographical differences. An EAC must match with at least, but is not limited to, the following criteria based on functional unit and product criteria.

In addition to the above-mentioned matching characteristics, the PCR methodology must also match between the EAC and inventory product.

	Geography	Product type	Product performance
Clinker	National or supra-national (e.g., EU)	NA	NA
Cement	National or supra-national (e.g., EU)	NA	*Within-range or greater than method* The minimum 28-day compressive strength of the physical product underlying the EAC must be equal to or exceed the minimum 28-day compressive strength of the physical product in the buyer's inventory for which substitution is claimed. If a 28-day compressive strength is not specified in the appropriate specification for either product (i.e., ASTM C150), 7-day compressive strength may be used for comparison. *Categorical method* The physical product underlying the EAC and the physical product in the buyer's inventory must fall within the same cement type category as defined by the applicable specification. For example, if the cement underlying the EAC conforms to ASTM C1157, both it and the product in the buyer's inventory must meet the criteria for classification as "General Use" to qualify for direct substitution.
Concrete	National or sub national (e.g., Northeast US)	Ready mix, pre-cast, masonry	*Within-range method* The maximum 28- or 56-day compressive strength of the physical product underlying the EAC must be within 5 MPa or 1,000 psi of the physical product in the buyer's inventory for which substitution is claimed.

NA indicates that no further matching is required in the applicable category

Direct substitution is an approach where the EAC purchaser may report the impacts of the EAC by substituting the EAC emissions intensity for what was previously in their inventory of an equivalent product. It requires that the EAC reporting company has primary data on the characteristics of the products currently used within its value chain.

For example, when a developer builds a new warehouse, they gather the EPD for all concrete and cements used from the general contractor. With this primary data, they can match their EAC purchases to these products based on the criteria outlined above.

The direct substitution approach is the current method for accounting renewable energy certificates. Today, GHGP Scope 2 guidance allows broad matching requirements, beyond what is physically deliverable and across markets that have significant different average emissions intensities.

In alignment with the direction of the REC standards, the additional matching requirements set forth above are intended to limit gaming of variability between markets. For example, if no matching requirements are included, a low-strength product from Europe could sell its EAC to directly substitute a high-strength product in the United States. Low-strength products, however, have lower GWP on average than high-strength products given the clinker factor, and, furthermore, European concretes typically have lower GWP than US concretes.

On the other hand, it is important to ensure that matching criteria are not so specific that they prevent meaningful investments. For example, if direct matching also considered components such as workability, durability, exposure class, and others, demand could not be aggregated based on the multitude of specific requirements within and across buyers. Clinker, in contrast to cement and concrete, has fewer matching requirements because of its technical equivalence and limited variability. A geographic matching requirement at the national or supranational level, however, is maintained to address the discrepancies in PCRs across regions and regulatory environments, which both result in a different baseline emissions intensity when substituting across regions.

6.2 Enhanced substitution

If using the enhanced substitution accounting approach, the EAC-generating product must match the functional unit of the EAC purchasers inventory product being addressed and, ideally, should match the product type as closely as possible. Scope 3 inventory activity may be comprised of primary data from suppliers or average/modeled data derived from life-cycle assessment (LCA) databases based on available data. If the EAC purchaser is using spend-based data for inventory accounting, the EAC purchaser should use the Activity Estimation approach outlined in AIM QAR. If using the Activity Estimation approach, baseline selection should follow guidance outlined in section 7.

In accordance with section 7, the EAC-generating product must match the PCR and measurement boundaries of the selected baseline.

The adjusted emissions intensity for any product may not go below zero for use in a Scope 3 inventory. Impacts resulting in a negative emissions intensity may be aggregated and used for things other than value chain mitigation statements (e.g., as offsets).

For more details on the enhanced substitution approach, review the AIM QAR. The enhanced substitution accounting approach may be adjusted following final guidance from the AIM Platform in 2026.

Enhanced substitution compares the EAC-generating product to the most likely alternative baseline, then applies that impact per functional unit to the purchaser's inventory activity reporting. Enhanced substitution is used when there are granular product characteristics or geographic market dynamics that result in significant discrepancies in product emissions intensity. While direct substitution is the preferred accounting method, when possible, instances may exist where a sufficiently tight match cannot be made.

For example, imagine that an EAC buyer matches the product performance between their inventory and an EAC issuer, but that EAC issuer operates outside of the geography of the buyer's inventory activity. A direct match is not possible because baseline emissions may be different across the two regions. Discrepancies across markets

may be the result of different regulatory policies or availability of local products (e.g., aggregates). As a result, it would be inaccurate for the buyer to simply substitute the GWP represented on the EAC into their inventory. However, enhanced substitution offers a solution to this by evaluating the magnitude of an emissions reduction within the EAC issuer's market, leveraging either operational data or reputable GWP baseline values, and allowing the EAC buyer to decrease the GWP represented in their emissions inventory by the equivalent amount.

