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EU SAF CLEARING HOUSE

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Sustainability Certification Guidelines and Ad-hoc Support

EU Sustainable Aviation Fuel (SAF) Clearing House

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GLOSSARY

Abbreviation	Description
AF	Alternative Fuels - Fuels derived from sources other than petroleum, including biofuels, RFNBOs, and synthetic fuels
BAT	Best Available Techniques - Technology and methods that represent the most effective and advanced stage in the development of activities to limit emissions and environmental impacts.
CB	Certification Body - An independent auditing firm that verifies compliance with sustainability criteria and issues certificates under a recognised sustainability certification scheme
SAF CH	Sustainable Aviation Fuel Clearing House - A technical interface supporting SAF producers in certification and regulatory compliance under EU frameworks
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation - An ICAO program to stabilize net CO_2 emissions from international aviation, based on certified use of low-carbon SAF and offsetting mechanisms.
DA	Delegated Act - A legal instrument under EU law used to specify detailed rules within a legislative framework, e.g., for RFNBOs and GHG accounting.
EF	Emission Factor - A coefficient that quantifies the emissions associated with a given activity, input, or process, expressed typically in gCO_2e/MJ.
EU RED (RED II/ RED III)	Renewable Energy Directive - EU directive setting sustainability criteria and renewable energy targets, including rules for the certification of biofuels and RFNBOs.
GHG	Greenhouse gas - Gases such as CO_2, CH_4, and N_2O that contribute to climate change. GHG emissions are assessed across the fuel lifecycle for sustainability certification.
ICAO	International Civil Aviation Organization - A specialized UN agency that sets global aviation standards, including the CORSIA sustainability framework.
ILUC	Indirect Land-Use Change - Land-use changes driven indirectly by the expansion of biofuel feedstock cultivation, potentially leading to increased GHG emissions.
ISCC	International Sustainability and Carbon Certification - A globally recognized voluntary sustainability certification scheme for biomass and bioenergy.
LCA	Life Cycle Assessment - A method to evaluate environmental impacts across all stages of a product's life—from raw material to final use and disposal.
MRV	Monitoring, Reporting and Verification - A structured process for tracking and validating GHG emissions and sustainability performance, particularly under CORSIA.
PtL	Power-to-Liquid - A process for producing synthetic fuels using renewable electricity and CO_2 or other non-biological carbon sources; a type of RFNBO.
RCF	Recycled Carbon Fuel - Fuel produced from non-renewable waste streams or gases that would otherwise be emitted into the atmosphere.
ReFuelEU Aviation	Regulation (EUE) 2024/2405 - A regulation mandating minimum shares of SAF at EU airports to decarbonize aviation.
RFNBO	Renewable Fuel of Non-Biological Origin - A liquid or gaseous fuel produced using renewable energy, excluding biomass. Includes e-fuels such as synthetic kerosene.

Abbreviation	Description
RSB	Roundtable on Sustainable Biomaterials - A voluntary sustainability scheme recognized by both the EU and ICAO, focusing on environmental and social criteria.
SAF	Sustainable Aviation Fuel - A renewable or low-carbon aviation fuel that meets sustainability and GHG reduction criteria, and is used to reduce aviation's climate impact.
SCS	Sustainable Certification Scheme - A system for assessing and verifying that fuels meet defined sustainability and GHG performance standards
ScRL	Sustainability Certification Readiness Level - A proposed scale assessing a producer's preparedness for SAF sustainability certification, used within the EU Clearing House
UDB	Union Database - The centralised European platform for tracking certified biofuels and RFNBOs, ensuring traceability and avoiding double-counting

1. INTRODUCTION

The decarbonisation of aviation is a central pillar of the European Union's climate strategy, reflected in key policies such as the ReFuelEU Aviation Regulation, the Renewable Energy Directive (RED III), as well as the ICAO CORSIA framework. At the heart of these policies lies the concept of sustainability, which today is a prerequisite for the production and deployment of Sustainable Aviation Fuels (SAF).

Sustainability frameworks for alternative fuels have been developed over decades for road applications and subsequently extended to other transport modes. In particular, the European approach - as described in the Renewable Energy Directive and its recasts - has paved the way. As of today, sustainability frameworks are implemented through Sustainability Certification Schemes (SCSs), both at European as well as at International scale.

This work is designed to support SAF producers in understanding and navigating the complex landscape of sustainability certification in both EU and international (ICAO/CORSIA) contexts. The aim is to provide practical, targeted guidance and tools that facilitate compliance and foster market uptake of SAF, while ensuring alignment with environmental and regulatory goals.

