

Unlocking SAF Potential: Market Dynamics, Corporate Programs and Carbon Accounting Integrity

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1. Introduction

The aviation sector is undergoing an accelerated transition toward net-zero emissions. The first report of this series entitled “*Sustainable Aviation Fuels (SAF): Market Trends, Certification Frameworks and Digital Traceability Solutions*” (2026, established the foundations for understanding this topic by analysing SAF feedstock and production pathways, sustainability certification requirements, and emerging institutional and market-based fuel traceability systems. However, the rapid evolution of decarbonization commitments and market mechanisms now requires a deeper assessment of SAF market dynamics and corporate programs to ensure transparent, accountable, and high-integrity emissions reductions across the aviation value chain.

Increasing regulatory ambition-driven by ICAO CORSIA, the EU ReFuelEU Aviation Regulation, and evolving global climate accounting and reporting standards – is redefining how economic operators engage in aviation decarbonization. While SAF is central to this transition, scaling its deployment depends not only on production capacity but also on ensured demand and harmonized accounting frameworks, certified environmental attributes, and interoperable Book & Claim (B&C) systems that safeguard traceability and prevent double counting.

This paper explores the market dynamics of the SAF use ecosystem by analysing emerging private-sector programs for demand generation, across four target groups (joint initiatives, airlines, airfreight operators and SAF certificate registries). It also provides a comprehensive assessment of global and EU climate accounting and reporting frameworks, with particular attention to environmental integrity challenges related to Scope 1 and 3 emissions attribution for SAF.

2. SAF potential for decarbonization

Carbon In-setting vs Offsetting

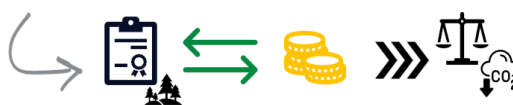
SAF deliver significant lifecycle emissions reductions compared to conventional jet fuel when assessed on a well-to-wake (WTW) basis, rounding 80% of CO₂ reduction. Recognized Life Cycle Assessment (LCA) methodologies (i.e., CORSIA, GREET, and RSB) quantify emissions savings across feedstock production, processing, logistics, and combustion, providing the verified environmental attributes that underpin SAF market claims.

Within this context, it is key to differentiate two approaches for accounting for these reductions:



Carbon in-setting: refers to emissions reductions achieved within an aviation company's own value chain (through the physical use of SAF or certified attribution mechanisms).

Under leading climate-target frameworks such as SBTi, **in-setting** stands out as the most credible route to decarbonization. It delivers **direct, verifiable emission reductions within the value chain** that can be **counted toward science-based targets**, generating long-term, structural climate benefits and strengthening the integrity of a company's transition pathway.



Carbon offsetting: compensates emissions outside the value chain via external climate projects. While it offers flexibility and a **lower-cost entry point** through **external compensation projects**, it does **not contribute to SBTi target** achievement, serving instead as a **complement** for addressing **residual**, hard-to-abate emissions.

In-setting vs. Offsetting for SAF

Feature	Insetting	Offsetting
Emission reduction location	Emission reduction within own value chain	Emission compensation via external projects
Relation to SAF	SAF used directly or within its supply chain	Buyer claims credits from unrelated SAF or carbon projects
GHG Scopes impacted	Scopes 1 or 3	Scope 3 (not directly linked)
Claiming reduction	By SAF user or value chain actor	By credit buyer, not SAF user
Use in SBTi / net-zero	Accepted as part of emission reduction	Not accepted for emission reduction (only for neutralization)
Credibility / Impact	High – embedded in business transformation	Lower – seen as a compensation rather than reduction
Cost	Higher	Often lower

Source: Own

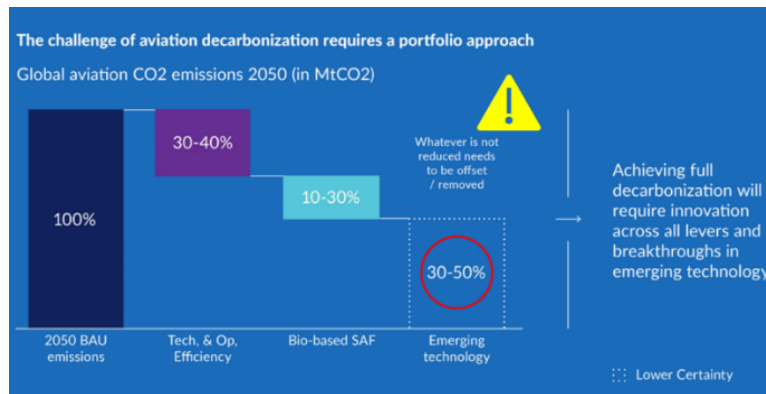
Leading climate strategies prioritize in-setting to meet SBTi-aligned goals, while leveraging high-quality offsets only to close the final emissions gap.

Carbon In-setting emerging technologies

Achieving net-zero aviation requires a portfolio approach rather than a single solution. While efficiency improvements and bio-based SAF can deliver substantial reductions, a residual share of emissions will remain. Scaling SAF is a critical first step, but emerging technologies, particularly advanced and synthetic fuels, will be essential to close the final gap.

As innovation reduces costs and increases availability, **in-setting becomes a more accessible and impactful decarbonization pathway across the value chain**. This requires prioritizing SAF deployment and operational efficiency to reduce emissions at source and only relying on emerging solutions to minimize what remains, limiting the need for offsetting to truly unavoidable emissions.

Overview of emerging technologies



Source: Aviation Climate Taskforce website

SAF Allocation Market-Based Mechanisms

As SAF is not yet physically available at all airports, market-based mechanisms such as **B&C** have emerged to bridge the gap between fuel supply and climate benefit allocation. B&C decouples the physical use of SAF from the allocation of its verified emissions reductions, enabling environmental attributes to be transferred independently of the fuel itself. To ensure environmental integrity, robust B&C systems rely on exclusive ownership, registry-based traceability, time-matching, and independent third-party verification to prevent double counting and ensure transparent accounting.

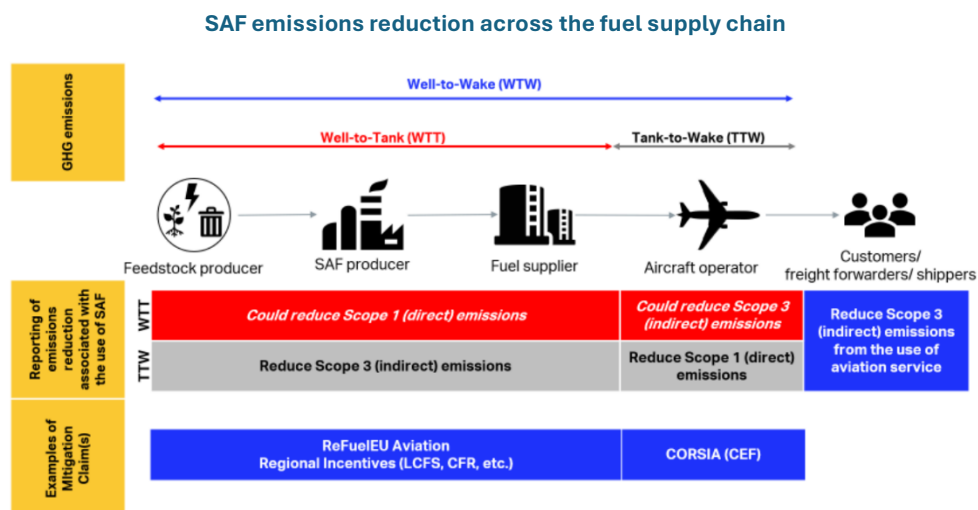
In this context, **SAF certificates (SAFc)** represent the digital and tradable environmental attributes associated with the certified GHG reductions of SAF. This system operates through two complementary layers. First, **Sustainability Certification Schemes (SCS)** (such as the International Sustainability and Carbon Certification- ISCC or the Roundtable for Sustainable Development - RSB) verify feedstock sustainability and lifecycle GHG performance of the fuel itself. Second, **registries or tracking platforms** (such as IATA-CADO, SAFc Registry, ISCC Credit Transfer System, 123Carbon) manage the issuance, transfer and retirement of the SAF environmental attributes. The first layer certifies the fuel, while the second manages ownership and retirement of its associated benefits.

Through these registries, SAFc can be issued, transferred and retired with clear and exclusive attribution, enabling airlines, logistics providers and corporates to credibly claim verified Scope 1 or Scope 3 emissions reductions under evolving accounting standards, while maintaining the guardrails to prevent double counting and ensure environmental integrity.

3. SAF Lifecycle GHG Emissions, Value Chain impact and Carbon Accounting

SAF lifecycle GHG emissions

Assessing the true climate benefit of SAF requires a **well-to-wake (WTW)** perspective, covering the entire fuel lifecycle, from feedstock production/collection and processing to distribution, to combustion (final use in aircraft). This approach distinguishes between **well-to-tank (WTT)** emissions (before the fuel is used by the aircraft) and **tank-to-wake (TTW)** emissions (released during combustion), enabling a transparent comparison with conventional jet fuel.