This can also be used to support an EAC purchase within a geography where a tight product performance match does not exist. In this instance, the default scenario without enhanced substitution would be that no EAC purchase takes place and no emissions reduction occurs. Alternatively, enhanced substitution allows a purchaser to evaluate the emissions reduction associated with the EAC issuer's intervention and apply that decrease in emissions intensity to the GWP of other cement or concrete products within their inventory. This can only be applied to similar cement or concrete products to limit overapplication of this principle to other materials.

The result is an approach that can enable a broader number of EAC transactions to take place without compromising the integrity of the emissions reduction measured in the system.

Fundamental to the enhanced substitution approach is the selection of the applicable baseline. Section 7 outlines the matching requirements and selection process.

6.3 Registry retirement

EACs must be retired within a digital registry to be reported and claimed by the purchasing company.

Retirement prior to accounting or claiming impact from the EAC ensures that the reporting company is being transparent and avoiding claiming the impacts in multiple annual reports. The retirement designates the final use of the EAC which can no longer be retired by any other entity at that layer of the value chain nor at any other time.

6.4 Allowable co-claiming

Only one organization may claim the Scope 1 and 2 emissions impact of the EAC-generating product. Multiple organization across the value chain may co-claim the Scope 3 emissions impact for the same EAC-generating product, matching how the product is typically accounted for in a physically segregated chain of custody model.

In the case of multiple Scope 3 claimants, only one entity at each layer of the value chain may make claims and retire within a registry. The allowable co-claimant layers should reflect the actual value chain. A more detailed registry rulebook will work with stakeholders to identify the best suited layers to enable co-claiming.

While direct emissions are limited to each company's activities within their operational or financial control (per GHGP inventory accounting guidance), indirect emissions are, by definition, overlapping across many stakeholders in the value chain. As a product moves through the value chain from supplier to customer, so too does its environmental attribute, counted toward each layer of Scope 3 inventory. In a book and claim model, the same concept may be applied but should be leveraged with guardrails to ensure integrity.

The number and type of co-claimant layers represents the primary categories of stakeholders involved in the value chain as well as those most likely to contribute to the EAC costs. While this is a simplification of the market, expanding the number of claimants can significantly increase complexity and potential for double counting. A detailed registry rulebook will outline the allowable co-claimant levels of the value chain. For example, co-claimant layers could include producers such as cement and concrete companies, market operators such as architect/engineering and general contractors, and end users such as developers and asset owners.

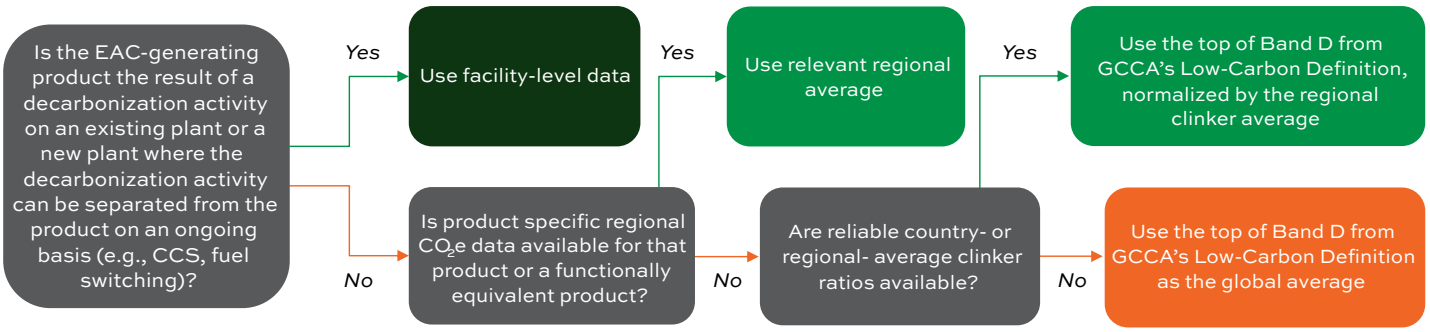
7. Accounting Baseline

The EAC baseline represents the emissions intensity of the product that was most likely displaced by the EAC-generating product. The emissions intensity of the EAC-generating product is compared to the baseline, and the EAC purchasing company uses the impact difference to adjust inventory emissions intensity for sustainability reporting.

The principal use of the baseline is for the enhanced substitution accounting approach, as outlined by the AIM QAR. For this accounting method, the baseline is the critical component to reflect the actual impact on the atmosphere, particularly when there is a fundamental or inherent difference in the displaced activity and inventory activity of the EAC purchasing company.

When selecting the appropriate baseline, EAC issuers should adhere to the flow chart described in Exhibit 3 below and outlined in sections 7.1 and 7.2. For existing facilities, primary data on product EPDs prior to an intervention should be prioritized. When the decarbonization impact of a solution can be assessed continuously, such as the case with CCUS technologies, the product-specific EPD without the implementation of the decarbonization solution should also be used. For new facilities, local benchmarks matching the EAC-generating product should be used when available. In the absence of a credible and granular local benchmark, a conservative baseline from GCCA may be used.