These outputs have been developed within the framework of the EU SAF Clearing House (CH) pilot initiative, which seeks to provide structured technical and regulatory assistance to SAF producers. The CH acts as an interface between producers and certification bodies, offering services that range from pre-screening assessments to ongoing monitoring of regulatory developments.

This deliverable has been developed to support new SAF producers to better understand the sustainability landscape, with a focus on the EU and CORSIA approaches. It presents a comparative review of the main sustainability frameworks applicable to Sustainable Aviation Fuel (SAF) production — the EU Renewable Energy Directive (RED III), ICAO's CORSIA scheme. It outlines key regulatory and reporting obligations, greenhouse gas (GHG) reduction requirements and calculation methods, eligible feedstocks, and the sustainability principles applied across the two systems. A practical tool — the Sustainability Readiness Level (SRL) — is introduced to help SAF producers assess their preparedness for certification and identify the most suitable compliance pathway for their fuel.

2. OVERVIEW OF SUSTAINABILITY REQUIREMENTS AND CERTIFICATION PROCESS AT EU LEVEL

The principal policy frameworks governing alternative fuels, outline specific methodologies for calculating greenhouse gas (GHG) emissions and verifying compliance with reduction targets. These frameworks rely on internationally recognized lifecycle assessment (LCA) approaches, particularly those established under the ISO 14000 series on environmental management, with ISO 14040 and ISO 14044 being central references. According to ISO, LCA evaluates the environmental impacts of a product throughout its entire life cycle—from raw material extraction to production, use, and disposal ("cradle-to-grave"). In the context of alternative fuels, carbon accounting typically focuses solely on GHG emissions. In particular, the European approach - as described in the Renewable Energy Directive and its recasts - has paved the way.

The certification process involves assessing whether a product meets a defined set of criteria. These criteria can be legally binding, used to demonstrate compliance with regulatory frameworks (such as the RED in EU) and/or connected to eligibility for incentives or financial instruments (e.g. US IRA). The “certificates” typically provide information about key attributes such as the origin of the energy, as well as the time and place of production. These details enhance transparency and allow consumers or investors to understand the source and sustainability profile of the energy they are purchasing. Certificates can vary in scope: some only indicate the energy's origin (commonly referred to as “guarantees of origin”), while others provide a broader overview of sustainability-related characteristics like land use or water impact (referred to as “sustainability certificates”). The European Union’s Renewable Energy Directive (RED) illustrates both approaches: Article 19 mandates disclosure of energy origin, while Articles 29 and 30 focus on environmental sustainability, giving rise to verification schemes tailored to these requirements.

A “certification scheme” (or system) goes beyond issuing individual certificates. It comprises the overall governance structure, procedures, and enforcement mechanisms necessary to ensure consistent implementation and compliance. This includes designated institutions (such as issuing or accreditation bodies), registries, and auditing processes.

The various certification processes are in support of specific regulated markets; alternative aviation fuels are an example. As reported in Figure 1, there is a certification ecosystem that requires harmonisation to allow producers to certify a single batch of fuels for various potential markets.