Source: IATA Sustainability & Economics

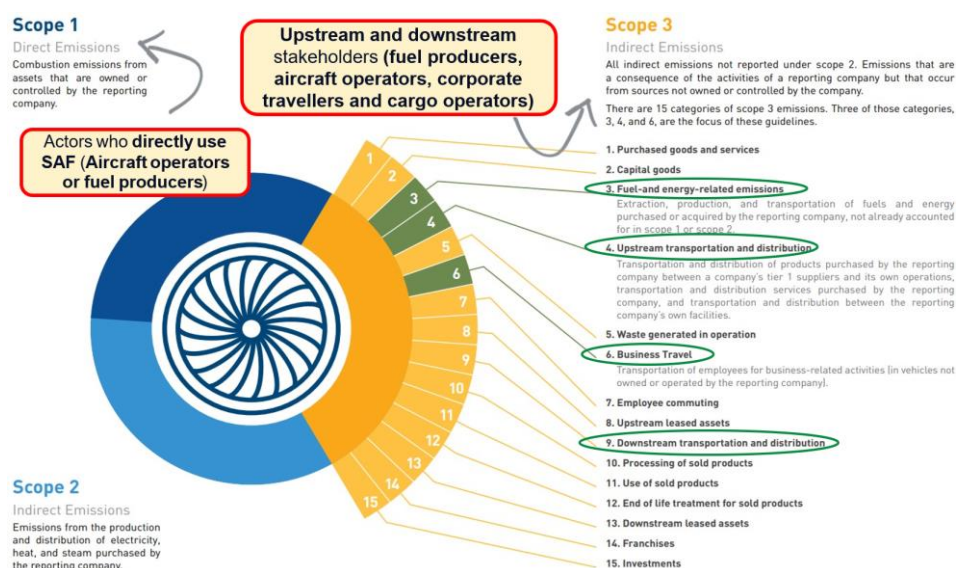
By mapping emissions across each stage of the fuel supply chain the WTW framework clarifies where reductions occur and how they are attributed across **Scope 1 and Scope 3** emissions. This LCA approach underpins frameworks such as the **GHG Protocol, CORSIA, and ReFuelEU Aviation**, ensuring SAF-related reductions are traceable, verifiable, and reportable.

SAF value chain impact

SAF impact extends beyond aircraft combustion, influencing emissions across the entire aviation value chain. By engaging fuel producers, airlines, cargo operators, logistics providers, and corporate customers, SAF enables emissions reductions at multiple points in the system. Airlines can lower **Scope 1** emissions through direct SAF use, while businesses and freight customers can reduce their **Scope 3** footprint by purchasing SAF-fueled transport or SAF certificates.

Upstream and downstream stakeholders (from feedstock production to airport delivery) contribute to overall lifecycle emissions, reinforcing the need for coordinated action.

GHG emission scopes and relevant categories for SAF value chain actors



Source: Smart Freight Centre y MIT Centre for Transportation & Logistics (2021)

Air Corporate Travel vs. Cargo

The allocation of SAF benefits differs between passenger travel and cargo operations. In **corporate travel**, emissions reductions are mainly shared between the airline and the corporate traveller, creating a relatively straightforward chain of climate claims. By contrast, in **air cargo** allocation is more complex, as carriers, shippers, and freight forwarders may each claim reductions within their Scope 1 or Scope 3 categories, enabling broader distribution of climate benefits across more intricate value chains.

GHG emission categories by actor in the SAF value chain

Cycle/Actor	Reports emissions, but cannot claim GHG reductions from SAF use		CORPORATE TRAVEL		AIR FREIGHT OPERATORS	
	SAF supplier	Aircraft operator	Corporate travelers	Carriers	Shippers	Freight forwarders
WTT (well-to-tank)	Scope 1 and 3 (depending on operational boundary)	Scope 3 – cat. 3	N/A	Scope 3 – cat. 3	N/A	N/A
TTW (tank-to-wake)	Scope 3 – cat. 11	Scope 1	Scope 3 – cat. 6	Scope 1	Scope 3 – cat. 9	Scope 3 – cat. 4

Source: Own

Key Insights on Carbon Accounting

Carbon accounting refers to the **systematic measurement, tracking, and reporting of GHG emissions reductions** from SAF use across relevant actors in the aviation value chain. By measuring lifecycle impacts, assigning reductions to the right actors, and validating claims against recognized standards, companies can translate SAF use into **traceable, auditable and decision-useful** outcomes.

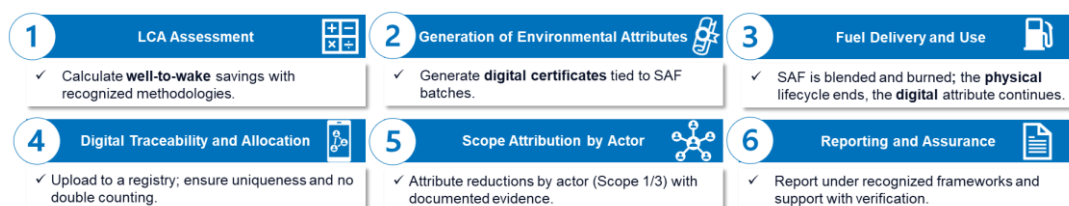
The process is straightforward: quantify the WTW benefit, convert it into certified environmental attributes (SAFc), ensure exclusive allocation (often through B&C mechanisms) and disclose results consistently under established reporting frameworks.

Carbon Accounting Foundations



Source: Own

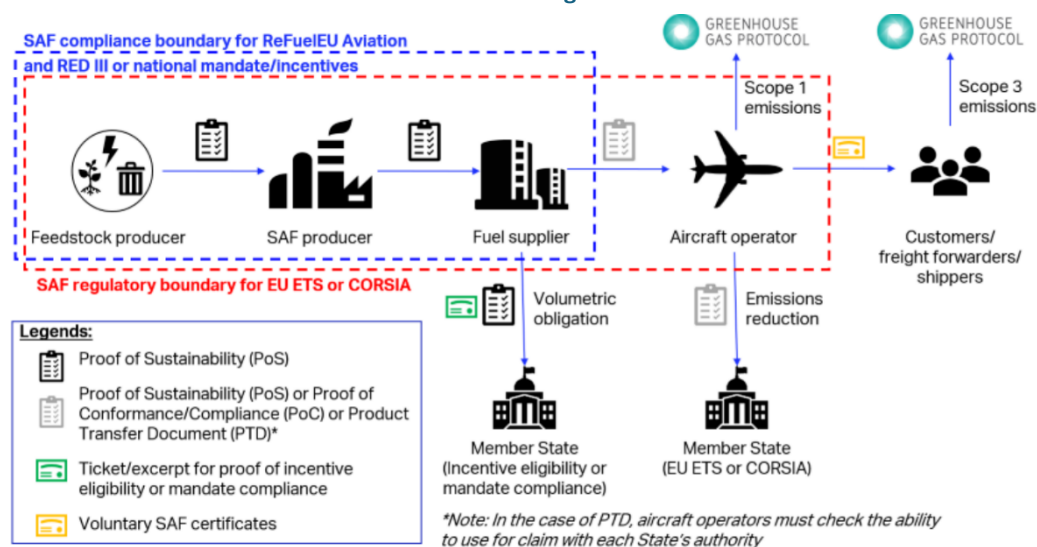
Process for SAF GHG emissions allocation



Source: Own

Effective climate accounting enables multi-actor participation across Scope 1 and 3, prevents double counting, and enhances transparency, providing investors and customers with confidence that **decarbonization efforts are real, measurable, and aligned with recognized regulations and standards.**

General SAF accounting workflow



Source: IATA Sustainability & Economics

4. Corporate carbon accounting & reporting frameworks

Climate disclosure trends and initiatives

Global climate disclosure is rapidly converging around a set of influential frameworks that are shaping corporate decarbonization strategies and climate standards. The Science

Based Targets initiative (**SBTi**) continues to set the benchmark for corporate ambition by validating science-based targets and prioritizing deep value-chain decarbonization, reinforcing credible approaches to residual emissions treatment.



Source: Own

At the same time, Climate Disclosure Project (**CDP**) has become the leading global disclosure platform, engaging thousands of disclosing companies and providing investors with comparable, decision-useful climate data. Meanwhile, the International Sustainability Standards Board (**ISSB**) has consolidated the former Task Force on Climate-Related Financial Disclosures (**TCFD**) recommendations into a unified global baseline (IFRS S1/S2), creating a standardized framework for climate-related financial disclosures and accelerating regulatory adoption across jurisdictions.

In parallel, the financial sector is also aligning with climate transition goals. Initiatives such as the Glasgow Financial Alliance for Net Zero (**GFANZ**) is mobilizing capital and advancing transition-finance frameworks across banks, asset owners and insurers, supporting real-economy decarbonization and enabling the scale-up of solutions such as SAF.