Exhibit 3: Baseline selection decision process



Source: GMA and RMI

7.1 Baseline selection for existing facilities and products

If the EAC-generating product is the result of a decarbonization activity on an existing plant, the baseline shall be the emissions intensity of the equivalent product prior to the decarbonization intervention. If the intervention results in a fundamental change to the emissions accounting and can no longer determine the alternative emissions intensity without the impacts of the intervention on an ongoing basis, the baseline shall be the EPD prior to the intervention until that EPD has expired, to be no greater than 5 years. After expiry, the baseline should be the lesser of the prior EPD or the market average determined in 7.2.

If the update to an existing facility results in a product that was not produced at the facility prior, the baseline GWP should be a weighted average of all products that are functionally equivalent, defined by the criteria of section 6.1. If the data for a weighted average is unavailable, use the lowest GWP of all the equivalent products being replaced by the new production.

If the impacts of a decarbonization activity can be separated from the product emissions intensity on a recurring basis after the intervention, (e.g., CCUS), the product emissions intensity excluding the solution impact shall be used as the baseline.

The baseline emissions intensity must be calculated according to the same PCR methodology as the EAC. Baseline assumptions and calculations should be validated by a third party.

For a facility that has been retrofit and produces a material with the same functional unit as prior to the intervention, the most likely displaced baseline to the EAC-generating product will be from that same facility. This is the most locally specific baseline possible.

Using the facility level baseline has limitations, however, as facilities often make incremental efficiency and decarbonization upgrades over time. If the pre-intervention emissions intensity was used in perpetuity without a way to recalibrate, the facility may have reduced its average intensity over time anyways, potentially overstating the impact to the atmosphere by using the pre-intervention EPD. As such, these facilities must transition to use the baseline approach consistent with new facilities after the pre-intervention EPD expiration.

Example – CCUS on existing facility

A facility produces CEM I cement with a GWP of 850 kgCO_2e/ton of cement. The facility develops a CCUS project that can capture and store 95% of direct emissions, resulting in a GWP for the same product of 90 kgCO_2e/ton of cement. Because this facility can track, on a recurring basis, the captured and stored emissions and separate those from the emissions intensity that would have occurred in the absence of the CCUS system, the baseline of 850 kgCO_2e/ton of cement may be used.

7.2 Baseline selection for new facilities or products

If the product is manufactured at a new facility that did not previously produce an equivalent product, the baseline shall be representative of similar products for the local market.

The characteristics of the baseline should match as closely as possible to the EAC-generating product, based on available facility or market data. The baseline should match across all of the following criteria:

	Guidance	Criteria
Product type	Match by functional unit and product type if possible. If a direct match to a single product type is not possible, select the product type with the lowest GWP that is available within the production region of the EAC issuer to avoid potential overestimation of impact.	*Concrete:* ready-mix, precast – masonry, precast – other *Cement*: defined by relevant specification (e.g., Type I-IV, GU, MS, HE, MH, LH, HS, CEM I-III) *Clinker*: NA
Compressive strength	Match by compressive strength class (28- or 56-day), consistent with the approach in Section 7.1.	*Concrete:* The maximum compressive strength of the baseline product should be within ±1,000 psi (±5 MPa) of the EAC-associated product. *Cement*: The minimum 28-day compressive strength of the baseline product must be equal to or exceed the minimum 28-day compressive strength of the EAC-associated product. If a 28-day compressive strength is not specified in the appropriate specification for either product (i.e., ASTM C150), 7-day compressive strength may be used for comparison. *Clinker*: NA
Production region	Match by relevant geographic scope of production and market availability.	***Examples: local, regional, national, supranational (e.g., EU)***

If the EAC-generating product can be categorized across multiple product types, the baseline should be the weighted average GWP. If data to calculate the weighted average is unavailable, the baseline should be the lowest average GWP of the equivalent products.

A locally available benchmark matching the product should be the prioritized baseline when available. Appendix 9.5 outlines the approved baselines available as of November 2025 and will be maintained and periodically updated as new benchmark studies are published.

If using a market average baseline, the baseline must be updated in line with new publication of the benchmark. Data year of average baseline should reflect the most recent publication and be within approximately five years of EAC issuance. The market average must also be calculated according to the same PCR methodology or boundaries as the EAC.

If the impacts of a decarbonization activity can be separated from the product emissions intensity on a recurring basis after the intervention, (e.g., CCUS), the product emissions intensity excluding the solution impact shall be used as the baseline.

For geographies and products outside of those listed in Appendix 9.5, EAC-issuers must use the top of the country-level GCCA Low Carbon Rating band 'D,' matching product strength and type, as the EAC baseline. If a county-level GCCA rating is unavailable, the EAC-issuer may use the global GCCA Low Carbon Rating band 'D' as the baseline for the matching product strength and type.

