REPORT

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MARKET INSTRUMENTS EXPLAINED

Market instruments for corporate climate accounting

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Market instruments explained

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Executive summary

Market-based instruments (MBIs) are becoming increasingly important in corporate climate strategies. The term covers a diverse set of tools, including commodity certificates, energy attribute certificates and contractual purchasing arrangements, that use market and pricing mechanisms to help companies address climate-related challenges. In some cases, these instruments may help channel finance to lower-emissions production, create demand signals for key sectoral transitions and enable companies to account for interventions that are difficult to recognise through conventional physical inventories alone.

However, the potential value of these instruments depends fundamentally on how they are designed, governed and used. Without robust guardrails, they risk creating misleading impressions of progress, weakening incentives for direct value chain decarbonisation and supporting incremental measures that delay the deployment of genuinely transformative technologies.

The critical question is therefore not whether MBIs should be accepted in principle, but under what conditions they can credibly contribute to real-world decarbonisation.

This briefing brings together the findings from a series of blog posts examining the role of MBIs in corporate greenhouse gas (GHG) accounting. By unpacking the advantages and risks of different mechanisms and breaking down overgeneralised terminology, it aims to bring more nuance to often polarised debates on the role of MBIs in corporate GHG inventories and target-setting frameworks.

Key takeaways

- → **The nuances matter to avoid polarised debates:** Discussions on the eligibility and conditions for using market-based instruments must consider the differences between approaches and cannot be generalised. For example, debates about whether 'credit mass balance' or 'book-and-claim' should be included in any particularly GHG reporting statement or target-setting approach are likely to become polarised and lead to poor outcomes, since these umbrella terms refer to a family of very different approaches.
- → **The ISO categorisations of mass balance do not provide sufficient nuance:** The two types of mass balance outlined by ISO 22095-2:2026, the 'rolling average percentage method' and the 'credit mass balance model', remain umbrella terms that could include a very wide number of different approaches.
- → **Book-and-claim has a legitimate role, but its credibility depends on why it is being used:** Book-and-claim is not simply a weaker version of mass balance; it

serves a distinct function where physical traceability is infeasible or where low-carbon technologies are not yet physically accessible to buyers. Positioning it as inherently less credible because it lacks physical connectivity overlooks its distinct role and could legitimise weaker mass balance approaches. The credibility of book-and-claim depends on why it is being used. Different use cases, such as addressing traceability constraints or supporting the scale-up of emerging technologies, may require different rules and safeguards. Without this differentiation, book-and-claim can mislead stakeholders about progress, reduce incentives for direct supply chain transformation and create serious risks of double counting and misattribution

→ **Robust governance and controlled application matters for scaling up the use of MBIs**. While MBIs may offer promising potential to address legitimate challenges in some parts of the economy, their governance is inherently complex. The more these systems expand across different commodities, technologies and use cases, the harder it becomes to ensure consistent rules, robust oversight and credible claims. There is a risk of becoming overly optimistic about their theoretical potential without sufficient attention to the practical difficulties of governing them at scale.

→ **MBIs can be highly relevant for non-GHG transition indicators:** Non-GHG transition indicators provide more tangible and decision-useful ways of assessing whether companies are progressing on the real sectoral transitions required for net zero. While much of the debate focuses on how MBIs could be used within companies' GHG inventories, market instruments can also be integrated into non-GHG transition indicators, and this may be a more transparent way to use some instruments (see Figure 3, Chapter 4).

Recommendations

→ **The GHG Protocol is well placed to develop a standardised framework for sufficiently nuanced terminology.** To determine the appropriate use of mass balance in GHG accounting, standard setters need to use more specific terminology that differentiates between distinct system design options. GHG Protocol Action and Market Instruments working group could provide a standardised framework for more specific terminology on various MBI approaches and principles for their use.

→ **The GHG Protocol, SBTi and ISO should root the rules for using different MBIs in specific contexts.** The credibility of using MBIs depends heavily on the use case and context. For book-and-claim in particular, different use cases may require different safeguards to substantiate that rationale. This may be better determined through sector-level guidance. This inevitably requires prioritisation and recognition that market-based instruments can only be effectively governed

for a handful of the most important use cases initially, rather than across hundreds of commodities and emission sources.

→ **The GHG Protocol, SBTi and ISO should define a narrow set of applications for a controlled scale-up of MBIs.** The trade-offs between potential benefits and integrity risks need to be assessed carefully. Rather than opening the door to a proliferation of certification schemes across a wide range of commodities, a more controlled approach may be to begin with a narrowly defined set of applications that are most relevant for real-economy decarbonisation and where the case for impact is strongest. A more selective approach would make it easier to develop appropriate guardrails, test governance arrangements and avoid creating a fragmented landscape of claims that cannot be effectively overseen.

→ **The GHG Protocol has a critical role to standardise and mainstream the use of non-GHG transition indicators, including the use of MBIs.** In a multi-statement GHG report (see Chapter 4), non-GHG transition indicators should be prioritised as a mandatory reporting element alongside the physical inventory. Arguments that non-GHG indicators lie outside the GHG Protocol's scope reflect a narrow and outdated view of its purpose. Given the limitations of traditional GHG inventories in capturing the full climate impact of corporate actions, expanding the framework to include transition indicators represents a necessary evolution to fulfil its purpose rather than a departure. While transition indicators are inherently sector-specific, the GHG Protocol has a critical role to play in supporting their consistent application. This could include: a) defining standardised indicators for key cross-sector commodities (e.g. electricity, major industrial materials); b) establishing criteria for identifying and reporting sector-specific indicators, including thresholds for when companies must disclose them; and c) providing guidance on the appropriate use of market instruments within these indicators.

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Abbreviations

AIM	Advanced and Indirect Mitigation Platform
AMI	Actions and Market Instruments (GHG Protocol workstream)
CO_2	Carbon dioxide
DRI	Direct Reduced Iron
EU	European Union
GHG	Greenhouse Gas
H2DRI	Hydrogen Direct Reduced Iron
ISO	International Organization for Standardization
MBI	Market-Based Instrument
PPA	Power Purchase Agreement
RECs	Renewable Energy Certificates
SAF	Sustainable Aviation Fuel
SBTi	Science Based Targets initiative
SMF	Sustainable Maritime Fuel
TCAT	Task Force for Corporate Action Transparency
TPT	Transition Plan Taskforce
VCI	Value Change Initiative

1 Promises and risks of market-based instruments

The corporate accountability landscape has changed significantly since the first voluntary corporate greenhouse gas (GHG) emissions and target-setting standards emerged more than 10 years ago. Today, many large public companies regularly estimate their GHG emissions footprint and have set emissions reduction targets. A select number of companies have even made significant progress toward reducing their operational GHG emissions or have implemented some more easily accessible decarbonisation measures to address supply chain emissions.

Yet despite this evolution, major challenges remain. Progress on reducing supply chain emissions and implementing key sectoral transition measures is slow, as companies face roadblocks in sourcing low-carbon commodities and materials. Companies also report difficulties in claiming the emissions reductions associated with activities that occur beyond their value chain.

These challenges point to a deeper issue: current approaches to emissions accounting do not capture the full climate impact, be it positive and negative, of companies' climate mitigation measures. This can create a gap between reported emissions and actual decarbonisation outcomes, potentially weakening companies' incentives to decarbonise.

In response, companies are increasingly turning to market instruments, such as green steel certificates, to both decarbonise their supply chains and receive recognition for their efforts.

But can these instruments deliver real-world, system-level decarbonisation, especially in harder-to-abate sectors? Or do they risk creating the impression of progress without driving the structural changes needed? And what guardrails are needed to ensure that their growing use leads to genuine transformation instead of locking in technologies that are not future proof?