Investors' perspective

Unlocking capital for SAF requires consistent policy mandates, targeted incentives, and robust disclosure frameworks that clearly position SAF as a strategic decarbonization lever. However, investment and scale-up remain constrained by **several barriers** across financial costs, regulatory uncertainty, supply and infrastructure gaps, and technological and IT challenges.



Transparent corporate climate risk reporting is increasingly central to investor decision-making. **Long-term offtake visibility, credible accounting of lifecycle reductions, and regulatory certainty and harmonization** across jurisdictions is key to build investor confidence, drive capital flows and make SAF a bankable climate solution.

As the market evolves, financial institutions are beginning to recognize SAF not just as a cost premium but as a **strategic decarbonization asset**, where robust reporting standards, effective B&C mechanisms, and high-quality data can help transform this early-stage market into a scalable and feasible pathway for aviation's net-zero transition.

Key financial levers to mobilize SAF capital

- | | |
|--|--|
| 1 Apply for research/innovation funding and grants | 6 Engage in Book&Claim to facilitate investments |
| 2 Multilateral development bank financing and local expertise | 7 Attract private equity capital for rapid expansion |
| 3 Secure guarantees/insurance instruments to navigate developing countries | 8 Attract infrastructure investors to access cheaper capital |
| 4 Attract strategic industry investors to build a future scale ecosystem | 9 Structure investment through a tollor model to attract more debt |
| 5 Secure long-term offtake agreements | 10 Issue green bonds to attract impact investors |

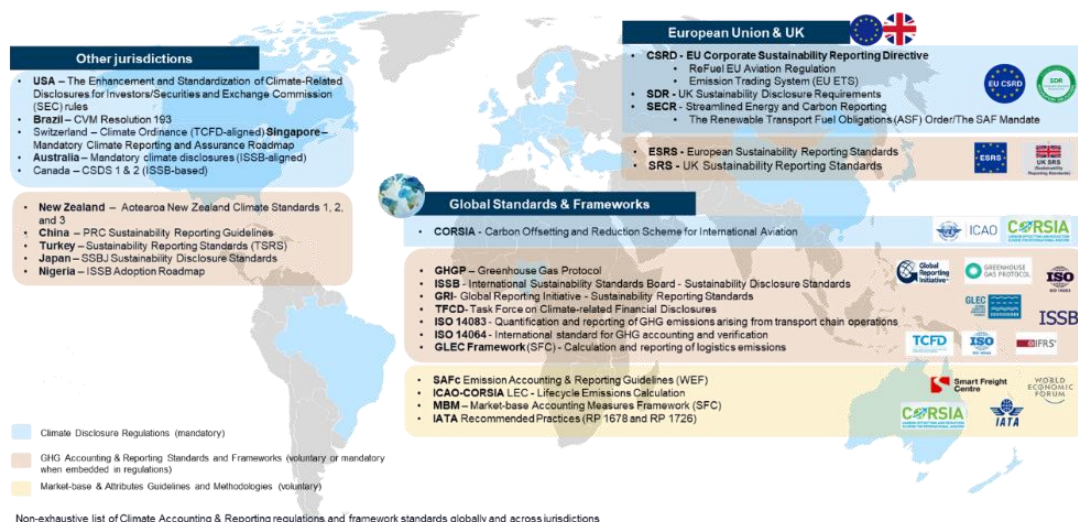
Source: Own

Overview of global and EU climate regulations and standards

The global landscape of climate-related disclosure is rapidly evolving toward more consistent, transparent and investor-relevant **regulatory and voluntary frameworks for GHG accounting and reporting**. At the **EU level**, the Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS) establish mandatory disclosure requirements aligned with globally recognized methodologies, while the ReFuelEU Aviation and the EU ETS define compliance obligations and emissions treatment within the aviation sector.

Beyond the EU, jurisdictions across the **UK, USA, Asia-Pacific, and Latin America** are advancing mandatory climate disclosure rules that tighten expectations on how companies must measure, account for, verify, and disclose emissions, particularly across Scope 3 value chains.

Mapping of regional and global regulations and standards¹

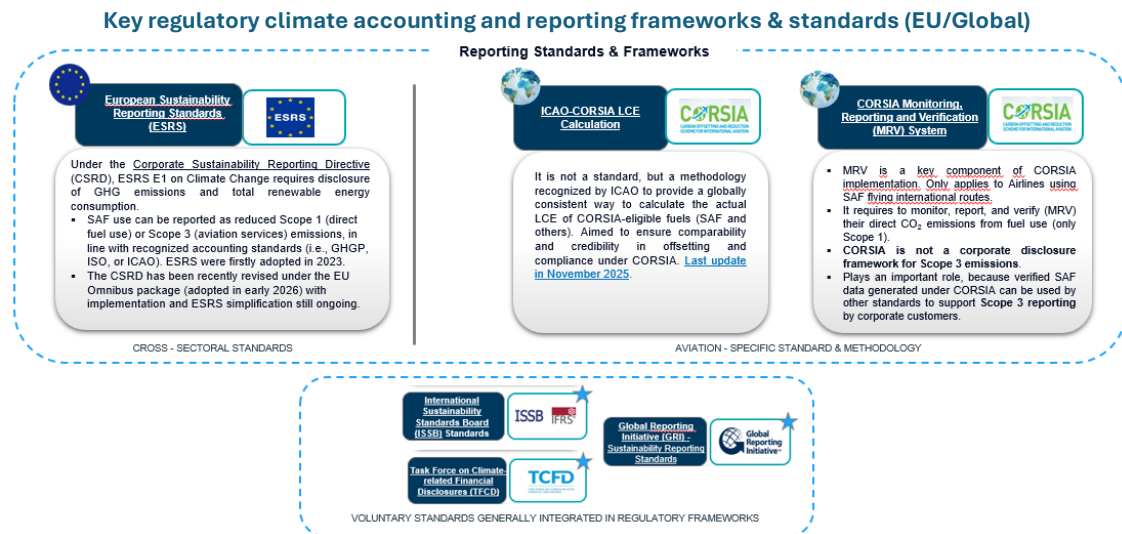


Source: Own

In addition to the EU regulatory framework lead by **CSRD and ESRS** disclosure rules, at the global level **ICAO CORSIA** provides a market-based mechanism for international aviation emissions, supported by defined calculation methodologies and Monitoring, Reporting and Verification (MRV) requirements. Relevant cross-sector standards such as **ISSB (IFRS**

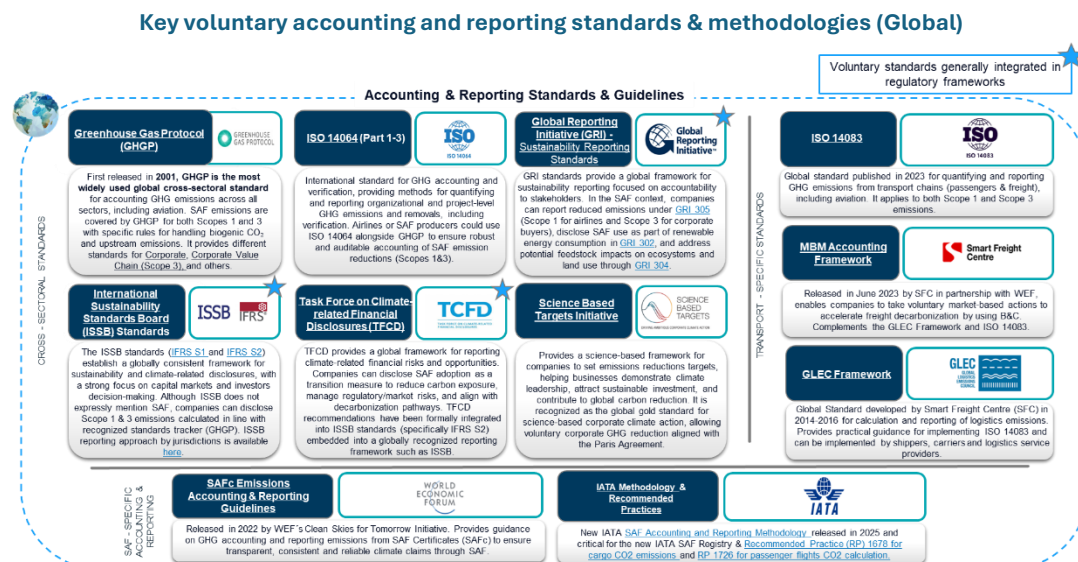
¹ Non-exhaustive list of adopted Climate Accounting & Reporting regulations and standards globally and across jurisdictions as of March 2026.

S1/S2) and GRI (often embedded in regulatory frameworks) complement these binding rules contributing to a progressively converging framework for climate-related reporting.