While the matching criteria are not comprehensive of all product characteristics for the cement and concrete industry, they represent the most influential indicators for average emissions intensity and are, therefore, sufficient to serve as proxy for the EAC product baseline.

Regional market averages are often already used by companies for their inventory accounting. Using these figures ensures a consistent and straightforward approach across EAC-issuers that limits the potential for significant gaming or subjectivity.

In the absence of third-party published benchmarks, the GCCA Low Carbon Rating provides another consistent and simplified option. Given the global applicability and potential for regions to be above or below the assumed average, band 'D' provides a more credible estimate for the displaced products to ensure impact of the EAC is not over-represented. While GCCA's Low Carbon Ratings require countries to adopt a country-specific clinker-to-cement ratio (CCR), as of January 2026, Germany is the only country to have adopted a CCR applicable to the rating scheme. In the absence of country-adopted CCR's, EAC generators may leverage the clinker-ratios defined in GCCA's "GCCA in Numbers" (GNR) resource for countries with greater than 50% coverage (see more in Appendix 9.3).

Example – New facility producing a novel cement

A novel cement producer builds a new facility in the United States. The product conforms to the C1157 certification and could replace several kinds of cements as defined by the American Cement Association (Type I, Type IL, Blended). ACA does not publish figures on the relative market share of products for each cement type. Therefore, the novel cement producer should use the product type with the lowest GWP average, which in this case is that of the blended cement. As such, the novel cement should use the ACA blended cement benchmark of 739 kgCO_2e/ton of cement as the baseline.

8. Physical Recipients of Products with Sold EACs

The book and claim chain of custody model is predicated on the product being used by the "physical recipient." Safeguards and transparent guidelines are required to reduce potential for double counting or greenwashing claims. If multiple stakeholders at any layer of the value chain make claims toward the reduced GWP of the product, the credibility of the entire system and chain of custody model could be jeopardized and diminished.

8.1 Avoidance of double counting emissions impact

Purchasers of the physical product that has decoupled its environmental attribute may not make any quantitative claim to the GWP or low-carbon nature of the product. This includes, but is not limited to, GHG inventory accounting, whole building LCAs, LEED certification, and corporate communications.

Physical recipients, may, however, make qualitative statements about the use of the products and experience with the supplier (consistent with any contractual disclosure and confidentiality agreements).

When the environmental attribute is separated from the product, the product can no longer be claimed as having the low-carbon GWP. This extends to all uses of the GWP, as the right to those claims are held by the EAC purchaser. This requirement limits double counting of the GWP and increases the credibility of the system.

Some products that will engage in the EAC market may not be readily available or known by the market today. There will be market education and awareness needed to increase adoption. As such, it is important for these physical recipients to be able to communicate about their experiences and learnings using these products — promoting their (hopefully) successful deployment. The physical recipients could publicize their use of products from a specific supplier, and proclaim the use of "sustainable" products, for example, without claiming any specific emissions impact.

This guidance may be updated based on the outcomes from the ongoing GHGP revisions, including key findings from the AMI technical working group.

8.2 Treatment of EPD and emissions intensity for inventory accounting of physical recipient

The EAC producer must provide the physical recipient with a baseline value to use for inventory accounting that does not include the low-carbon product. The baseline provided to the physical recipient should match that provided to the EAC purchaser, as described in Section 7.

The baseline emissions intensity should be integrated into the EPD disclosure process directly, through the existing "notes" section or future updates to relevant PCRs to enable book and claim disclosures, and indirectly, with an additional "cover page" that accompanies the EPD or digital tracking in the EPD database to flag the sale of the EAC.

EPDs are a critical tool for tracking emissions and promoting transparency and comparability of environmental impacts. PCRs were, understandably, not designed with book and claim models in mind and, therefore, additional guardrails must be added to reduce pathways for double counting. With the increased adoption of book and claim, program operators should consider integrating components into the EPD that showcase the status of the environmental attribute.

In the absence of this broader integration with PCR, additional measures are needed when an EPD is provided to the physical recipient. The above suggestions are not comprehensive of all possible methods to reduce double counting, and stakeholders across the market should work to identify the best ways to drive credibility and transparency.

9. Appendices

Appendix A: Glossary

Below are terms commonly used within book and claim design, as well as the cement and concrete industry. While not exhaustive, this resource aims to bridge any gaps in terminology.