These questions are becoming more relevant as the Greenhouse Gas Protocol (GHG Protocol) develops new guidance on the use of market instruments. A draft of this guidance is expected to be published for public consultation in late 2027.

In this briefing we offer an overview of market instruments examining their potential value and their risks. Our insights are based not only in emerging literature but also drawing on interviews we conducted with key company representatives, civil society organisations and various supply chain decarbonisation experts across the steel, agrifood and freight sectors.

What are market instruments?

Market instruments have a long history in corporate climate accountability. While the term covers a diverse set of tools, they share a common approach: utilising market and pricing mechanisms to address corporate climate challenges.

Well-known market instruments include commodity certificates, long-term offtake agreements and energy attribute certificates. Certain instruments are already widely used, such as renewable electricity certificates (RECs), which the GHG Protocol already allows for scope 2 market-based emissions reporting, and sustainable aviation fuel (SAF) certificates. Some companies have also begun claiming emissions reductions from market instruments in their scope 3 inventories, pointing to the need for clearer guidance and a common approach for all companies.

While some argue that market instruments can help companies demonstrate progress towards sectoral emissions-reduction pathways and accelerate decarbonisation at scale, existing market instruments such as RECs and voluntary carbon credits have a mixed track record.

Research has shown that RECs often do not drive the installation of additional renewable electricity capacity and therefore may have limited impact on emissions reductions in certain regions. Similarly, the voluntary carbon market has faced systemic integrity issues and also cannot replace real emissions reductions in company value chains. For these reasons, a previous proposal by the Voluntary Carbon Markets Initiative to integrate voluntary carbon credits into target-setting frameworks faced significant pushback. There is also a risk that integrating any form of market instrument into emissions reporting may ultimately discourage direct value chain decarbonisation.

The issue has now moved to the forefront of corporate climate discussions. In particular, the GHG Protocol has set up an Action and Market Instruments working group (AMI Group) which will provide guidance on how companies can 'completely and transparently report on impacts of actions and market instruments in a credible manner within a corporate GHG report.'

Why companies want to integrate market instruments into scope 1 and 3 emissions inventories

Companies may turn to market instruments for different purposes, and the rationale for integrating them into emissions inventories is often shaped by the specific barriers they face. These barriers may include challenges in supply chain accounting or difficulties in financing or gaining access to low-carbon technologies in those supply chains.

Market instruments can be used to help companies overcome the barriers to accounting for their emissions reduction measures.

Within today's corporate accountability landscape, companies' climate commitments are scrutinised largely through the lens of their emissions reduction targets. This puts pressure on them to reflect all their climate-related efforts in their emissions inventories. However, current accounting approaches, which often rely on industry averages rather than primary supplier data, struggle to capture the impact of lower-carbon procurement practices. While they can be effective at recognising efficiency improvements and fundamental business model changes, they cannot effectively track efforts for low-carbon procurement without primary supplier data or when the effects occur outside a company's direct value chain.

Take the case of a dairy company which has direct relationships with its dairy suppliers. The company may be able to reduce emissions at the farm level, but it is much harder to influence emissions from feed production if it has no direct relationship with feed producers. If the dairy company wanted to adopt more accurate emissions accounting methods, it would need to collect primary data from its suppliers. This could involve significant efforts, which can be expensive due to long and fragmented supply chains. Instead, the company could purchase certificates for lower-emissions commodities traced back to the same region as its supply chain. In this case, market instruments can enable companies to claim mitigation outcomes in sectors where structural barriers limit emissions data traceability.

Market instruments could be used to incentivise the financing of capital-intensive decarbonisation technologies in the value chain.

Companies across sectors, especially those that are not consumer-facing, may lack strong incentives to decarbonise their supply chains. Our analysis highlighted two main incentives for companies: regulatory compliance and the ability to claim emissions reductions in their inventories and towards their emissions reduction targets.

Market instruments could incentivise companies to decarbonise by enabling them to demonstrate progress on key sectoral transitions. This in turn can incentivise producers to implement key decarbonisation measures by enabling them to recoup investment in costly and lengthy technological changes or fund further

decarbonisation. For example, steelmakers may only be able to decarbonise parts of their production processes at a time due to financial and operational constraints. As only part of the plant has been refurbished, the steel sold by the steelmaker may include a mix of lower-emissions and conventional steel, creating a slightly lower-emissions steel. Selling a portion of that steel as 'green' at a premium to interested buyers through market instruments could provide the cash flow necessary to fund the replacement of energy-intensive processes in the future or enable recouping past investments.

Market instruments can be seen as a transition tool when the physical supply of lower emissions commodities or fuels is structurally constrained.

Market instruments could be needed to support technological transitions taking place beyond a company's supply chain. For example, sustainable aviation fuels (SAF) and maritime fuels (SMF) are key decarbonisation measures for the freight sector. However, these fuels are not yet widely available across all airports or ports, as global supply remains limited. Linking the supply of fuels to the demand would require transporting fuels across long distances, leading to additional emissions and costs. In this context, market instruments could help connect demand and supply until sustainable aviation and maritime fuels become more available.

Although logistical constraints may justify the use of market instruments in certain sectors, there remains uncertainty on what criteria should determine which decarbonisation measures qualify for inclusion under market instrument frameworks.

The risks of allowing the use of market instruments without guardrails

Currently, market instruments cannot be counted towards scope 1 and 3 emissions inventories according to the GHG Protocol. The impact of any changes made to these guidelines will depend highly on the right guardrails being in place to reduce a number of associated risks.

Without appropriate guardrails, market instruments may risk rewarding existing practices rather than driving new emissions reductions.

If the rationale for using market instruments is to expand the development and use of breakthrough technologies, it is important that they support further emissions reductions beyond those that occur without them. In the steel industry, for instance, stakeholders reported that steel producers are selling certificates for lower emissions steel based on an increased share of scrap steel. However, the practice of recycling steel as part of production is already common practice and the sale of certificates may not necessarily increase it significantly. While this intervention may lower emissions at the product level, it does not necessarily go beyond 'business as usual' within the sector.

Without appropriate guardrails, meeting the surging demand for lower-emissions products may have unintended consequences.

While a market instrument could support a technology that reduces emissions in a particular sector, its use might cause other unintended risks. For instance, in aviation, almost all SAF on the market today is produced from biomass resources, which are limited in supply. Increased use of SAF in aviation may divert these resources from other sectors that also rely on them for decarbonisation, including the chemicals sector, power generation and land transport. Moreover, their production can also have negative effects on ecosystems and food security by competing for land with agriculture.

Without appropriate guardrails, market instruments could be used to invest in incremental action, potentially delaying system-level change.

Market instruments can support decarbonisation measures with varying levels of ambition in emissions reductions, but some interventions only deliver minor cuts. When companies purchase instruments for such low ambition interventions and make associated claims, they risk misrepresenting their impact and delaying the phase-in of high-ambition solutions. For instance, stakeholders expressed concern that steelmakers might use market instruments to delay the high capital investment needed for key technologies like Hydrogen Direct Reduced Iron (H2DRI) and instead advertise and sell the emissions reduction achieved through recycled steel. While this is a quicker and cheaper solution, it maintains the sector's reliance on fossil fuels. Used this way, market instruments could legitimise incremental progress at the expense of commercialising breakthrough technologies. Establishing minimum technology or decarbonisation requirements for claims made using market instruments could help address this risk.

The need for balancing rigorous emissions accounting with deep decarbonisation

Our analysis shows that the risks associated with market instruments depend heavily on how and why they are used. When these instruments are presented as a way to track climate efforts and demonstrate a physical link to a company's supply chain, it is essential that they do not mislead consumers or buyers about the true emissions footprint of a company's products or operations. Conversely, when companies use these instruments to drive deep decarbonisation in sectors where strong demand signals are essential, their legitimacy hinges on whether the underlying intervention is real, additional and technologically material.