Source: Own

In parallel, a set of **global voluntary accounting & reporting standards** contribute to harmonize fragmented rules emerging across jurisdictions. These include **cross-sector initiatives** (i.e., GHG Protocol, ISSB (IFRS S1/S2), ISO 14064, GRI, SBTi), as well as **sectorial transport/SAF- specific methodologies and guidelines** (i.e., WEF SAFc Accounting Guidelines, IATA Recommended Practices, ISO 14083 and the GLEC and MBM Accounting Frameworks). Together these global initiatives aim to improve comparability, consistency, and cross-border credibility of emissions reporting.



Source: Own

Despite this expanding regulatory and methodological architecture, the SAF market remains fragmented across a wide set of climate accounting and reporting standards that differ in accounting baselines, lifecycle boundaries, attribution methodologies, and disclosure requirements, as reflected in the benchmarking analysis below. This lack of harmonization creates uncertainty over what qualifies toward climate targets versus what

may only be disclosed, weakening the consistency of SAF claims and undermining confidence in SAF certificate (SAFc) transactions and broader market integrity.

Benchmarking of accounting and reporting standards & regulations

Voluntary standards & methodologies (Global)

Comparative analysis of the key features of voluntary standards & guidelines included in the research.	Scope & Objective	Emission Calculation Method	Double counting prevention	Reporting & Compliance	Adoption / Maturity Level
Greenhouse Gas Protocol  Year: 1998 - Voluntary accounting standard - Cross-sectoral	Global framework for measuring, categorizing, and reporting emissions from both public and private organizations. Ensures consistency & transparency. Referenced by major disclosures regimes.	Emissions calculation across Scope 1, 2, and 3. Organizations collect activity data (fuel use, distance, energy) and apply recognized emission factors and GWPs. Provides standards, guidance and tools.	Allows Scope 1 and Scope 3 overlaps for gross emissions reporting but prohibits double counting of the same GHG reduction. Exclusive attribution of SAFc (airline or corporate).	One of the most widely used and recognized framework for corporate GHG accounting and reporting. Requires annual GHG inventories with transparent boundaries and data sources.	Global voluntary standard with very high adoption across industries and geographies. Referenced by GRI, ISSB, TCFD, ERSR or SBTi. 91% of S&P500 companies reported to CDP using GHGP. ISO partnership .
SBTi  Year: 2015 - Voluntary standard - Cross-sectoral	Global standard for science-based corporate climate action. Clear framework to set emission reduction targets, helping businesses demonstrate climate leadership and contribute to global decarbonization. Currently under revision (V2).	Targets and inventories follow the GHGP standards, with transparent activity data, baselines, emission factors (GCRSA) and boundaries. Only consumed SAF volumes count, and offsets are excluded.	SBTi prohibits double claiming of the same SAF-related reduction across different entities. Physical use counts as direct mitigation for the airline; B&C certificates count as indirect only with exclusive ownership (V2 draft).	Requires annual reporting of emissions and progress toward targets using transparent and verifiable data. V2 draft will introduce cyclical validation and spot-checks. B&C accepted only if proves traceability and ownership.	One of the world's fastest-growing corporate climate initiatives, trusted by over 12,000 companies and financial institutions. Considered the benchmark for science-based climate ambition.
GRI  Year: 1997 - Voluntary* reporting standard - Cross-sectoral	Global framework for sustainability reporting, designed to enhance transparency and comparability. First issued in 2000, now modular GRI Standards (Universal, Sector, Topic). Enables to disclose ESG impacts and contributions to decarbonization.	Builds on GHGP for defining scopes and calculation boundaries. Use primary activity data and recognized factors (IPCC, DEFRA, ICAO). Organizations can align GRI 305 with ISO 14083 for multimodal transport chains.	Purchased SAFc must be disclosed separately as market-based adjustments. If physically used, SAF emissions are reported under Scope 1. Follows GHGP to avoid double claiming, exclusive ownership of the SAFc (airline or customer).	Companies report using GRI Universal Standards such as GRI 305: Emissions. Includes management approach, targets, actions, and performance. Voluntary but interoperable with CSRD/ESRS, GHGP, and ISO 14083.	The world's most widely used sustainability reporting framework, adopted by thousands of organizations across 160+ countries.
ISSB (IFRS 1-2)  Year: 2021 - Voluntary* reporting standard - Cross-sectoral	Global baseline for sustainability-related financial disclosures. It provides investors and financial markets with consistent and decision-useful information about climate and sustainability risks and opportunities.	Requires disclosure of Scope 1-3 using GHGP and ISO 14064 methods. Entities must explain boundaries, base year, and emission factors, and distinguish between location and market-based results. Based on SASB Standards .	Disclose baseline (not an accounting rulebook), so double-counting prevention depends on reporting discipline aligned to GHGP/STi. (i) report gross Scope 1, 2, 3, (ii) separately disclose any market instrument, (iii) exclusively and traceability.	Follows the TCFD reporting structure and embeds SASB Standards requiring companies to use industry-specific metrics to meet disclosure objectives. IFRS 1: Sustainability related and IFRS 2: Climate related information.	Rapid uptake expected globally as regulations integrate ISSB into mandatory reporting framework (adopted or in-process in ~36 jurisdictions as of 2025). Seen as the global baseline for sustainability disclosure.
TCFD  Year: 2015 - Voluntary* reporting standard - Cross-sectoral	Created to improve and standardized climate-related financial risk disclosure. Structured in 4 pillars – Governance, Strategy, Risk Management, and Metrics & Targets. TCFD was disbanded in 2023, and its content is now embedded in IFRS S2.	The Metrics & Targets pillar requires companies to disclose quantitative emissions and performance indicators. Scope 1-3 emissions must be calculated across the entire transport chain end-to-end. Primary data and recognized databases (IPCC, DEFRA).	It relies on GHGP for emissions accounting and require transparent methodologies/boundaries. In practice, double counting prevention is increasingly operationalized via IFRS S2 (clear, separate disclosure of market instruments and transition actions).	It is a disclosure framework now integrated into IFRS S2 (2023). Emphasizes governance, strategy (impacts and scenario analysis), risk management and quantified goals and progress.	TCFD-aligned climate disclosure is mandatory or legally referenced in 60+ jurisdictions (EU CSRD/ESRS, UK, Japan, Canada, etc.). It is the de facto climate disclosure baseline and has been codified into IFRS S2.

Comparative analysis of the key features of voluntary standards & guidelines included in the research.	Scope & Objective	Emission Calculation Method	Double counting prevention	Reporting & Compliance	Adoption / Maturity Level
ISO 14083  Year: 2023 - Voluntary accounting standard - Transport-specific	Global standard to quantify and report GHG emissions from logistics and transport chains of both passengers and freight. Harmonized method applicable across all transport modes.	Operational implementation is frequently supported by the GLEC Framework. Emissions must be calculated across the entire transport chain end-to-end. Primary data of distance metrics if possible.	The combined ISO14083 + GLEC approach enforces traceability and separation of stages/modes to avoid double attribution across actors. Clear boundaries, chain-level allocation and transparency.	Reports can be established at 2 different levels (transport services, and organizational level). Results include GHG emissions, intensities, activity data and system boundaries. Further details .	Rapid industry uptake as the reference standard (replacing the EN 16258 practice in Europe). The GLEC framework has been updated in 2025 for full alignment with ISO14083 and refreshed emission factors.
MBM Accounting Framework  Year: 2023 - Voluntary accounting standard - Transport-specific	Is a voluntary market-based accounting and reporting framework aimed to overcome decarbonization in freight using flexible CoC models (including B&C). Enables to allocate/claim emission reductions across logistic actors.	Builds on and supplements the GLEC Framework following 3 steps: (i) Determine organization's mode-specific transport, (ii) Determine the energy consumption, (iii) Apply emission factors. Create a LETS by implementing SAF reduction.	Exclusive ownership of claim rights, registry issuance & retirement (unique serials), B&C controls (allocation logic, documentation, evidence), separate disclosure from physical inventory and 3 rd party verification.	The SFC launched in 2024 and MBM Specification for Logistics Reporting – a normative, auditable document with clear, verifiable requirements and a standardized emissions report template, enabling 3 rd party verification. Dual-scope assessment (physical vs. MB).	MBM has moved from guidance (2023 Framework) to an auditable specification (2024) – an indicator of growing maturity and readiness for assurance. It is positioned to work alongside ISO14083/GLEC.
GLEC Framework  Year: 2016 - Voluntary accounting standard - Transport-specific	Global methodology to harmonize the calculation and reporting of freight transport systems, chains and operations. It is the primary industry guideline to support ISO14083 implementation.	Harmonized methodology based on 3 key steps: (i) Calculate the transport activity of the Transport Chain Element (TCE), (ii) Identify the applicable emission intensity of the TCE, (iii) Calculate the TCE's emissions multiplying activity data with EF's.	It is done by enforcing clear boundaries, chain-level allocation, data quality hierarchy, and transparent methodology. Market-based claims are handled separately for clear auditability.	It aligns with ISO14083 and the Global Green Freight Action Plan. Recognized by the GHGP, and it is a recommended method for reporting logistics emissions for the CDP and SBTi.	Global industry guideline implemented by 200+ leading companies. It was the core basis for ISO 14083. Latest GLEC framework version 3.2 released in Oct 2025.
SAFc Emissions Accounting & Reporting Guidelines  Year: 2022 - Voluntary guidelines - SAF-specific	Standardized approach, including a robust B&C methodology to account for SAF across the value chain. It provides step-by-step instructions for SAF suppliers, aircraft & freight operators, and corporate travelers.	Aligns with other existing carbon accounting and reporting standards (GHGP, SBTi, ICAO-CORSIA, RSBB, B&C, and SFC/GLEC). Refers to CORSIA LCA methodology for calculating SAF life cycle emissions.	Exclusive ownership and single use of SAFc: clear separation between regulatory compliance claims and voluntary ones. Avoids using the same reduction for two voluntary targets. Transparent B&C documentation.	Reporting suggestions are based on existing GHGP standard, and a proposed content is provided to be included by users in their SAFc reports.	The WEF SAFc guidelines are widely cited by different standards such as SASB education materials and registry workstreams. They serve as the reference for corporate users until GHG Protocol/STi finalize definitive rules.
IATA Methodology & Recommended Practices  Year: 2025 - Voluntary guidelines - SAF-specific	Global framework for quantifying and reporting the GHG emissions reductions from SAF used. Technology-neutral framework that applies regardless of what feedstock is used. It helps to claim SAF environmental benefits against regulatory/voluntary obligations.	It aligns closely with ICAO CORSIA Methodology and calculates SAF-related GHG reductions by comparing the WTW lifecycle emissions of SAF against conventional fossil jet fuel. It is based on the volumemass of SAF purchased.	No double counting is a core principle – use purchase-based accounting, clear CoC, and transparent data to ensure one claim per reduction. Robust registry. Allow 2 claims from same batch if they are in separate systems – voluntary vs. regulatory.	It defines how Scope 1 and Scope 3 attributes must be generated, allocated and reported, supporting both regulatory compliance (CORSIA, EU ETS) and voluntary B&C systems through IATA-CADO Registry.	It was launched in January 2025, developed by 40+ airline experts in positions a global standard ahead of IATA's Registry to enable consistent SAF claims (regulatory + voluntary) through IATA-CADO Registry.