Term	Definition
Book and claim	Chain of custody model in which the administrative record flow is not necessarily connected to the physical flow of material or product throughout the supply chain. Book and claim decouples environmental attributes from the physical products or services that would ordinarily directly carry those attributes, creating a separate certificate (see EAC) that allows buyers to financially support the decarbonization of the associated industry and claim its benefits. *Source: Adapted from RMI and Microsoft's report* Structuring Demand for Lower-Carbon Materials *and ISO 22095-3:2026*
Certification	Official documentation proving that a person, product, project, or attribute has met a particular standard. *Source: Adapted from RMI and Microsoft's report* Structuring Demand for Lower-Carbon Materials
Clinker	A pebble-like substance produced when raw materials (limestone, clay, and sand) are quarried, ground up, combined with other materials (shale, iron ore), preheated, and then fired in a kiln to 1,500°C. A majority of the emissions associated with concrete are due to the process and combustion emissions from clinker production. *Source: Adapted from GCCA's "Policy Document on Blended Cements and Supplementary Cementitious Materials"*
Clinker ratio	The proportion of clinker in the final cement product. It is typically expressed as a percentage by mass. A lower clinker ratio indicates that a greater share of the cement is composed of filler or supplementary cementitious materials (SCMs), such as calcined clay, which generally have lower associated carbon emissions. Reducing the clinker ratio is a key decarbonization strategy for the cement and concrete sector. *Source: Adapted from GCCA's "Policy Document on Blended Cements and Supplementary Cementitious Materials"*

Double counting	The erroneous, duplicate, or improper accounting of emissions reductions arising from three main scenarios: duplicate creation of certificates for the same solution, multiple parties claiming the same certificates [at the same layer of the value chain], and repeated utilization of a single certificate by the same party for multiple purposes. *Source: Adapted from SBTi*
Double issuance	When more than one certificate or claim is created for the same environmental benefit in a book and claim system, allowing it to be sold or claimed multiple times. This undermines credibility and must be prevented through robust safeguards. *Source: Adapted from AIM Platform Quality, Accounting, and Reporting*
EAC (environmental attribute certificate)	A certificate representing the environmental attributes (including carbon intensity, GHG emissions reductions, and other sustainability characteristics that substantiate a claim) associated with a given quantity of lower-carbon product (e.g., ton of cement). This is also commonly referred to as a book and claim unit (BCU), credit, or token. *Source: Adapted from SBTi*
Emissions intensity	The quantity of greenhouse gas (GHG) emissions associated with producing a specific unit of product, typically expressed in terms such as kilograms of CO_2 equivalent ($kgCO_2e$) per ton of cement or per cubic meter of concrete. It provides a measure of the carbon footprint relative to the amount of material produced and is commonly used to evaluate and compare the environmental performance of different products or production methods. Note that on an Environmental Product Declaration (see EPD), emissions intensity is reported under the term "Global Warming Potential (GWP)," typically expressed in $kgCO_2e$ per mass or volume of product. *Source: Adapted from SBTi*
Enhanced substitution approach	An emissions accounting approach that calculates emissions reductions based on the difference in emissions intensity per functional unit between the low-carbon product represented by the EAC and the most likely alternative that would have been used in its absence. This approach attributes only the marginal emissions benefit of the lower-carbon option, rather than substituting its full emissions intensity into the purchaser's inventory. *Source: Adapted from AIM Platform Quality, Accounting, and Reporting*

EPD (Environmental Product Declaration)	A third-party verified report displaying the results of a life-cycle assessment for a specific product or group of products. Typically includes the environmental impact of the product's value chain from material extraction through manufacturing, usage, and end of life. *Source: Adapted from RMI and Microsoft's report* Structuring Demand for Lower-Carbon Materials
Functional unit	The unit in which the environmental attribute certificate is measured and denominated (e.g., clinker, cement or concrete).
GCCA (Global Cement and Concrete Association)	An international organization representing the cement and concrete industry. GCCA works with members to share knowledge, drive sustainability initiatives, and support industry standards worldwide. *Source: Global Cement and Concrete Association*
GHGP (Greenhouse Gas Protocol)	A widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas (GHG) emissions. Developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), it provides standards and guidance for measuring and reporting emissions across various sectors. *Source: Greenhouse Gas Protocol*
Intervention	Any action taken by an organization to address its Scope 3 greenhouse gas emissions (i.e., indirect emissions from its value chain), including, for example, monetary support for a discrete decarbonization project and the purchase of an environmental attribute certificate, regardless of the accounting approach implicated. *Source: Adapted from AIM Platform Quality, Accounting, and Reporting*
LCA (life-cycle assessment)	Assessment of environmental impact, particularly emissions, from a product's full life cycle. *Source: Adapted from ISO 14040:2006*
Masonry	Pre-cast blocks of concrete that can be used in structural applications.
Mass balance	Chain of custody model in which materials or products with a set of specified characteristics are mixed according to defined criteria with materials or products without that set of characteristics. Although the physical inputs may be mixed with other materials that do not meet the specific criteria, and cannot be discerned in the final product, certified bookkeeping allows the attribution of sustainability or GHG emission data to the final product in a manner where both the input and output are balanced over a specified period of time. *Source: Adapted from ISEAL Chain of Custody Guidance and ISO 22095-2:2026*