Although market instruments have faced integrity issues in the past, today's debate is more nuanced. Different actors are advocating for rules that align most with the rationales they are prioritising, and some proposals are more rigorous than others. The standards set in the coming years will determine whether market instruments

accelerate system-level decarbonisation or entrench approaches that fall short. Guardrails will be essential to distinguish frameworks capable of driving genuine progress from those that are merely ambitious in their claims.

2 Mass balance: one term, many different approaches

Key takeaways

- → Mass balance is not one method, but many. This accounting approach allows companies to track emissions reductions even when lower- and high-emission materials are physically mixed. However, the term encompasses vastly different methods with different levels of integrity.
- → Integrity depends on design choices. Seven key decisions determine whether mass balance drives genuine transformation or enables misleading claims. In particular, 'stacked attribution' could enable products to falsely appear lower-carbon than they actually are.
- → Standards need to set clearer safeguards. Existing standards remain vague on critical design choices. Without clear guardrails, mass balance risks delaying real decarbonisation rather than supporting the transition.

Decarbonising supply chains does not happen overnight. New low-emissions technologies or practices are often gradually applied to parts of production processes alongside existing production lines. As a result, lower- and higher-emissions materials may end up mixed together and the final product might not be purely 'low-carbon'. This creates a growing challenge for both suppliers and buyers: how should emissions reductions from mixed products be credibly tracked, monetised and counted towards progress?

In many sectors, accelerating demand for lower-emissions products has intensified this challenge. For example, a steel company may invest in a new electric arc furnace that produces steel with lower emissions than a traditional blast furnace. However, it may still feed into the same production line as legacy assets. The lower-emissions steel is physically mixed with conventional steel, rolled into the same sheets and shipped as the same product. Meanwhile, many large automakers are seeking to procure and claim near-zero steel today and are willing to purchase from these transitioning production processes, even if the final products are not technically 'low-carbon' yet.

In response to this challenge, many sectors are looking to mass balance methods for emissions accounting. In this chapter, we explore what mass balance is and show that it is not a single approach, but rather an umbrella term encompassing vastly different methods. We discuss that whether a 'low-carbon' product represents genuine industrial transformation or clever accounting depends heavily on which

features of the mass balance approach are applied. As standard-setting bodies and regulators develop rules for these systems, it is crucial to consider these nuances.

What is mass balance and why is it being used?

Mass balance is a chain-of-custody model that tracks environmental attributes, such as emissions reductions, through supply chains even when physical products are blended. Instead of physically separating sustainable materials from conventional ones – a practice known as segregation – mass balance allows them to be mixed during production. It maintains accounting records to ensure that the qualities of materials entering the production process match those attributed to the final products.

Mass balance is not a new concept. It has a longer history in deforestation-free commodity supply chains, where its use has been highly contested. Critics argue that it may not deliver lower deforestation rates at a system-wide level and can be misleading to consumers. Under the EU Deforestation Regulation update released in April 2026, only certain types of mass balance are permitted to prove non-deforestation claims.

However, proponents of mass balance argue that its use for emissions accounting follows a different theory of change. In the case of deforestation-free sourcing, segregation is often viewed as necessary to exclude deforestation-linked commodities from the market completely. But for emissions accounting, the picture is more nuanced.

Supporters of mass balance typically make two main arguments. The first is a complexity argument: in opaque, global supply chains like agriculture, requiring segregation could be technically complicated and costly, potentially diverting resources away from mitigation efforts.

The second is an economic argument: to justify the 'green premium' needed to fund a technology upgrade, a supplier may need to sell a product with a significant emissions reduction. If the company can only claim the average emissions reductions across all products, the final emissions profile might be only marginally lower than conventional alternatives. This could make it challenging to charge a premium on the product as buyers might not be willing to pay the premium necessary for products with only limited emissions improvements. From this perspective, mass balance can be viewed as a bridge to fully segregated physical supply of lower-emission commodities or fuels.

Whether there is merit to these arguments depends highly on how mass balance accounting is applied in practice.

Mass balance is not a single approach

Although often presented as a singular method, mass balance actually encompasses many accounting approaches, largely based on seven key decisions (see Figure 1). These decisions are not necessarily made sequentially or independently in practice, but they are presented step-by-step here for clarity. The various options across these seven decision points create numerous possible combinations that companies who are implementing mass balance systems could choose between, each with different implications for credibility and rigour (see Table 3 for an explanation of the terms). In the following sections, we zoom into a few key decisions in greater detail, specifically transfer boundaries and attribution, as these play a significant role in determining robustness.

Figure 1: Creating your own Mass Balance model with 7 decisions

The choice of distinct features within a mass balance model shapes its integrity and decarbonisation impact.

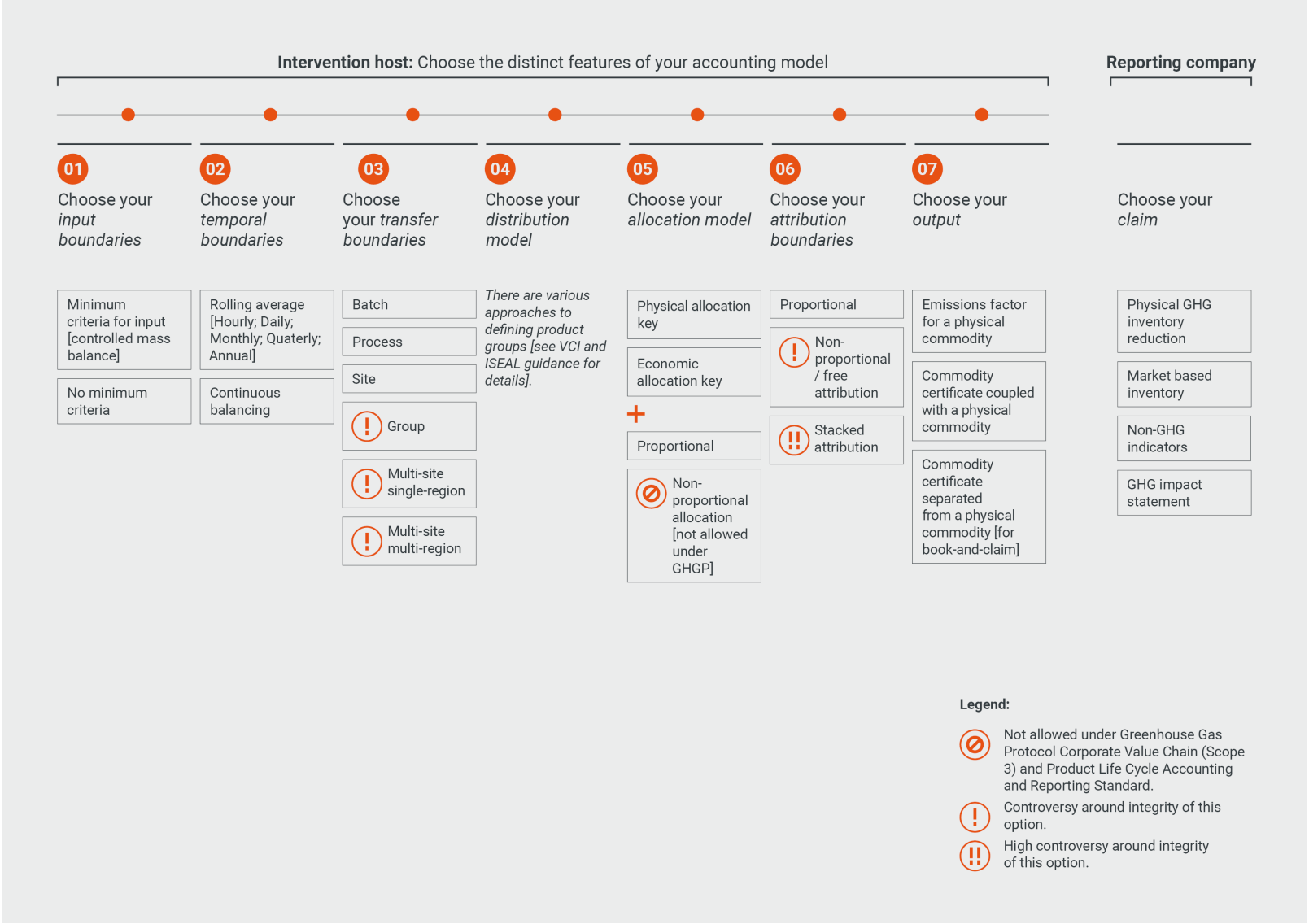


Table 1: Description of terms used in Figure 1

This overview does not propose formal definitions; it reflects a current understanding of the terminology used in the visualisation.