Regulatory frameworks & standards (EU/Global)

Comparative analysis of the key features of regulatory standards & frameworks included in the research.	Scope & Objective	Emission Calculation Method	Double accounting prevention	Reporting & Compliance	Adoption / Maturity Level
ICAO-CORSIA LCE Calculation  1st version: 2019 - Calculation methodology & standard - Sector-Specific (aviation)	Regulatory scheme adopted by ICAO. Technical methodology to calculate full life-cycle GHG emissions of CORSIA-eligible fuels (including SAF). Primarily used for verified reductions under CORSIA international flights and as a reference LCE model for voluntary schemes. Voluntary participation (2021-2026) and mandatory application (2027-2025).	Based on Life Cycle Assessment (LCA) from feedstock to aircraft use (WTW), including sustainability criteria and ICAO-defined default emission factors. Incorporates adjustments for indirect Land-use Change (ILUC).	Requires certification by approved sustainability schemes (e.g., ISCC, RSBB) to ensure fuels accurate traceability. Uses Monitoring, Reporting and Verification (MRV) system and registries to prevent double issuance or use of reduced units.	Mandatory for regulatory goals under CORSIA (ICAO MS). Reporting is done through CORSIA MRV System with independent verification. Methodology also used for corporate reporting, including Scope 3 reductions via B&C.	High adoption among ICAO Member States (129 participating in 2025). A well-established regulatory scheme since 2021. Globally used for voluntary aviation market, referenced by other standards (e.g., default values, emission factors).
European Sustainability Reporting Standards (ESRS)  Year: 2023 - Regulatory reporting standard - Cross-sectoral - Currently under revision (Omnibus Package)	Mandatory reporting standard under the EU CSRD regulation setting a legal framework for sustainability reporting in the EU. It requires companies to disclose climate risks, GHG emissions, and decarbonization plans across the full value chain. Applies to all large companies operating in the EU market. Currently subject to revision under the Omnibus Package . Adoption of new simplified ESRS expected by mid-2026 (application by FY27).	Following the ESRS E1 ('Climate Change'), companies must report quantified Scope 1-3 GHG emissions aligned with GHGP and ISO 14083, disclose calculation boundaries, emission factors, and data sources, and integrate market-based measures with safeguards to prevent double counting.	Encourages consistent methodology across reporting entities; relies on interoperability with global standards to ensure data comparability and avoid misalignment.	Annual sustainability reports under ESRS E1 must include quantitative GHG data and narrative disclosures on transition plans, targets, and progress. Limited assurance applies from 2025, moving to reasonable assurance post-2028. Aligned with SBTi, TCFD and ISSB (IFRS S2) for climate risk and target disclosures.	Mandatory across the EU under CSRD framework. Under Omnibus revision ESRS application is expected to significantly decrease, lowering the scope of companies affected by reporting obligations (from original 50,000 to around 5,000) (80-90%). Smaller companies and most SMEs are expected to be excluded from mandatory ESRS reporting.

5. Double counting prevention & Scope 3 accounting integrity

Key Risks in SAF Attribute Allocation

As SAF deployment scales, the most significant **risk to market integrity is double counting**; the situation in which more than one actor claims the same emissions reduction. In a multi-actor value chain such as aviation, where airlines, shippers, freight forwarders and corporate travellers may be associated with the same flight activity, the environmental benefit of SAF can be easily misallocated if accounting rules are not clearly defined and consistently applied.

The implications are significant since, where environmental integrity is not assured, claims lose credibility, greenwashing risks increase, and SAFc may no longer be trusted as evidence of real decarbonization. These risks often stem from **misaligned definitions** of what constitutes a valid claim, overlapping Scopes 1 and 3 boundaries, and divergent frameworks on whether concurrent reporting is acceptable.

Preventing double counting is therefore not just a technical accounting exercise, it is a foundational requirement for maintaining trust in SAF as a credible climate solution. Today, this challenge is amplified by **different interpretations across major standards**, including IATA, CORSIA, GHG Protocol and SBTi, each influencing how SAF-related reductions may be attributed and disclosed across Scope 1 and Scope 3 categories.

Different Perspectives on Double Counting of SAF Attributes

While discussions often refer to “double counting” as a single issue, it actually spans four distinct domains, each governed by different rules and levels of maturity:

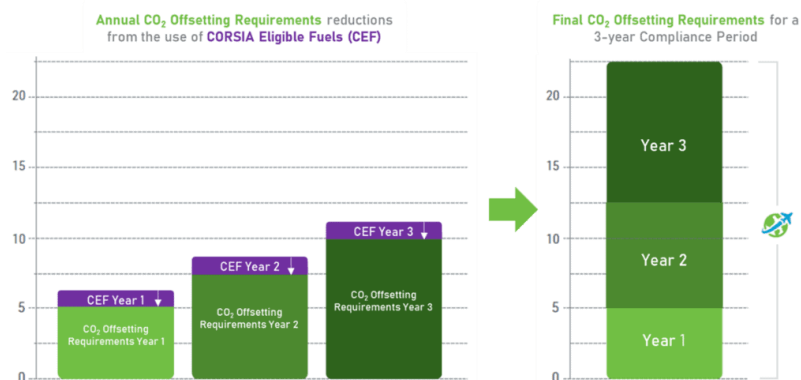
1. **Physical GHG inventories** follow attributional accounting under the **GHG Protocol** and reflect real, measurable emissions.
2. **SBTi target eligibility** introduces an additional layer of integrity, defining which reductions can be counted toward science-based targets.
3. **Public corporate claims** determine how companies communicate climate contributions, requiring precision to avoid misleading or inflated narratives.
4. **Regulatory compliance systems** such as **CORSIA or EU ETS** apply their own logic for recognizing SAF use and offsetting obligations.

While these layers are interconnected, they are not interchangeable, and alignment among them is still evolving. **Clearly distinguishing these domains clearly is essential to avoid misinterpretation and to ensure that SAF-related claims remain credible, consistent and defensible as standards mature.**

ICAO / IATA (CORSIA context)

CORSIA is a regulatory offsetting scheme for airlines, not a SAF mandate. Airlines may **optionally** use SAF to **reduce their offsetting obligations** instead of purchasing external offsets. In parallel, customers may choose to make a voluntary Scope 3 claim via SAFc. Under specific and clearly defined condition, these claims can **coexist without double counting**: 1) a **regulatory** Scope 1 claim by the airline under CORSIA/EU ETS, and 2) a **voluntary** Scope 3 claim by a customer through SAFc.