PCR (product category rule)	A rule that dictates how to perform an LCA for a specific product category and how to summarize the results in an EPD. PCRs are created, published, and updated by program operators (e.g., SmartEPD, NSF, EPD international, SCS Global Services, UL solutions, and others). *Source: ISO 14050:2020*
Precast	A concrete product that is mixed and cast into a mold at a production facility then delivered to a construction site. Precast products typically have a higher degree of quality control due to mixing and pouring at the same facility but traditionally include a higher cement content due to rapid production and stripping of formwork. *Source: ISO 22966:2009*
Ready-mix	A concrete product that is pre-mixed according to a specific mix design and then typically delivered to a work site to pour in place. *Source: ISO 22965-1:2007*
Registry	A trusted digital platform that ensures environmental attribute certificates (see EACs) meet standards or certification criteria and are accounted for appropriately by transparently recording certificate generation and retirement. *Source: Adapted from AIM Platform Quality, Accounting, and Reporting*
Regulatory surplus	Outcomes (i.e., emissions benefits) that go beyond what is required by law. *Source: Adapted from AIM Platform Quality, Accounting, and Reporting*
SBTi (Science Based Targets Initiative)	A global partnership that helps companies set greenhouse gas emissions reduction targets aligned with climate science. It is supported by the World Resources Institute (WRI), the World Business Council for Sustainable Development (WBCSD), and CDP, among others. SBTi provides guidelines to encourage businesses to commit to targets that contribute to limiting global warming to 1.5°C or 2°C. *Source: Adapted from Science Based Targets Initiative*
SCM (supplementary cementitious materials)	Materials that are used in blended cements to replace some or all the cement and therefore lower the emissions intensity. Traditional SCMs: fly ash, ground granulated blast-furnace slag Newer and novel SCMs: ground glass pozzolan, calcined clay, other types of fly ash (bottom ash, beneficiated ponded ash), natural pozzolans *Source: Adapted from GCCA's "Policy Document on Blended Cements and Supplementary Cementitious Materials"*

Scope 1, Scope 2, Scope 3	Scope 1: Direct emissions that occur from sources controlled or owned by an organization. Scope 2: Indirect GHG emissions associated with the purchase of electricity, heat, steam, or cooling. Scope 3: Indirect GHG emissions associated with a company's upstream or downstream activities across the value chain. *Source: Adapted from Greenhouse Gas Protocol*
Value chain	The full range of activities — including design, production, marketing, distribution, and use — linked to a particular business. In the case of cement and concrete, the value chain includes raw materials quarrying, energy supply, production and use, design, construction, buildings use, and end of life. *Source: Adapted from AIM Platform Quality, Accounting, and Reporting*

Appendix B: Documentation demonstrating utilization

	Purpose/Function	Unit	Who Uses It	When Used	Region
Bill of Lading	Legal shipping document, receipt, contract, title of goods	Cement and Concrete	Shipper, Carrier, Buyer	During shipment and delivery	US / EU
Delivery Ticket	Confirms delivery details and receipt of specific concrete batch	Concrete	Supplier, Customer	At delivery to job site	US / EU
Invoice	Requests payment for goods delivered	Cement and Concrete	Supplier, Customer	After delivery	US / EU
Declaration of Performance (DoP)	Required in the EU for cement and concrete under the Construction Products Regulation; typically issued when the product leaves the plant	Cement and Concrete	Manufacturer	During shipment and delivery	EU

Appendix C: GCCA cement band threshold for example countries (January 2026)

Note, these values are published as of January 2026 and must be updated on a recurring basis. Baseline selection must be updated in accordance with section 7.2 when new data becomes available and normalized to the applicable regional PCR. Additional guidance from GCCA would be needed to provide clarity on how to normalize for specific regions (e.g., gross vs net waste accounting).

Country	Clinker-to-cement ratio (CCR)	CCR source	Cement intensity by rating band (kg CO_2e / ton cement)	
			C band	B band
Global	**0.75**	**GNR – global**	**312-415**	**209-311**
Argentina	0.705	GNR – country-specific	301-400	201-300
Austria	0.689	GNR – country-specific	297-394	198-296
Brazil	0.71	GNR – country-specific	302-401	202-301
Canada	0.832	GNR – country-specific	333-443	222-332
Colombia	0.691	GNR – country-specific	297-395	198-296
Czechia	0.735	GNR – country-specific	308-410	206-307
Egypt	0.718	GNR – country-specific	304-404	202-302
France	0.768	GNR – country-specific	317-421	212-316
Germany	0.706	Country-designated	301-400	201-300
India	0.713	GNR – country-specific	303-402	202-302
Italy	0.745	GNR – country-specific	311-413	208-310
Philippines	0.702	GNR – country-specific	300-399	200-299
Poland	0.731	GNR – country-specific	307-409	205-306
Spain	0.782	GNR – country-specific	320-426	213-319
United Kingdom	0.863	GNR – country-specific GNR	341-453	228-340
United States	0.858	GNR – country-specific GNR	340-452	227-339