Decision-making level	Decision point	Description	Possible options to choose
Intervention host	**1. Input boundaries**	Refers to whether minimum criteria are required for materials to enter a mass balance system.	• **Minimum criteria ('controlled mass balance')**: Inputs must meet eligibility thresholds (e.g. emissions benchmarks, production standards). • **No minimum criteria ('standard mass balance')**: Any input can enter the accounting pool.
	2. Temporal boundaries	Refers to the time period over which inputs and outputs must be balanced.	• **Rolling average (temporal matching / fixed periods)**: Reconciliation within a defined time window (hourly to annually). • **Continuous balancing**: Attributes assigned only after physical volume enters the system.
	3. Transfer and geographic boundaries	Refers to the operational granularity and spatial scope across which inputs in the system can be mixed.	• **Batch-level**: Discrete, identifiable lots. • **Process-level**: Across production lines or plants. • **Site-level**: Single site. • **Group-level**: Multiple smaller sites with multiple owners. • **Multi-site single region**: Facilities in one region under one owner. • **Multi-site multi-region**: Cross-border/global reconciliation.
	4. Distribution	Refers to how product groups are determined prior to allocation of environmental attributes across those groups.	*There are different approaches to the definition of product groups, which can affect the next decisions on the credibility of allocation and attribution (for more info see guidance by Value Change Initiative and ISEAL).*
	5. Allocation	Refers to how environmental attributes are assigned across product groups derived from the same material. To reflect the causal relationship between the production of outputs and their attributes, an allocation key needs to be chosen. The GHG protocol defines a hierarchy for allocation keys and does not allow non-proportional allocation.	• **Physical allocation key:** Attributes are distributed based on a physical relationship, such as weight, energy content, or volume of the outputs. • **Economic allocation key:** Attributes are distributed based on the relative monetary value of the outputs, reflecting their market value. • **Other keys:** Area-time, or other sector- or industry-specific keys
	6. Attribution boundaries	Refers to how environmental attributes are assigned within a product group.	• **Proportional attribution**: Evenly assigning all input attributes to the corresponding share of outputs in a specified time period. • **Non-proportional/free attribution**: Selective assignment of attributes to specific units of output without exceeding input performance. • **Stacked attribution**: Combines improvements, potentially yielding an exaggerated claim for a unit of output that exceeds the actual performance of any single input.
	7. Output type	Refers to the form of output from a chain of custody approach.	• **Emissions factor for a physical commodity**: GHG emissions per unit of activity. • **Commodity certificate coupled with a physical commodity:** A certificate is issued alongside the physical product and remains linked to it throughout the value chain. This ensures that the environmental attributes (e.g., lower emissions) are transferred together with the actual commodity, maintaining higher physical connectivity. • **Commodity certificate coupled separated from a physical commodity (for book-and-claim):** The certificate is decoupled from the physical product and can be traded independently, for example in a book-and-claim system. This allows organisations to claim environmental attributes without necessarily receiving the corresponding physical commodity.
Reporting company	**Claim**	Refers to how outputs are used for reporting	Proposals for separating companies' climate reporting (see more information in Chapter 4) into four inventories include: • **Physical GHG inventory reduction** • **Market-based GHG inventory** • **Non-GHG indicators** (e.g. commodity-specific claim '100% renewable', 'green steel') • **GHG impact statement**

Input boundaries: What products can enter the accounting pool? The first decision concerns the criteria products should meet to enter the mass balance system. For example, what emissions profiles should the steel included in the system have? Products entering the system may either have no criteria or be required to meet a minimum set of criteria such as a benchmark on product emissions intensity. The latter approach is often referred to as 'controlled mass balance'.

Temporal boundaries: What timeframe is considered?

The next decision concerns the time frame considered for inputs included in the mass balance system (see other analyses for more information on this topic).

Transfer boundaries: Where do we draw the line?

The third decision concerns the geographic and operational scope within which emissions profiles can be claimed, known as the transfer boundary. This choice directly affects physical connectivity – the likelihood that an end product contains any of the low-carbon material – and traceability – the ability to track product attributes through the supply chain. The question of what level of physical connectivity and traceability are necessary to ensure robust mass balance has sparked intense debate.

High-connectivity approaches, such as batch, process or single-site mass balance, maintain stronger linkages between inputs and outputs, making the presence of physical attributes more likely and verification more feasible. While they require closer monitoring, these methods enjoy broad support as they limit how far claims can extend from actual interventions.

Low-connectivity approaches, such as multi-site mass balance, allow companies to pool emissions reductions across multiple facilities and attribute them to products from any participating site. Proponents argue that this flexibility is essential to reward companies for transformation even when existing production processes span multiple locations.

However, experts, companies leading the transition and environmental advocates warn that low-connectivity approaches risk overstating the presence of 'green' attributes in a product, potentially leading to distorted markets and delayed transformation. More fundamentally, companies could avoid decarbonising all sites by focusing improvements only at their most cost-effective facilities and marketing these improvements widely. Allowing approaches with low physical connectivity could also discourage companies from improving commodity traceability over time. Strong traceability matters not only for enabling regulation on supply chains in the future but also for addressing other critical issues such as human rights due diligence.

Distribution model: How are emissions assigned across product groups?

The fourth decision is to determine product groups before allocation can occur. There are different approaches to the definition of product groups, which can affect

the next decisions on the credibility of allocation and attribution (for more info see guidance by VCI and ISEAL).Allocation model: How are emissions assigned across product groups?

The fifth decision concerns how emissions are assigned across different product groups derived from the same material, known as allocation. While either economic or physical allocation keys can be chosen, the assignment of emissions across product groups must be proportional according to the Greenhouse Gas Protocol Corporate Value Chain (Scope 3) and Product Life Cycle Accounting and Reporting Standard.

Attribution boundaries: How are emissions assigned within product groups?

The sixth decision concerns how emissions values are assigned within a specific product group when materials with different characteristics are mixed, known as attribution. Attribution has become one of the most contested aspects of mass balance accounting and there are a number of different approaches.

Proportional attribution assigns attributes evenly, while non-proportional attribution, also known as free attribution, allows selective attribution to certain outputs.

Consider the example of a fictitious steel company undergoing transition. The company invests in a new direct reduced iron (DRI) plant at a specific site. However, when lower-emissions steel is mixed with higher-emissions steel from legacy production facilities, the overall emissions remain relatively high when averaged across all products. Non-proportional attribution enables the company to assign the lower emissions factor from the steel produced in the DRI plant to a specific portion of the output, creating a 'low-carbon' steel product that can be sold at a premium alongside conventional steel.

Many actors describe non-proportional attribution as the 'credit mass balance' model. However, approaches within this category differ significantly in legitimacy. While non-proportional attribution may be reasonable when emissions reductions result from a change in technology or approach, it can also be used to misrepresent products' emissions profiles even when no new technology has been adopted.