Using SAF reduces CORSIA offsetting requirements



Source: ICAO, Uniting Aviation website

Clear guardrails apply: **only one airline may claim Scope 1 reductions for a given SAF batch.** If SAF attributes are transferred to a customer for a voluntary Scope 3 claim, it must be removed from the airline's voluntary targets, although the airline may still report the physical Scope 1 reduction upon combustion. Aligned with SBTi and GHG Protocol, the **same reduction cannot support two voluntary corporate targets.** Therefore, regulatory Scope 1 claim (airline) and a voluntary Scope 3 claim (customer) are acceptable only when ownership is exclusive, batch-linked in a verified registry, and formally retired, while two voluntary claims on the same reduction are not allowed.

SBTi / GHG Protocol

SBTi and GHG Protocol share a strict environmental integrity principle: **the same emissions reduction cannot be claimed twice, whether across voluntary or regulatory systems.** Both frameworks recognize the use of SAF for Scope 3 target-setting only when environmental attributes are exclusive, verified, time-matched, and retired in a recognized registry, reflecting the true lifecycle benefit of the fuel.

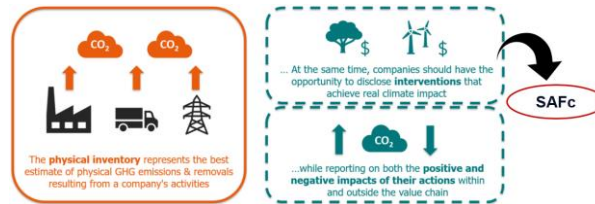
Under current guidance, **concurrent voluntary claims or targets on the same SAF-related reduction by an airline (Scope 1) and a customer (Scope 3) are not permitted.** If a company purchases SAFc that does not physically affect its own operations, the associated emissions reduction cannot be deducted from its Scope 3 inventory. Instead, it must be reported separately as an additional mitigation contribution.

At the same time, the airline may continue to report lower Scope 1 emissions in its physical inventory when burning SAF. However, once the SAFc is transferred to a customer, the airline relinquishes the voluntary claim associated with that reduction. In short: one reduction, one owner, one voluntary target is the foundation that preserves environmental integrity and prevents inflated performance claims.

GHG Protocol's multi-statement model: bringing clarity and credibility to SAFc

To address the complexity of SAF claims and provide clarity on how to recognise the climate impact of SAFc without distorting actual emissions, the GHG Protocol is developing a new approach through its **Actions & Market Instruments (AMI) workstream.** It proposes a **multi-statement reporting model** introducing a structured distinction between: what a company emits (physical inventory reporting), and what a company enables (attributational climate contributions).

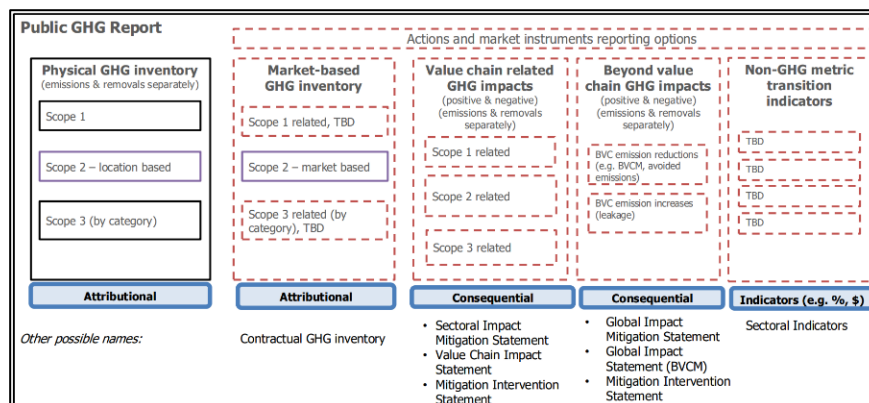
Reasons for disaggregated reporting



Source: GHG Protocol, Actions and Market Instruments Phase 1 Whitepaper Draft

This means that the physical emissions remain reported within the traditional GHG inventory (Scopes 1-3) under an **attributional accounting approach**. At the same time, the climate impacts of interventions – such as SAFc acquired through Book & Claim – are disclosed separately in dedicated impact statements (e.g., *Value-chain related GHG impacts*), using a consequential accounting perspective. This dual structure enables companies to **recognize and communicate real climate contributions**, demonstrate to investors how capital supports decarbonization, and preserve the integrity of their emissions inventories.

GHGP Reporting statements option under consideration



Source: GHG Protocol, Actions and Market Instruments Phase 1 Whitepaper Draft

At the moment of this report, the AMI framework remains under development, with final standard expected toward late 2028. Until then, stakeholders should treat this as a transition period, follow best-practices (exclusive ownership, registry retirement, time-matching, separate disclosure, and transparent audit trails) to ensure credible SAF accounting.

Why SAFc Matters for Corporate Buyers

Even when SAF do not directly reduce a company's physical Scope 3 emissions inventory, purchasing SAFc contributes to scaling SAF supply and enabling future sector-wide decarbonization, allowing corporates to **fund real emission reductions**, send a strong **demand signal** and demonstrate **credible climate action** beyond traditional offsets. Through the GHG Protocol's emerging **multi-statement model**, companies can demonstrate their role in accelerating aviation decarbonization while maintaining accounting integrity.

Evolving Integrity and Quality Criteria for SAFc

As the role of market instruments grows, global standards such as SBTi and GHG Protocol are placing greater emphasis on what truly constitutes a high-integrity claim. Discussions within the GHG Protocol's AMI workstream are shaping a common set of Quality Criteria that instruments like SAFc may have to meet to be recognised with confidence – covering measurability and MRV, exclusive issuance and right of claim, credible (conservative) baselines, time-matching, independent verifications, and geographical relevance – so that the reported impacts are real and transparently documented.

A key area still under active discussion is additionality – ensuring that the reduced emissions would not have happened without the buyer's intervention – and the conditions under which any form of shared attribution of impact (co-claiming) might be acceptable in the multi-statement model, signalling that this area is still evolving rather than settled.

In parallel, the SBTi is moving toward recognising only “high-integrity interventions” for Scope 3 target achievement, which may influence how different SAFc models are treated as rules mature. The practical implication is clear: SAFc should be viewed as an emerging evolving pathway, purchases must align with the AMI quality guardrails today and expect market and program recognition to track those safeguards as standard-setting progresses.

Market perspective: transparency, accounting & reporting system

Scope 3 decarbonization has entered a more complex phase, where **market instruments (including SAFc) are becoming essential to address hard-to-abate emissions** toward 2030 and beyond.

However, market stakeholders interviewed for this research agreed that the credibility and scalability of these mechanisms depend on harmonized accounting guidance, transparent reporting systems, and robust safeguards against double counting across the full lifecycle.

Today, fragmentation in standards, lifecycle boundaries, and disclosure requirements is seen as the main barrier to market confidence, creating uncertainty over what qualifies toward climate targets. Clear eligibility criteria, interoperable registries, independent verification, and digitalized infrastructure are seen by economic operator as critical to ensure environmental integrity and consistent cross-jurisdictional reporting. In addition, further alignment between accounting standards and regulatory frameworks is viewed as the key trigger for unlocking investment and scaling SAF markets.

6. Overview of SAF use Ecosystem and Private Promotion Programs

Private Sector Engagement in the SAF Use Ecosystem

In the private sector sphere, the SAF use ecosystem relies on coordinated actions across different stakeholders involved. Airlines, corporates, investors, registries and standard-setting bodies each play a distinct role, but no single actor can scale SAF independently.

Customers create the **demand signal** that underpins new production, while **B&C systems** provide the **trusted infrastructure needed** for credible and traceable claims. In parallel, **investors** supply the **capital** required to develop production and distribution capacity and support long-term offtake agreements; and **standards** safeguard integrity, **consistency and transparency** across the value chain.



Source: World Energy, Collaboration Across the Sustainable Aviation Value Chain

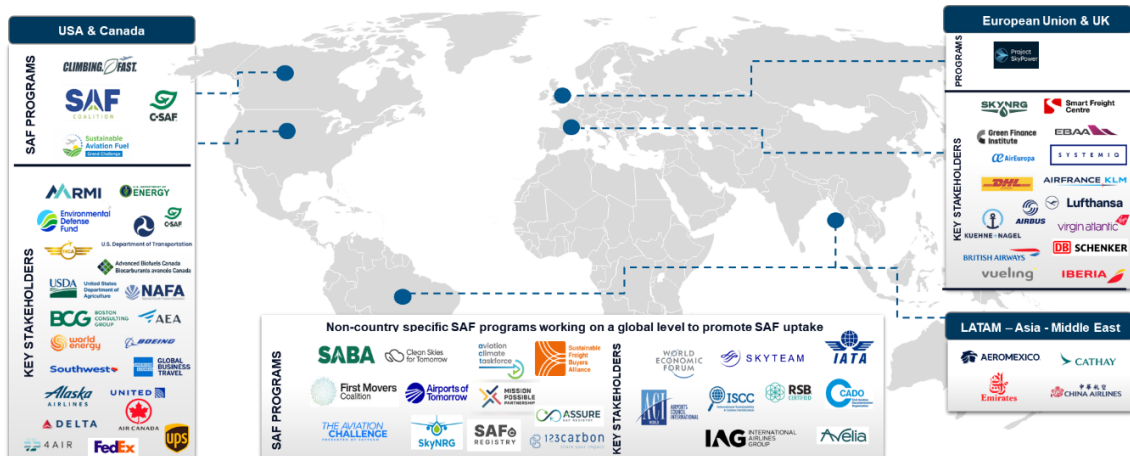
When these elements are effectively aligned, confidence is reinforced across the market enabling SAF to scale from early projects toward a global decarbonization solution.