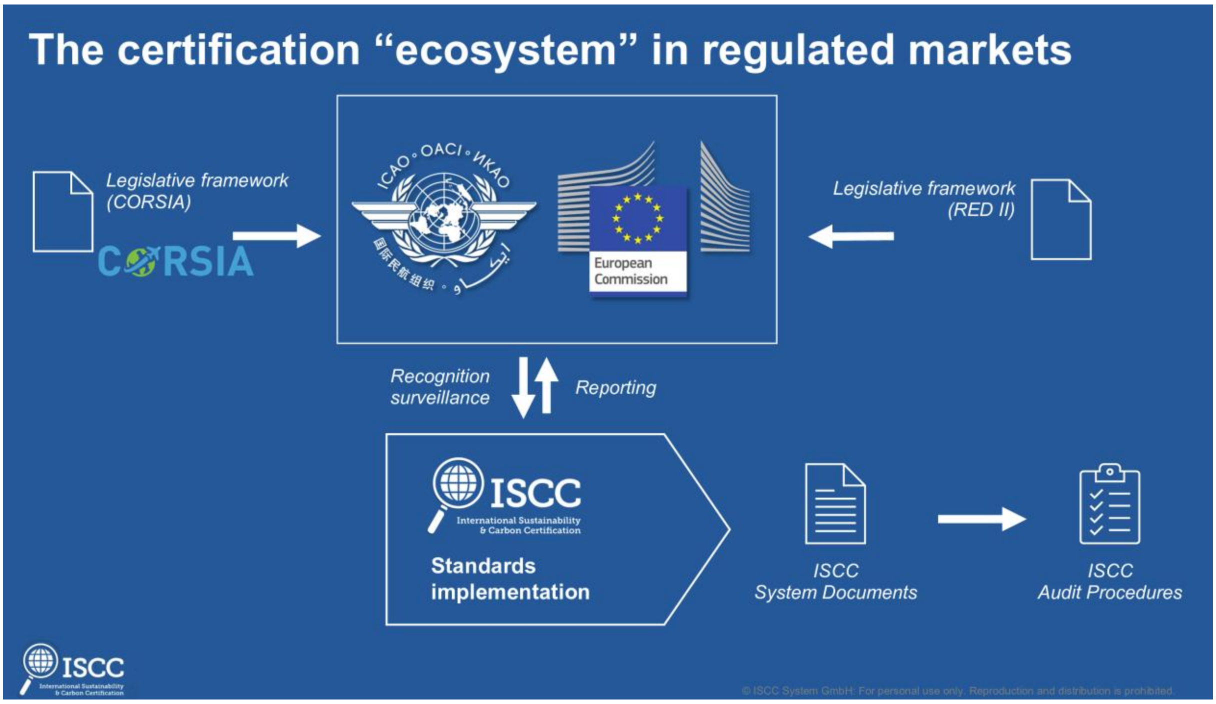

Figure 1. The certification "ecosystem" in regulated markets (Source ISCC)

2.1 THE EU APPROACH TO SUSTAINABILITY

Under the REDII the establishment of voluntary schemes for sustainability certification (SCS) was foreseen. Voluntary schemes and national certification schemes of EU countries are supposed to help ensuring that biofuels, bioliquids and biomass fuels as well as renewable hydrogen and its derivatives (renewable fuels of non-biological origin or RFNBOs), and recycled carbon fuels (RCF) are sustainably produced by verifying that they comply with the EU sustainability criteria.

The schemes check that the fuel producer align with th sustainability criteria set in the EU context. In particular, that:

- The production of feedstock for these fuels does not take place on land with high biodiversity;
- No land with a high amount of carbon has been converted for such feedstock production;
- The biofuel, bioliquid or biomass fuel production leads to sufficient greenhouse gas emissions savings

Several schemes also consider additional sustainability aspects such as soil, water, air protection and social criteria (e.g. ISCC PLUS). For the certification process, an external auditor verifies the whole production chain, from the farmer growing the feedstock to the biofuel producer or trader. While the schemes are run privately, the European Commission can recognise them as valid.

For a scheme to be recognised by the European Commission, it must fulfil criteria such as:

- Feedstock producers comply with the sustainability criteria of the revised Renewable Energy Directive and its implementing legislation;
- Information on the sustainability characteristics can be traced to the origin of the feedstock;
- All information is well documented;

- Companies are audited before they start to participate in the scheme, and retroactive audits take place regularly;
- The auditors have both the generic and specific auditing skills needed with regard to the scheme's criteria.

The decision to recognise a voluntary scheme usually has a legal period of validity of 5 years. As of today, 18 voluntary schemes are recognised by the European Commission[1]. It is worth noticing that the Commission does not supervise the functioning of recognised voluntary schemes. Generally, national systems require or accept as proof of sustainability the certificates issued under the voluntary schemes recognised by the Commission. Overall, all national systems include the use of recognised voluntary schemes, and usually several voluntary schemes operate in each Member State. Therefore, voluntary schemes certify most of the eligible fuel types placed on the EU market.

In the framework of the European Certification process, some definitions are of clear relevance:

- **Certificate**: Attestation by an independent certification body that an economic operator complies with the sustainability requirements for alternative fuels set by the REDII.
- **Certification**: An inspection (certification audit) procedure by means of which the conditions for issuing a certificate to an economic operator are assessed by a certification body.
- **Certification body**: An independent inspection (audit) firm providing certification services for alternative fuels. A certification body concludes an agreement with a voluntary scheme on the certification of economic operators using a voluntary scheme's certification system. Certification bodies issue certificates on behalf of the voluntary schemes.
- **Chain of custody/supply chain**: The whole production chain from the farmer growing the feedstock for the production of alternative fuels up to the fuel producer or trader.
- **Economic operator**: A business producing and/or trading biomass or biofuels. Economic operators have to demonstrate that they comply with sustainability requirements, which can be done in accordance with a national system or making use of voluntary schemes. Economic operators are part of the fuels supply chain.
- **Elements of the supply chain**: Economic operators such as farms/plantations, first gathering/collecting points, traders/warehouses, conversion units (mills, refineries, processing plants), transport and market players (those who bring sustainable alternative fuels into the market).
- **Independent auditing**: The auditing of the information submitted by economic operators. It should verify that the systems used by economic operators are accurate, reliable and protected against fraud. Independent auditing is performed by certification bodies.
- **National system**: The legal framework set by the Member States for verification that economic operators comply with the RED sustainability criteria.
- **Voluntary scheme**: A sustainability certification system established to demonstrate compliance with the sustainability criteria for alternative fuels.

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[1] https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/voluntary-schemes_en

Certification under VS

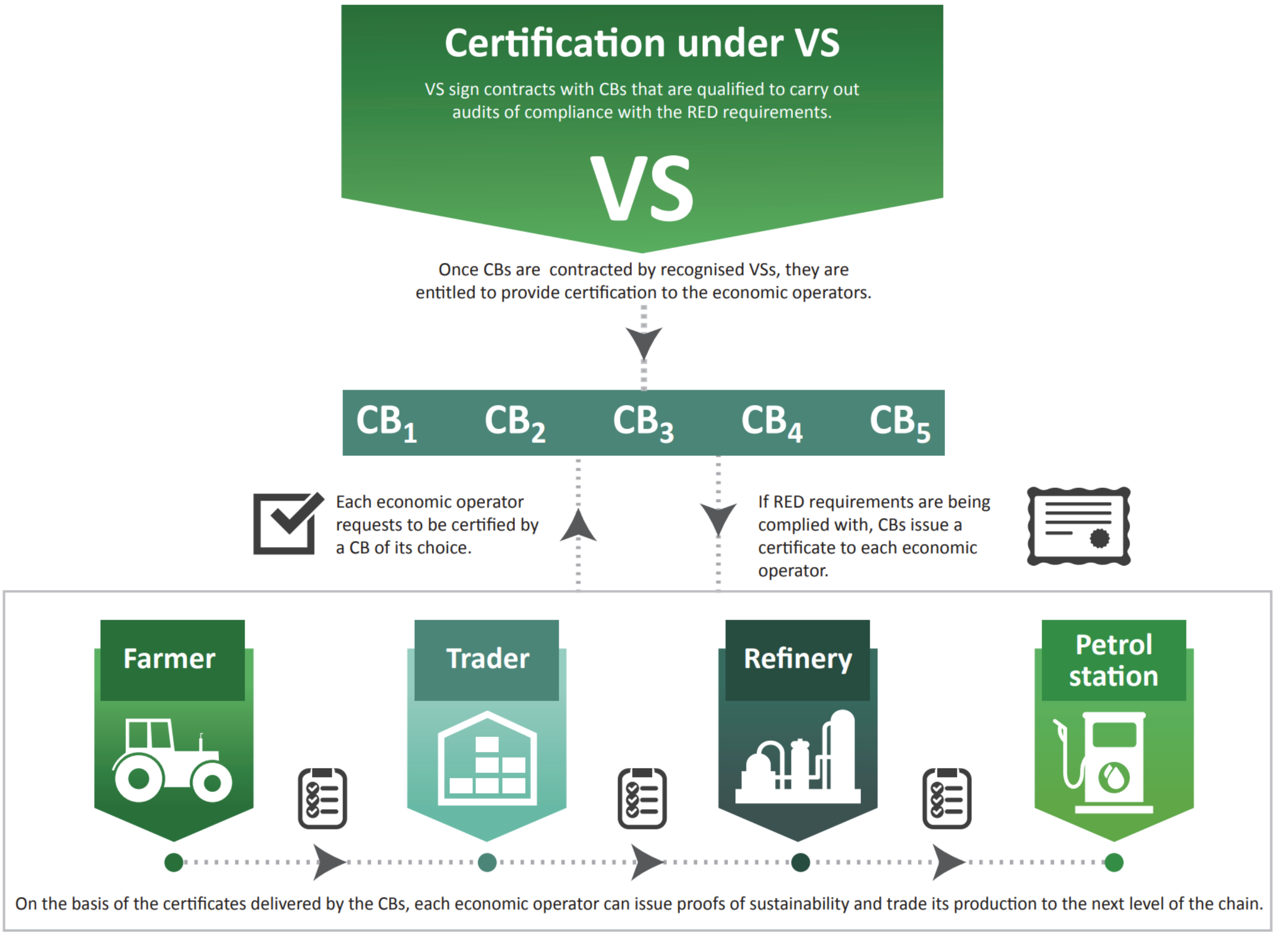


Figure 2. Certification structure under a voluntary scheme (VS – voluntary scheme; CB – certification body. Source: European Court of Auditors.