One particularly concerning approach is what we term 'stacked attribution'. Stacked attribution occurs when all emission reductions from multiple inputs are attributed to a single output, resulting in a commodity that has a lower emissions factor than any individual unit of that commodity that enters the mass balance system. For example, with its Kobenable® Steel, Kobe Steel claims that it 'reduces 100% of CO_2 emissions in steel production based on the mass balance method.' However, it is currently impossible for any steel product to be genuinely zero emissions using available technology. The claim is especially misleading in Kobe Steel's case, as their product is still produced using traditional coal-based methods with only partial substitution by DRI.

Such a claim could fundamentally mislead customers about a commodity's real emissions footprint and delay necessary investment in and regulation of key

decarbonisation technologies. As a result, some experts are warning against non-proportional attribution altogether. Critically, the current standards by the International Organisation for Standardization (ISO) do not yet clearly distinguish between these approaches, as discussed in the following section.

Decisions on output: How are the outcomes packaged and presented?

The final decision is determining the output of the mass balance system. Mass balance calculations are mainly used for two types of outputs. The first is an updated emissions factor. The second is a certificate, a tradable instrument that can either be sold together with physical products or unbundled and traded separately. This choice fundamentally shapes how emissions attributes are transferred through the value chain.

Reporting methods: How to buyers report the mass balance emissions?

How and where emissions factors or certificates generated through mass balance can be claimed by buyers is an ongoing debates within standard-setting processes. Currently, the GHG Protocol only requires companies to have a physical emissions inventory (scope 1-3). However, discussions are ongoing on whether additional inventories will be allowed or required. Standards bodies and regulators are actively debating whether and which mass balance approaches are robust enough for which inventory. This decision is important as it could affect corporate climate disclosures, target-setting and compliance with emerging regulations (see Chapter 4 where we discuss the nuances of corporate emissions inventories).

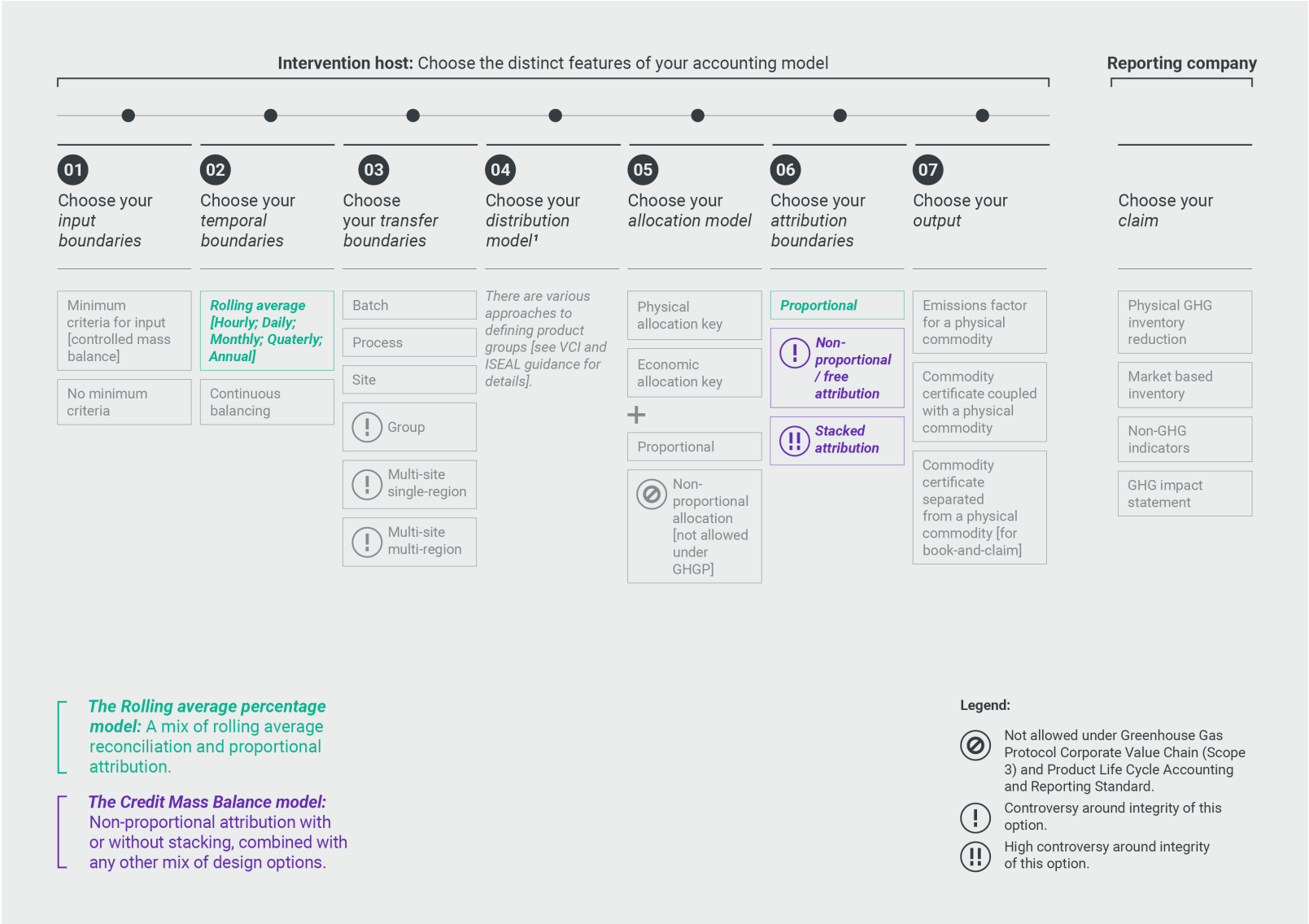
Existing standards on mass balance remain vague on key decisions

The ISO standard number 22095-2:2026 illustrates this challenge. While it offers a general definition of chain of custody terminology, it is not specific to emissions accounting. The standard outlines two types of mass balance: 1) the rolling average percentage method and 2) the credit mass balance model (see Figure 2). These approaches only specify certain criteria as illustrated in green and purple, while leaving other critical decisions open. For example, the 'credit mass balance model' could allow for the non-proportional attribution of emissions reductions based on a genuine technological intervention. However, it could also allow stacked attribution that is highly exaggerated and misleading.

To properly evaluate the integrity of these models, more nuanced guidance is needed on how these open decisions should be resolved in specific contexts. A growing number of sectoral guidance documents and standards on mass balance, such as the Land Sector Removal Guidance or the World Steel association guidelines are attempting to add nuance, but their requirements still vary in levels of specificity and detail. Through this role, the GHG Protocol could help ensure consistency and comparability while allowing for necessary sectoral differentiation.

Figure 2: ISO Mass balance models remain indeterminate

The current ISO 22095:2026 standard determines two general approaches but keeps key decisions1 open. GHG accounting standards need to be more specific but encourage high-integrity approaches.



3 Matching book-and-claim rules to real-world impact

Key takeaways

- → Book-and-claim has a compelling theoretical rationale. It serves a different purpose to mass balance accounting. Positioning it as inherently less credible because it lacks physical connectivity overlooks its distinct role and could legitimise weaker mass balance approaches.
- → The credibility of book-and-claim depends on why it is being used. Different use cases, such as addressing traceability constraints or supporting the scale-up of emerging technologies, may require different rules and safeguards.
- → Robust governance is essential for scaling book-and-claim. Its credibility ultimately hinges on robust oversight that can ensure consistency, transparency, and integrity as these systems expand.