Overview of SAF Programs and Stakeholders

The SAF ecosystem is becoming increasingly global, driven by a growing number of private initiatives aimed at boosting SAF adoption and reducing aviation-related GHG emissions. Although many programs originate at national or regional levels, most operate internationally, influencing demand signals, technical standards, and cross-border coordination.

Stakeholders are identified by their home region, but their activities span worldwide, reflecting a rapidly evolving market. **Key activity clusters are emerging in North America, Europe, and Asia**, each adding distinct strengths—from policy leadership and early offtake commitments to logistics integration and certification expertise. Together, these dynamics are raising awareness and enabling a more connected, coordinated, and mature global SAF ecosystem.

Global mapping of key SAF programs and stakeholders



Source: Own

Key Stakeholders for Driving SAF Demand Scale-up

Scaling SAF, among several factors, depends on the effective engagement of key stakeholders' groups that collectively drive the demand generation and market development through private-led programs and initiatives.

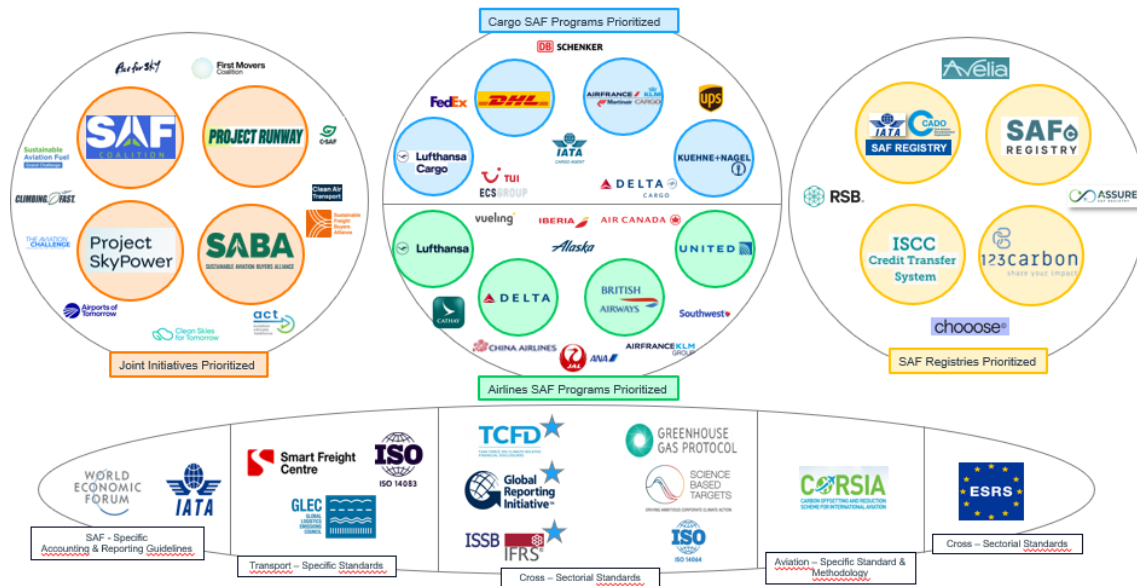
Private-sector actors are translating ambition into **operational SAF deployment and credible climate action**. Across the aviation value chain, companies are launching SAF promotion programs that aggregate demand, mobilize financing to de-risk supply, streamline B&C systems and strengthen the integrity of Scope 3 emissions participation. While each initiative follows its own model, together they illustrate how **private actors are shaping early market dynamics**, learning by doing, and accelerating the conditions for SAF scale-up.

Notwithstanding other actors across SAF value chain, this report focuses on four groups, with a critical role in enabling SAF demand scale-up:

1. **Joint initiatives** coordinate knowledge and ambition and set common frameworks across the value chain.
2. **Airlines**, through private SAF programs, translate ambition into concrete offtake, operational deployment and customer engagement.
3. **Air-freight operators**, through private SAF programs, amplify impact by mobilizing multi-actor demand across complex logistics chains.
4. **Certificate registries** provide the trusted infrastructure that ensures SAF claims are credible, exclusive and traceable. This is the foundation upon which accounting integrity, certificate robustness and market interoperability must come together to unlock growth.

An overview of the most relevant actors within these prioritized groups is provided below.

Map of key stakeholders, Programs and Standards



Source: Own

Joint initiatives

Across regions and sectors, a growing number of coalitions are emerging to **coordinate decarbonization ambitions, aggregate demand, shape policy signals, accelerate technology pathways, and establish shared guardrails for climate integrity and accounting within the aviation industry**. These initiatives bring together airlines, corporates, fuel producers, financiers, airports, and NGOs to create the conditions under which SAF can mature from niche supply to a globally scalable climate solution.

This landscape shows the variety of collaboration emerging across the SAF ecosystem, ranging from demand-side alliance and market design coalitions to policy-shaping platforms and technical taskforces.

SAF Joint Initiatives



Source: Own

Airlines private programs

Airlines are turning climate commitments into **actionable programs** that make SAF participation simple and credible for customers. Through integrated corporate offerings, combining fuel procurement, B&C systems, audited documentation and certificate retirement, these initiatives convert demand into **real offtake**, unlock co-investment from business travel and cargo, and enable **verifiable Scope 1/3 pathways** without compromising inventory integrity. Taken together, these programs demonstrate how airlines can mobilize demand at scale and accelerate SAF deployment across the aviation value chain.

SAF Airline programs					
Passengers – Compensated Program - Launched in 2019. Global scope. - Digital consumer (and corporate) platform enabling passengers (and businesses) to offset CO₂ from flights through SAF or high-quality climate project. - SAF management via IATA-CADO.	Corporate SAF Programme (Passengers & Cargo) - Launched in 2022. Global scope. - Enables corporate customers and forwarders to purchase SAF for uplift on Cathay Pacific passenger and cargo flights, helping offset Scope 3 emissions and allocating benefits to companies.	Eco-Skies Alliance - Launched in 2021. US and global scope. - Corporate SAF purchase program where companies co-invest in SAF to reduce their Scope 3 emissions from business travel. SAF use in United flights allocating benefits to companies. - IATA CADO, ISCC and SAFc registries user.	SAF Program (Choose platform) - Early SAF initiatives in 2020 and digitally scaled in 2025 via Choose platform. Global scope. - Corporate program enabling companies to co-invest in SAF for their travel and cargo shipments (scope 3 reduction). - SAF management via IATA CADO.	Corporate SAF Program - Launched in 2020. EU & global scope. - Allows corporate customers to opt into SAF use for cargo and passenger flights. The program is integrated with KLM's cargo SAF initiative. - Management via IATA CADO.	CO₂laborate (Corporate Passenger Program) - Launched in 2022. Global scope. - Book-and-claim SAF credit portal (via Choose platform), where companies can purchase SAF, carbon offsets or removals tied to their flights. - Relevant SAF promoter airline.
AF Beta / Business Assist (Choose platform) - Launched in 2021. USA primary scope. - Corporate SAF claims tool integrated in Business Assist platform, allowing corporate clients to purchase SAF claims and offsets covering Scope 3 for business travel.	SAF Carbon Reduction Program for Corporate Business Travel - Launched in 2025. China primary scope. - Use locally produced SAF for corporate business travel, allowing offset emissions through carbon credits. - Limited information.	Leave Less Travel Program - Launched in 2021. Canada & global scope. - Corporate & cargo opt-in program, allowing businesses to calculate, choose, and purchase SAF attributes/carbon offsets credits. - Clients received certified scope 3 GHG reductions.	Ever Green SAF Corporate Credit Program - Launched in 2022. USA scope. - First airline to manage SAF certificate transactions end-to-end via a registry end-to-end integrated solution (SAF-c Registry) with Choose digital platform.	Circulo SAF Corporate Program - Launched in 2025. EU-IAG network scope. - Companies can reduce Scope 3 emissions from business travel and cargo through uniquely allocated and audited SAFc. - Future registry management via IATA-CADO.	Passenger Opt-In for SAF (via Avikor) - Launched in 2022. EU-IAG network scope. - Passenger-centered program, inviting SAF voluntary purchase during booking. Raises passenger-based SAF demand and empowers passengers via opt-in contributions.