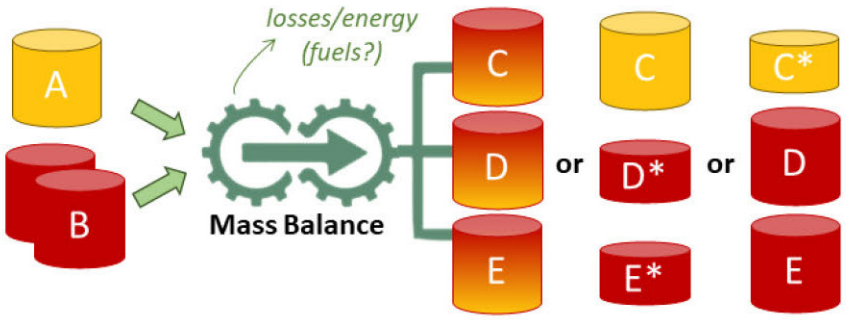
An equivalent table for the concrete threshold bands is under development; users should consult GCCA for further guidance in the meantime.

Appendix D: Comparing chain of custody models; mass balance versus book and claim

A mass balance chain of custody model allows low-carbon materials to be physically mixed with conventional materials during production or distribution. Even though these materials are combined, the quantity of inputs with specified characteristics is tracked through the system. The total amount of these inputs documented as entering the system must equal the total amount allocated to outputs, accounting for any process losses. In mass balance models, the inputs can either be proportionally allocated across all product outputs equally, or concentrated non-proportionally to a subsection of output. There has been significant debate within the environmental community about the merits and consequences of non-proportional balance, with some stakeholders taking more strict perspectives than what guidance allows for.

The landscape for mass balance standards has also been evolving. As of November 2025, ISO is finalizing a standard on chain of custody models including mass balance. The final publication is likely to come in 2026.

Exhibit A1: Mass balance model



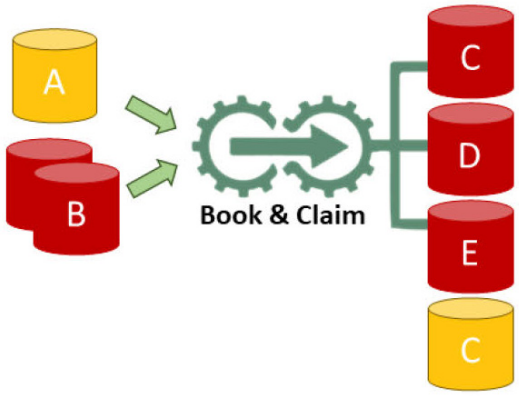
Source: NIST, *An Assessment of Mass Balance Accounting Methods for Polymers Workshop Report*

Description: The diagram illustrates how low-carbon and conventional inputs are physically mixed and accounted for using a mass balance approach. Inputs A (low-carbon) and B (conventional) enter a shared production system, where they are combined along with associated losses and energy or fuel use. Because the materials are mixed, the resulting outputs are physically indistinguishable. Two alternative mass balance accounting outcomes are shown. In the first case (C, D, and E), the emissions reduction associated with the low-carbon input is averaged across all outputs, resulting in each product carrying a proportional, partial reduction. In the second case (C, D, and E*), the same total emissions reduction is fully allocated to selected products (C), while other products receive no reduction at all (D* and E*). Although the accounting treatment differs, the physical products remain mixed and indistinguishable in both cases.*

By contrast, a book and claim system fully decouples the environmental attribute from the physical product. The environmental benefit is issued as a separate tradable unit (i.e., an EAC or certificate) that can be transferred independently of the physical product flow. The physical material can still be tracked for assurance or verification purposes, but the environmental attribute is no longer tied to the product itself.

This decoupling enables greater flexibility in how and where claims are made but also requires robust safeguards to ensure credibility and prevent double counting. While both book and claim and mass balance chain of custody models have merit, book and claim is particularly well suited to the cement and concrete sector at this stage of decarbonization. The industry is characterized by a complex and fragmented value chain, limited availability of low-carbon production, and geographic constraints that make it difficult for buyers to directly procure low-carbon materials. A book and claim system overcomes these barriers by allowing stakeholders anywhere in the value chain to credibly support and claim the use of low-carbon cement and concrete, even if the physical materials cannot be directly procured. This makes book and claim a practical and powerful tool to channel early demand and investment toward emerging decarbonization solutions in the sector.

Exhibit A2: Book and claim model



Source: NIST, *An Assessment of Mass Balance Accounting Methods for Polymers Workshop Report*

Description: Book and claim separates the physical product flows from environmental attributes, allowing emissions reductions from low-carbon inputs to be claimed independently of the physical products delivered.