Book-and-claim appears to be growing rapidly in importance within corporate climate strategies, particularly in sectors facing traceability challenges and restricted access to nascent low-carbon technologies. Companies are already using these systems despite the absence of clear, widely agreed rules. Their treatment in GHG inventories and target-setting remains under debate in ongoing revisions of the GHG Protocol, Science Based Targets initiative (SBTi) and ISO frameworks.

However, without clear guardrails, the risks are significant. The inappropriate use of book-and-claim systems can enable misleading claims, weaken or delay direct supply chain transitions by offering a lower-cost alternative and ultimately undermine the credibility of corporate climate action. The central question is therefore not whether book-and-claim is inherently good or bad, but under what conditions its use can deliver credible, real-world impact.

In this chapter, we explore what book-and-claim systems are, why companies use them, the risks associated with integrating them into corporate climate accounting without robust guardrails and what robust guardrails could look like in practice.

What book-and-claim is and why companies use it

Book-and-claim systems separate the environmental attributes from the physical product. Similar to renewable energy certificates, one actor purchases a 'green' attribute, such as a certificate for low-emissions steel or sustainable aviation fuel, while another receives the physical product without the associated claim. This decoupling enables companies to support product decarbonisation without needing to purchase the physical product itself, which may be physically not accessible to the buyer, too costly or lead to an increase in emissions due to long-distance procurement.

Book-and-claim is often compared to mass balance (see Chapter 2) and portrayed as less credible because it lacks a physical connection between the decarbonised product and the claimant. However, the two approaches serve different purposes. Book-and-claim serves as a financing and allocation mechanism where traceability is infeasible or where companies support nascent technologies that are inaccessible in their direct supply chains. Comparing the two solely on the basis of physical connectivity overlooks these distinct roles and risks oversimplifying the debate, potentially legitimising weaker mass balance approaches.

Different uses of book-and-claim may require different rules

Different applications of book-and-claim rely on different theories of impact, and the rationale for using these systems varies significantly across sectors and supply chains. Some aim to address traceability constraints, while others are designed to support the scale-up of emerging low-carbon technologies. This distinction matters because the credibility, risks and appropriate guardrails for book-and-claim depend heavily on the challenge the system is intended to address.

There are two fundamentally different rationales for allowing companies to use book-and-claim in emissions inventories.

First, book-and-claim can be used to claim outcomes for **interventions in supply chains where physical traceability is not technically feasible**. This applies in cases such as electricity consumption, where electrons cannot be traced through the grid to specific generators, or complex agricultural supply chains, where commodities are highly mixed and fragmented, making other accounting systems infeasible. In these contexts, certificates are used to allocate the outcomes of real interventions that physically occur within a defined system boundary but cannot be directly linked to specific buyers.

Second, book-and-claim can be used to support the **emergence or scale-up of low-carbon technologies that are not yet physically accessible** to buyers, either because they are still nascent or geographically constrained. This logic is

particularly relevant in sectors such as freight and aviation, where sustainable aviation fuels (SAF) and marine fuels are both limited in supply and unevenly distributed. In such cases, book-and-claim is positioned as a mechanism to bridge the gap between distributed demand and highly concentrated, limited supply.

The risks: why strong and differentiated guardrails are important

As there are fundamentally distinct rationales for using book-and-claim, different use cases may require different rules and safeguards. Without strong and differentiated guardrails, book-and-claim can create significant risks for the credibility and effectiveness of corporate climate action. These include:

- **Misleading signals on progress:** Without transparent and accurate communication, book-and-claim can create an inflated impression of decarbonisation within the value chain. This may mislead investors and policymakers by distorting the true level of progress.
- **Disincentivising supply chain transformation:** While certificates can offer a lower-cost or more practical solution, they may reduce companies' incentives to actively engage in meaningful emissions reductions across their value chains. This could slow real transformation efforts and result in higher emissions over the long term.
- **Double claiming and inconsistent accounting:** Where the environmental attribute is sold separately from the physical product, there is a risk that multiple actors claim the same emissions reduction outcome. This risk is heightened if downstream users of the physical product, now stripped of its attributes, are not required to adjust their emissions factors accordingly.

What strong and differentiated guardrails look like in practice

Conditions for scaling nascent technologies

Where book-and-claim supports emerging technologies, its credibility depends on two conditions being met simultaneously.

First, **the technology must be genuinely nascent or geographically constrained**. If it is already widely available, there is no clear justification for using certificates instead of direct procurement.

Second, **the technology must be aligned with net-zero pathways**. Nascency alone is not sufficient; support should not reinforce incremental improvements that risk locking in high-emitting systems. For example, the possibility of using biomethane certificates to claim emission reductions from gas heating in manufacturing

processes overlooks, and potentially distracts from, the fact that replacing gas-based heating systems is the long-term transition needed in these cases.

These are joint conditions: one ensures that book-and-claim is used only where it is needed, while the other ensures it contributes to long-term decarbonisation. Treating them as alternatives undermines the rationale for this use case.

One way to operationalise this may be through **technology allowance lists** linked to transition pathways and regularly updated. While promising, such approaches also raise governance challenges, as decisions on eligibility can define transition trajectories and may be subject to competing interests.

Additionality requirements should differ by use case

If book-and-claim is intended to finance interventions that would not otherwise occur, then certificate procurement should have a demonstrable causal impact on outcomes. However, the way this is demonstrated varies across use cases.

For **truly nascent or constrained technologies**, additionality may be largely implicit and further additionality tests may not be needed. This logic relies on a high bar for demonstrating technology nascency and limited access.

In contrast, for **mature systems with traceability constraints**, additionality cannot be assumed. Evidence from existing renewable energy certificate markets suggests that short-term or spot purchases do not reliably drive new supply or system-level change in such cases. Further additionality tests are therefore needed.

There are many different types of additionality tests, each with its own advantages and limitations. Simple additionality tests, such as demonstrating that an intervention is not common practice or goes beyond regulatory requirements, may offer a practical screening function, but they do not necessarily ensure that interventions lead to meaningful system-level change. A combination of multiple tests could offer more confidence that system-level impacts will occur.

In some cases, additionality may be more credibly demonstrated where certificate procurement is linked to **long-term offtake agreements or financing structures**, as seen in fuel supply agreements for SAF, or long-term purchase power agreements (PPAs) for new renewable electricity installations. These arrangements can provide clearer evidence that revenues are directly enabling new production capacity, rather than simply reallocating existing supply.

Accounting integrity depends on preventing double-counting and misattribution

A central challenge for book-and-claim is ensuring that certificates reflect real, attributable emissions reductions without enabling double-counting or overstating impact.

Many frameworks seek to address the potential risk of double-counting by applying residual emissions factors to products once their low-carbon attributes are sold. While this can preserve formal consistency in theory, ensuring its application is challenging and sometimes unrealistic in practice.

Consider the example of a new low emissions steel facility: a tech company from another country may purchase the green certificates, while a machinery manufacturer receives the physical steel but cannot market it as low emissions. This raises a fundamental question: should the machinery manufacturer report a 'higher than reality' emissions factor for the steel, even when it knows the physical product has lower emissions? If so, this risks distorting the physical inventory; if not, it risks double counting.

Moreover, the residual factor approach assumes that companies use bottom-up, verified supplier data. While this may be feasible for electricity, it is far less common for other emission sources, where companies rely on averages or estimates. As a result, the practical implementation of robust safeguards against double claiming remains highly uncertain.

This double-counting challenge is not uniform across use cases. For **nascent technologies with very limited market penetration**, the risk of distortion may be relatively small, as residual emissions factors would not differ significantly from sector averages.

However, for more **mature technologies used in the context of traceability constraints**, the risk of double-counting and misattribution becomes substantially more pronounced, and these tensions may be difficult to fully resolve in practice. This implies that, in such use cases, the application of book-and-claim may need to be limited to a relatively narrow set of cases where the potential for real impact is highest, and the use of residual emission factors remains practically feasible. In other contexts, the challenges to accounting integrity may outweigh the benefits.