For the purpose of certification, the entire production chain from the feedstock producer to the alternative fuels producer; should be checked (Figure 1). To carry out the controls, the voluntary schemes rely on independent auditors (e.g., certification bodies (CB)), which certify compliance with sustainability criteria by economic operators on behalf of a voluntary scheme (VS) in accordance with a contract concluded with that scheme. The certification bodies' auditors may carry out document and on-the-spot checks on farmers, first biomass collecting points, warehouses, oil mills, alternative fuels plants and biomass or fuels traders.

One of the key points for any certification procedure is the **establishment of a robust chain of custody**. According to WWF [8], a chain of custody can be defined as: '*The custodial sequence that occurs as ownership or control of the material supply is transferred from one custodian to another in the supply chain*'. This allows for traceability.

As an example, for the Roundtable on Sustainable Biomaterials (RSB) the chain of custody has to provide traceability for the RSB EU RED and/or EU RED Certified Material (e.g. biomass, chemical intermediaries, biofuel, etc.) acquired from and/or delivered to other operators in the supply chain. This procedure also aims to ensure that sustainability claims are based on compliance with the standards of sustainability schemes. To establish such a chain of custody, the operator shall identify and document the employees or third parties involved in the chain of custody system, particularly those responsible for acquisition, handling, and forwarding (including verification of product information). The operator shall have all necessary infrastructure (e.g. software or other tools) and operating procedures in place to effectively operate the chain of custody system and ensure that the documentation can be tracked continuously without interruption through all processing and trading steps taking place within the scope of certification between the acquisition of the material and forwarding to clients.

Examples of the needed information for an industrial unit are (these records have to be kept for 5 years):

- List of all suppliers of certified material, and a copy of their valid certificates;
- Purchase documents including, e.g. purchase orders, contracts, invoices, goods receipts inspections, delivery notes and received quantities;
- Processing information, including the conversion factors and specification of quantities of materials and products, stored and finished;
- Production records;
- Sales orders, sales invoices, dispatch information, including dates, customers to which the batch or lot was dispatched, delivery records;
- Stock records including inventory balancing;
- Transporter or shipper details;
- Records of mass balance calculation (if relevant);
- List of sites, status (in production/not in production),
- Chain of custody model employed.
- List of all recipients of certified material (e.g. collection points, storage facilities, warehouse, traders), including their address and contracts.
- Additional sites used by the operator but owned by third parties

There are several options for the chains of custody:

Identity Preservation (IP): This model guarantees that certified products originating from certified sites remain fully segregated from other materials. When applied consistently across the entire supply chain, it enables precise tracking of certified products from their point of origin - linked to a specific production site and batch (the sustainability certificate holder) - to the final stage of processing, labelling, or claim usage. Under an identity preservation (IP) system, both the product and its accompanying documentation can be traced back to a single, identifiable source. Each lot, batch, or shipment of certified material is managed independently, ensuring clear separation—both physically and in documentation—from other certified or non-certified products at every stage of the supply chain.

Figure 3. The IP chain of custody example. The numbers represent a hypothetical unit or volume of product. (source: ISEAL alliance[2]).

Segregation (SG): This model ensures that certified products remain physically separated from non-certified materials at every stage of the supply chain, providing confidence that the components used in a final product come exclusively from certified sources, even if it is not possible to trace each individual molecule to a specific origin. In a Segregation Chain of Custody system, certified materials may be blended, but only with other materials that are certified to the same standard or standards recognized as equivalent. Although the physical products may be mixed, their certification status remains intact, and the documentation must clearly distinguish between certified and non-certified materials. This documentation can be used to track each batch, lot, or consignment of certified material independently. It may also include origin details, allowing claims to reflect sourcing from a particular region or country, even when materials have been physically combined.