Appendix E: Regional baseline emissions sources and intensities

	Approved baseline sources and values
Clinker	
Country	*Source*: Global Cement and Concrete Association *Product types: GWP — vary by region— see GNR2.0, or latest version, and ensure the country has ≥50% estimated coverage to leverage the average GWP per ton of clinker.*
Cement	
United States	*Source*: American Cement Association *Product types: GWP* Portland Cement: 919 kg CO_2e per ton cement Portland Limestone Cement: 844 kg CO_2e per ton cement Blended Hydraulic Cement: 739 kg CO_2e per ton cement
Europe	Source: Cembureau *Product types: GWP* CEM I: 803 kg CO_2e per ton cement CEM II:683 kg CO_2e per ton cement CEM III: 442 kg CO_2e per ton cement
Concrete	
United States	Source: National Ready Mix Concrete Association (NRMCA) *Product types: GWP — vary by strength and region — see most recent report for GWP values.*

Appendix F: Additional resources

- **Greenhouse Gas Protocol**, Corporate Value Chain (Scope 3) Accounting and Reporting Standard
- **Science-based Targets initiative**, Corporate Net-Zero Standard
- **Advanced and Indirect Mitigation Platform**, Intervention Quality, Accounting, and Reporting Standard
- **Book & Claim Community**, Principles and Best Practices for Book and Claim Systems in Heavy Transport
- **RMI**, Structuring Demand for Lower-Carbon Materials
- **U.S. Department of Energy**, Pathways to Commercial Liftoff: Low-Carbon Cement

Framework Statements of Support

Despite growing corporate ambition and investment in Scope 3 climate targets, most value chains remain opaque, and practical guidance for action is still limited. These challenges are especially acute in complex materials sectors like cement and concrete, where physical procurement for low-carbon products is constrained. This book and claim framework provides additional guardrails for high-integrity environmental attributes, expanding upon the AIM Standard to provide sector-specific guidance to the industry. The framework will support companies in allocating resources towards real-world, verifiable, catalytic emissions benefits to cement and concrete value chains.

- AIM Platform

"As a buyer with a complex, global value chain, we see book and claim systems like the one developed by GMA and RMI as essential to decarbonizing our cement and concrete inventory. Working alongside industry peers to support its development underscores the collective value of this framework. It provides the credibility needed to ensure that our investments are tied to real, measurable emissions reductions while helping unlock the signals necessary to scale lower carbon cement and concrete solutions."

- Chris Atkins, Director, Worldwide Operations Sustainability, Amazon

"Book-and-claim is a proven framework for unlocking scalable, credible markets for sustainable materials. With demand already there, tools like book-and-claim give innovators like Brimstone a faster path to help customers lower emissions, deploy materials in infrastructure projects at scale, and drive the industry forward"

- Adam DiNardo, Head of Strategy & Business Development, Brimstone

Fortera is enthusiastic about the implementation of the Book and Claim framework for low-carbon cement and concrete, having worked alongside industry leaders to shape the approach through an initiative convened by the Center for Green Market Activation and the RMI. This framework establishes verifiable demand for high-impact solutions like our low-carbon ReAct® cement products, connecting end users pursuing ambitious climate commitments with our regional production, while maintaining the traceability and integrity essential to credible climate action, and driving the investment needed to support deployment and ensure wide availability.

- Fortera Global

"We support the Concrete Book and Claim Framework as a important step toward creating actionable, low-carbon solutions for the construction industry. This type of cross-industry collaboration is essential for advancing innovation and transforming high-impact sectors like construction through novel market instruments."

-Noah Goldstein, PhD, Google Sustainable Data Center Construction Lead

"Robust, transparent industry standards and frameworks are crucial for new market mechanisms such as Book and Claim to help to connect buyers and producers of low-carbon cement and concrete. We look forward to further contribute to the development of such important frameworks as an important tool to support the implementation of breakthrough technologies like CCS and to enable the sector's transition towards net-zero."

- Christian Artelt, Senior Manager Sustainable Construction & Public Affairs, Heidelberg Materials

"Holcim welcomes the intent of the book-and-claim framework developed by GMA and RMI for the cement and concrete sector, which aims to help channel investment toward further decarbonization efforts. Holcim's strategy remains focused on scaling its sustainable offering to meet customer demand and delivering tangible emissions reductions, including through deep decarbonization action and the deployment of breakthrough technologies. Holcim will continue to follow and engage in discussions around the framework's evolution, with a focus on credibility, integrity, and transparency."

- Holcim

Scaling production of novel low-carbon materials like Sublime Cement® requires bankable offtake agreements to attract investors long before reaching FID for new facilities. An innovative book and claim model and framework developed by RMI and GMA makes this possible. Their tireless work convening the entire concrete value chain has resulted in a framework that will make cement EACs verifiable, trusted, and capable of reducing corporate supply chain emissions while accelerating the scale-up of manufacturers who are here to meet that need.

- Cory Waltrip, Director, Business Development & Strategy, Sublime Systems