A related issue is how certificates are generated. Some approaches propose aggregating, or 'stacking', incremental improvements across multiple units to generate a single, larger claim (see Chapter 2). This risks overstating impact by attributing more emissions reduction than any individual intervention achieves, potentially delaying more transformative shifts. Robust approaches should therefore ensure that certificates only reflect what can be credibly demonstrated within the defined system boundaries and mirror the actual technology or process change implemented.

Robust governance matters for scaling book-and-claim

A number of standard-setting processes and initiatives (including the GHG Protocol, the SBTi, the AIM Platform, the Task Force for Corporate Action Transparency (TCAT), and sector-specific perspectives such as those from Rocky Mountain Institute and the Smart Freight Centre) are actively developing guidance on book-and-claim. These efforts increasingly reflect a shared understanding of key challenges, including additionality, technology maturity, supply chain association and double counting. However, current approaches do not always distinguish clearly between different use cases and underlying impact logics for book-and-claim, and

some proposed guardrails remain too flexible to sufficiently mitigate associated risks. Even if robust safeguards can be defined, an important question remains: how can they be governed at scale? To date, experience is limited to a small number of energy and commodity certificate systems in GHG accounting, each with well-documented limitations. Ongoing revisions to the GHG Protocol may help consolidate this fragmented landscape by introducing clearer criteria. However, this process is also likely to legitimise and significantly expand the use of these mechanisms.

This raises a broader governance challenge: what happens when such commodity certification schemes are used for many more commodities? Who provides oversight that certification schemes meet the criteria for use set by standards, and how can consistency and integrity be ensured at scale? Alongside further work on the technical design of such systems, it is essential to address these governance questions head-on. While book-and-claim has a compelling theoretical rationale, its credibility ultimately hinges on robust oversight that can ensure consistency, transparency and integrity as these systems expand.

4 The multi-statement GHG framework and the importance of non-GHG transition indicators

Key takeaways

- → The proposed multi-statement GHG reporting structure represents a promising reform that could improve transparency by preserving the integrity of the physical emissions inventory while clarifying the role of market-based instruments (MBIs).
- → However, without strong safeguards, it also introduces substantial risks. In particular, it could open the door to selective emphasis, duplication, confusion and misleading netted claims across different reporting statements.
- → To address these risks, the GHG Protocol is right to establish a clear hierarchy across the statements. The physical emissions inventory (statement 1) should remain the primary reference point for the GHG inventory, while the market-based inventory (statements 2) and GHG impact statement (statement 3) should serve as complementary, not interchangeable, sources of information.
- → Non-GHG transition indicators (statement 4) should be prioritised as a mandatory reporting element alongside the physical inventory, as they represent the most tangible and transparent tools for corporate climate accountability.

Under the current GHG Protocol framework, companies report emissions through a single GHG inventory for scopes 1, 2 and 3, alongside an optional market-based inventory for scope 2. For nearly two decades, this approach has played an important role in corporate climate accountability by creating a standardised way for companies to measure emissions, set targets and communicate progress. Its simplicity and consistency have helped establish a common language for emissions reporting across companies and sectors.

However, the limits of this model have become increasingly apparent. A single inventory cannot fully capture the breadth of corporate climate action. Companies lack clear mechanisms to report interventions in supply chains with limited traceability or interventions beyond their value chains. Long-standing questions also remain about how market-based instruments, beyond the existing use of renewable energy certificates in scope 2, should be reflected in corporate reporting.

To address these limitations, the GHG Protocol's Actions and Market Instruments (AMI) white paper proposes a multi-statement reporting framework. Rather than relying on a single inventory, companies would report across four distinct

statements: (1) a physical GHG inventory, which most closely resembles the single inventory of the current GHG Protocol framework, (2) a market-based inventory, (3) a GHG impact statement and (4) a set of non-GHG indicators.

By disentangling these elements, the framework aims to increase transparency and better reflect the different roles of direct emissions reductions, contractual instruments and climate interventions both within and beyond the value chain. The proposal remains under development and is currently undergoing stakeholder consultation as part of the GHG Protocol's AMI standard development process.

This proposed shift has implications beyond corporate disclosure. Standards and frameworks for target-setting will draw on these statements in determining how companies set targets and how their progress is assessed. As a result, the way they are defined, prioritised and governed will shape not only how companies report emissions, but also how they are evaluated and incentivised to act.

In this chapter, we examine the proposed multi-statement reporting structure, the risks it could create without a clear hierarchy and robust safeguards and the key considerations for ensuring a high-integrity framework.

Key considerations for ensuring a high-integrity reporting framework

The primacy of the physical inventory should be safeguarded

The physical GHG inventory (statement 1) should remain the authoritative measure of a company's emissions footprint. This principle must guide the implementation of any multi-statement structure.

While separating market-based and impact-related information into different statements may improve transparency, it also creates risks. In particular, companies may selectively highlight market-based or impact metrics that appear more favourable, while giving the physical inventory less attention. There is also concern that changes to the framework could gradually weaken physical inventory requirements, undermining decades of progress towards standardised, comparable emissions reporting, which remains a critical metric for climate accountability.

To address this, we support the wording of the GHG Protocol's AMI draft paper, which describes statements 2 and 3 as 'additional statements [...] complementary to the physical GHG inventory', which continues to serve as the 'foundation of corporate GHG accounting.' The GHG Protocol should operationalise this principle by introducing explicit requirements on the valid use of its reporting standard to ensure that the physical inventory is reported prominently and consistently. In any form of communications, statements 2 and 3 should only be valid when reported as complementary disclosures alongside the physical inventory, not as alternatives.

This hierarchy is essential to prevent companies from cherry-picking the information they report. A multi-statement GHG report should offer recognition and incentives for further climate action, not facilitate selective reporting.

Statement 3 poses risks, but could add value if limited to contributions beyond the value chain

The proposed GHG impact statement (statement 3) presents some of the most significant challenges within the multi-statement framework. This statement will be based on consequential accounting, which aims to estimate the emissions impact resulting from specific actions or measures using project-level accounting or consequential life cycle assessment. However, this method is associated with significant risk of inaccuracies due to the complexity of determining baselines, monitoring outcomes and assessing additionality and leakage. The negative consequences of inaccurate consequential accounting have been widely documented in carbon credit markets, despite decades of efforts to address these issues.

As currently conceived, statement 3 includes reporting on emissions reductions, avoided emissions and removals from actions both inside and outside a company's value chain. However, coverage of interventions within organisational boundaries and value chains overlaps with activities that can already be captured in the physical and market-based inventories. The key distinction between statements 2 and 3 lies in the accounting method rather than the underlying interventions, which could be reported in either statement. This raises questions about whether including these activities in statement 3 adds meaningful value.

The overlap between statements 2 and 3 in covering market-based interventions within a company's value chain creates significant risk of confusion and misleading netted claims. As both statements apply different accounting methods to the same underlying activities, there is a risk that interventions reported in statement 3 are likely to be conflated with communications around market-based emissions in statement 2, whether intentionally or unintentionally. If this occurs, there is also a risk that other impacts reported in statement 3, including contributions beyond the value chain and avoided emissions from products, could also be inappropriately netted against value chain GHG inventories.

These risks are not merely theoretical. They reflect weaknesses in existing reporting practices, which the AMI process aims to address rather than exacerbate. To reduce these risks, market-based interventions within the value chain should be accounted for only through attributional accounting in the market-based inventory (statement 2).

Despite these concerns, statement 3 could still add value if its scope is clearly limited. Specifically, to avoid overlap with statements 1 and 2, statement 3 should be restricted to reporting contributions beyond the companies' value chain, including the third and fourth of the currently proposed sub-categories of this statement: sector-associated impacts and beyond-sector and value chain impacts.