Source: Own

Airfreight private programs

Airfreight operators are emerging as key drivers of SAF adoption, promoting dedicated programs to mobilize shippers, freight forwarders and logistics networks around credible - value chain climate action. By combining SAF procurement with B&C mechanisms, audited documentation and tailored cargo solutions, these initiatives unlock **multi-actor demand**, reduce the carbon intensity of global supply chains and extend SAF uptake beyond passenger travel. Together, they demonstrate how the cargo sector can accelerate early-market scale-up by transforming complex logistics flows into **structured, verifiable SAF engagement pathways**.

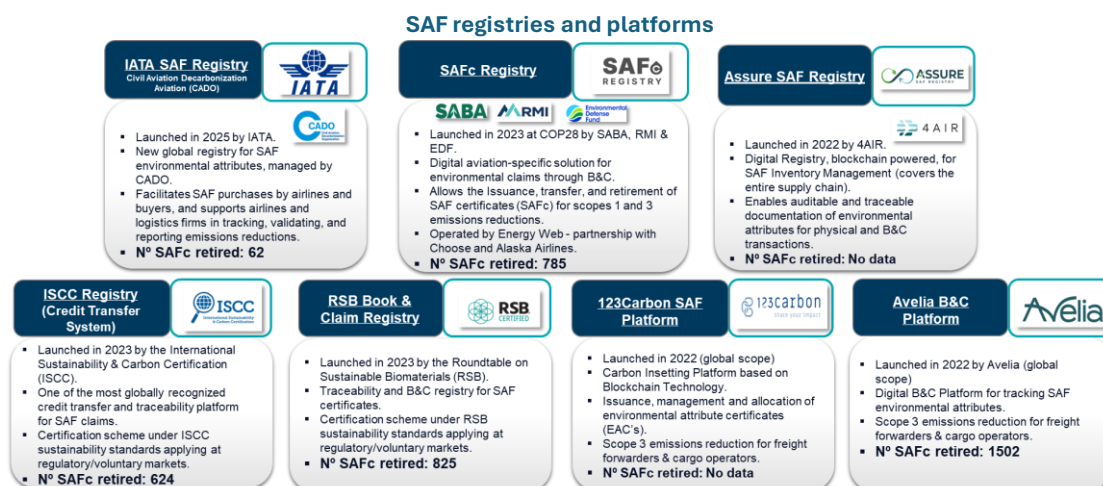
SAF cargo programs					
DHL Express GoGreenPlus SAF Program - Launched in 2023 in partnership with IAG Cargo. - Carbon-inset air freight solution offering scope 3 GHG reductions in air shipment. - First global express logistics service to offer SAF-based inseting solutions. - SAF management via IATA-CADO.	Air freight Carrier Sustainability Programme - Launched in 2025. - Provides SAF-based air freight options across all routes and airlines, via logistics provider. - Agreements (MoUs) signed with more than 14 global airlines, supported by verifiable certificates. - Option to offset residual emissions via VCS & GS.	Cargo SAF Program - Launched in 2022. - Enables cargo customers to reduce carbon footprint via SAF tailored contributions or shipment-level add-ons. Integrated into Delta's broader Path to Net Zero initiative to cut cargo emissions.	Cargo - Sustainable Choice Program - Launched in 2021. - Add-on carbon-inset airfreight service combining SAF use and high-quality climate projects. - Available on all routes with a freighter segment, all product groups and customers worldwide. - SAF management via IATA-CADO.	Cargo SAF Program - Launched in 2020 - world's first airfreight SAF program. - Allows freight forwarders and shippers to purchase SAF volumes and reduce cargo shipment CO₂ emissions subject to robust traceability and certification. - SAF management via IATA-CADO.	SAF Sustainable Freight Program - Launched in 2020-2021. - Offers air-freight SAF via virtual allocation/book-and-claim platforms with customizable environmental attributes for Scope 3 emissions reductions. Flexible Engagement Models for Customers (Carbon X and Buy&Sell).
SAF cargo opt-in (not specific program) - Launched in 2022. First SAF partnership between an airline and ECS Group, which contributes 1% SAF towards the incremental fuel burn associated with the cargo carried on all TUI flights. - TUI allows forwarders to opt in for a 10% SAF blend through logistics choices.	SAF supply Los Angeles Airport (LAX) - No formal customer-facing SAF program is currently available. - In 2025 FedEx partnered with Neste to supply over 3 million gallons of blended SAF at Los Angeles Airport (LAX) (largest SAF purchase by a U.S. cargo airline at LAX).	SAF cargo opt-in (not specific program) Corporate target for SAF to cover 30 % of air-fleet fuel by 2035 as part of UPS's net-zero roadmap.	CargoNet Calculation Tool Digital platform to help freight forwarders and cargo operators calculate, certify, and report carbon emissions from air freight operations.		

Source: Own

SAF certificate registries

Registries are the **trust infrastructure** of the SAF market, converting fuel batches into **traceable, uniquely owned environmental attributes through the issuance**, transfer and retirement of certificates with auditable records, preventing double counting and enabling clean B&C systems across geographies.

Through data standardization, alignment with sustainability certification schemes, and integration with airline and corporate initiatives, these platforms **convert SAF transactions into credible verifiable claims**, reinforcing **accounting integrity** and providing the interoperability required for the SAF ecosystem to scale with confidence.



Source: Own

7. Future trends and Conclusions

Key enablers for SAF scale-up

The next phase of SAF deployment will be driven by a combination of **policy ambition, financing mechanisms, technology diversification and data standardization**. Clear and long-term market signals – through regulatory mandates, incentives and procurement agreements – will remain critical to unlocking investment in production pathways beyond HEFA, especially in synthetic SAF.

At the same time, the sector is advancing decisively toward **standardization, digital integration and automation**, as registries, platforms and corporate promotion programs converge around batch-level traceability, harmonised reporting datasets and automated issuance-transfer-retirement processes.

Across market stakeholders interviewed in this research, one message stands out: **market confidence depends on accounting clarity**. As long as Scope 3 rules remain fragmented across frameworks, demand will continue to grow unevenly. However, once key standards – particularly, from the GHGP and SBTi – finalize their guidelines, the transition from early interest to committed SAF purchasing is expected to accelerate significantly.

SAFc Market Evolution

The SAFc market is entering a new phase in which **integrity is becoming the defining currency**. Stakeholders interviewed increasingly agree that the key question is no longer whether SAFc will play a role, but under what **integrity conditions**. Ongoing work under the GHG Protocol's AMI process and emerging SBTi guidance is steering the market toward high-integrity expectations, with clearer positions on additionality, attribution, and likely eligible certificate structures for future Scope 3 targets. In this context, SAFc should be seen as an **emerging pathway**, where some models may strengthen while others face increased scrutiny.

As these guardrails take shape, a new dynamic is emerging: **a market price for integrity**. Certificates that demonstrate higher credibility, transparent documentation, and alignment with recognised climate frameworks are already attracting greater confidence and willingness to pay. Conversely, instruments with weaker safeguards risk losing relevance, as buyers and auditors favour structures that minimize reputational and regulatory risks. Looking ahead, the evolution of SAFc will depend on **interoperable registries and harmonised digital infrastructure**, ensuring that claims remain consistent, comparable and trusted as the market matures.

Corporate Roadmaps

Companies are entering a transition phase in SAF adoption. Today, most rely on **contractual SAFc**, as physical supply remains limited and unevenly distributed – making B&C the primary mechanism for participation. As new production pathways emerge – especially **synthetic fuels and more decentralised production hubs** – physical supply will gradually move **closer to where emissions occur**. When that happens, a growing share of climate impact will be reflected directly in **physical Scope 1 and Scope 3 inventories**, reducing reliance on purely contractual attribution in certain markets. Accounting frameworks must adapt accordingly, remaining flexible enough to recognize real physical use while continuing to provide credible pathways for participation where local SAF supply is still constrained.

For corporates, the roadmap is therefore twofold. In the **near term**, the priority is to **act with confidence**: adopt high-integrity certificates, follow best-practice guardrails, and alignment across sustainability, procurement and finance. In the **medium term**, companies should prepare to **report contributions and physical impacts separately** in line with GHGP and SBTi final guidance and rules. Looking ahead, organisations should anticipate a more **hybrid landscape**, where physical SAF, contractual instruments, and localized production coexist, ensuring that strategies can adapt to changing availability, accounting boundaries and market expectations.

Conclusions & Call to Action

The coming years will be decisive for the trajectory of aviation decarbonization. SAF will only scale if policy, finance, supply, digital infrastructure and accounting rules evolve in parallel, and it is precisely at this critical intersection where private-sector leadership is most needed. SAFc remain a valuable bridge for early participation in the market, but its long term relevance will depend on the development of high-integrity standards through initiatives such as the GHGP AMI and SBTi.

The path forward is clear: accelerate SAF market participation while ensuring robust integrity safeguards. Scaling real SAF supply, deploying high quality certificates with exclusive ownership and transparent retirement, and reporting climate contributions with precision will be essential. If the sector aligns around interoperable registries, harmonized standards and informed corporate demand, today's fragmented early market can evolve into a **trusted, scalable and coordinated driver of aviation decarbonization**, enabling a system-wide transformation.

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