Crucially, such a statement of contributions should never be used to meet or offset targets derived from the physical or market-based inventories. Maintaining this separation is essential to preserve the credibility of corporate claims.

Non-GHG transition indicators should play a central role in the framework

The multi-statement framework presents an opportunity to strengthen the role of non-GHG transition indicators within a wider shift toward robust corporate transition planning. As we move into the latter half of this critical decade for climate action, there is increasing emphasis on credible transition plans that link targets to real change. Frameworks such as the Transition Plan Taskforce (TPT) have already advanced the definition of transition indicators at a sectoral level, highlighting their importance for tracking progress across key systems.

Non-GHG transition indicators provide a more direct and tangible link between corporate actions and the sectoral transitions required for a net-zero economy. Rather than relying solely on inherently inaccurate and non-tangible emissions metrics, transition indicators focus on measurable changes in real-world activities, such as procuring a defined share of zero-emissions materials or using market-based instruments to match consumption with low-carbon production in relevant activity pools.

Such indicators are already widely used in reporting templates and target-setting frameworks for renewable electricity procurement, where they serve as a more accurate and actionable guide for implementation. The GHG Protocol should build on this experience and extend it to other major commodities, products and services. In this context, non-GHG transition indicators (statement 4) should play a central role in the multi-statement framework, with reporting on critical indicators made mandatory alongside the physical GHG inventory. Market instruments should be integrated into these indicators where appropriate.

Arguments that non-GHG indicators lie outside the GHG Protocol's scope reflect a narrow and outdated view of its purpose. Given the limitations of traditional GHG inventories in capturing the full climate impact of corporate actions, expanding the framework to include transition indicators represents a necessary evolution to fulfil its purpose rather than a departure.

While transition indicators are inherently sector-specific, the GHG Protocol has a critical role to play in supporting their consistent application. Their use raises methodological challenges around identifying indicators and defining benchmarks such as 'zero-emission steel' or 'low-carbon energy'. To address this, the GHG Protocol could:

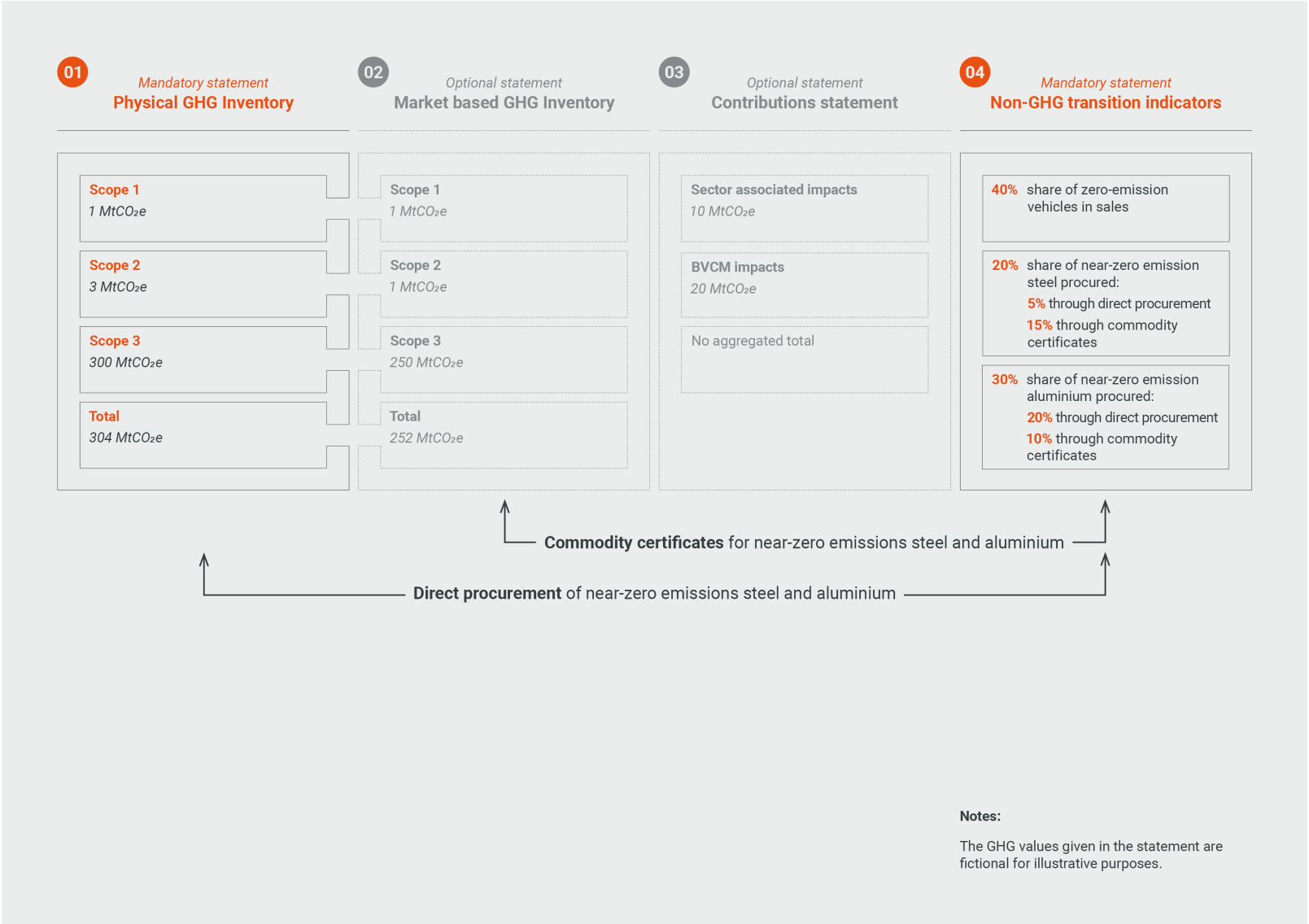
- → Define standardised indicators for key cross-sector commodities (e.g. electricity, major industrial materials).
- → Establish criteria for identifying and reporting sector-specific indicators, including thresholds for when companies must disclose them.

→ Provide guidance on the appropriate use of market instruments within these indicators. Where market instruments are reflected in both statements 2 and 4, this should be seen as complementary rather than duplicative, as each statement captures different dimensions of the same intervention for distinct information purposes.

Through this role, the GHG Protocol could help ensure consistency and comparability while allowing for necessary sectoral differentiation.

Figure 3: NewClimate's proposal for a robust multi-statement GHG reporting framework

Automotive manufacturer example: We propose that commodity certificates could be used to report and set targets on statement #2 and #4. There should be no overlap in coverage between attributional inventories (#1 and #2) and consequential contribution statements (#3).



Prioritising clarity, credibility and hierarchy

The proposed multi-statement GHG reporting framework has the potential to improve corporate climate transparency, but only if implemented with clear hierarchy and clarity.

First, the physical GHG inventory must remain the dominant and authoritative metric of GHG inventory, alongside mandatory reporting of non-GHG indicators to reflect progress on key sectoral transitions more transparently.

Second, overlapping and duplicative accounting approaches must be minimised to avoid confusion and misleading netted claims.

Third, non-GHG transition indicators need to be a central part of the multi-statement framework to ensure that the GHG Protocol remains relevant and useful for investors, regulators and other stakeholders seeking tangible, transparent and comparable indicators of companies' climate risk exposure and decarbonisation progress.

The AMI process must not only introduce new layers of reporting but also strengthen the integrity of the system as a whole. Achieving this will require careful balancing: while additional layers can provide useful flexibility and nuance, without clear boundaries and hierarchy they risk creating a fragmented reporting landscape that ultimately undermines transparency and credibility.

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