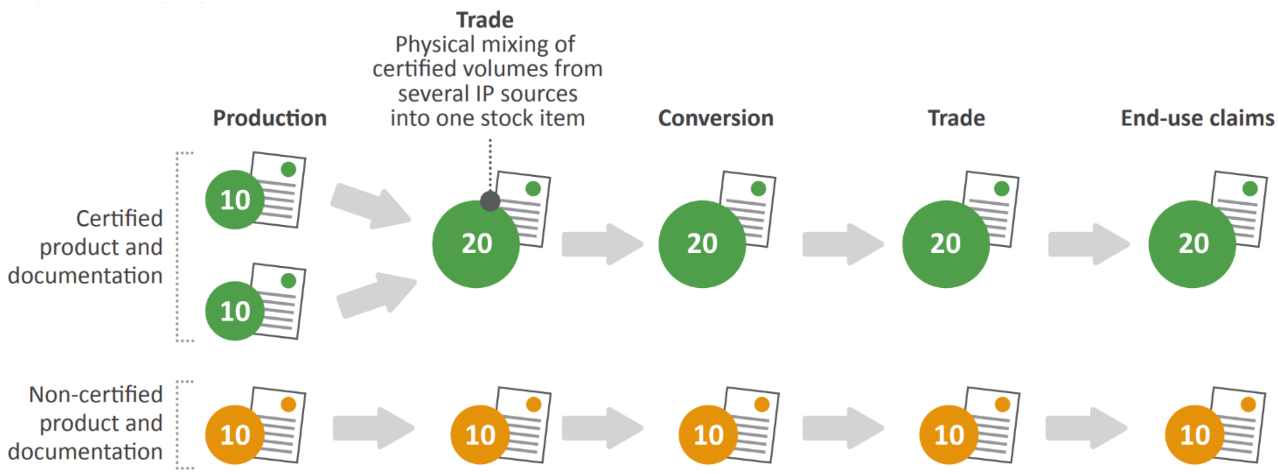


Figure 4. The SG chain of custody example. The numbers represent a hypothetical unit or volume of product. (source: ISEAL alliance[3]).

[2] ISEAL Guidance: Chain of custody models and definition. https://isealalliance.org/get-involved/resources/iseal-guidance-chain-custody-models-and-definitions

[3] ISEAL Guidance: Chain of custody models and definition. https://isealalliance.org/get-involved/resources/iseal-guidance-chain-custody-models-and-definitions

Mass balance: mass balance is an overarching term for various slightly different types of chain of custody which involve balancing volume reconciliation. As defined by Article 30 of Directive (EU) 2018/2001, a mass balance system:

- (a) allows consignments of raw material or fuels with differing sustainability and greenhouse gas emissions saving characteristics to be mixed for instance in a container, processing or logistical facility, transmission and distribution infrastructure or site; and
- (b) allows consignments of raw material with differing energy content to be mixed for the purposes of further processing, provided that the size of consignments is adjusted according to their energy content; and
- (c) requires information about the sustainability and greenhouse gas emissions saving characteristics and sizes of the consignments referred to in point (a) to remain assigned to the mixture; and
- (d) provides for the sum of all consignments withdrawn from the mixture to be described as having the same sustainability characteristics, in the same quantities, as the sum of all consignments added to the mixture and requires that this balance be achieved over an appropriate period of time.

Under a mass balance system, certified and non-certified physical products may be mixed at any point during the production process, as long as the quantities of certified input and output are accurately tracked and balanced. This system relies on the reconciliation of certified material flows—accounting for all variations and derivatives of the original certified product—within a defined time frame known as the *reconciliation period*, which prevents indefinite carryover of balances. Volume reconciliation can occur at various levels: batch, site, or group. These levels differ significantly in terms of traceability and auditability, with batch-level offering the highest level of assurance, followed by site-level, and then group-level, where audit precision diminishes. Therefore, it is essential to clearly specify which level is allowed or required in any given context. Mass balance systems may follow either a percentage-based (physical mixing) or volume-based approach, but they do not guarantee the presence of certified material in every unit of the final product, unless batch-level mass balance with physical mixing is used. Within these systems, sustainability-related data can be assigned to any outgoing product, provided that volumes are strictly controlled and that associated claims are accurate and not misleading. Certified product transactions across the supply chain are tracked administratively, supporting the integration of certified products into mainstream markets. In some mass balance frameworks, additional controls are applied to the non-certified material that is mixed with, or volume-reconciled against, certified material to maintain the integrity of the system. Documentation typically reflects the aggregated mix of certified lots, batches, or consignments.

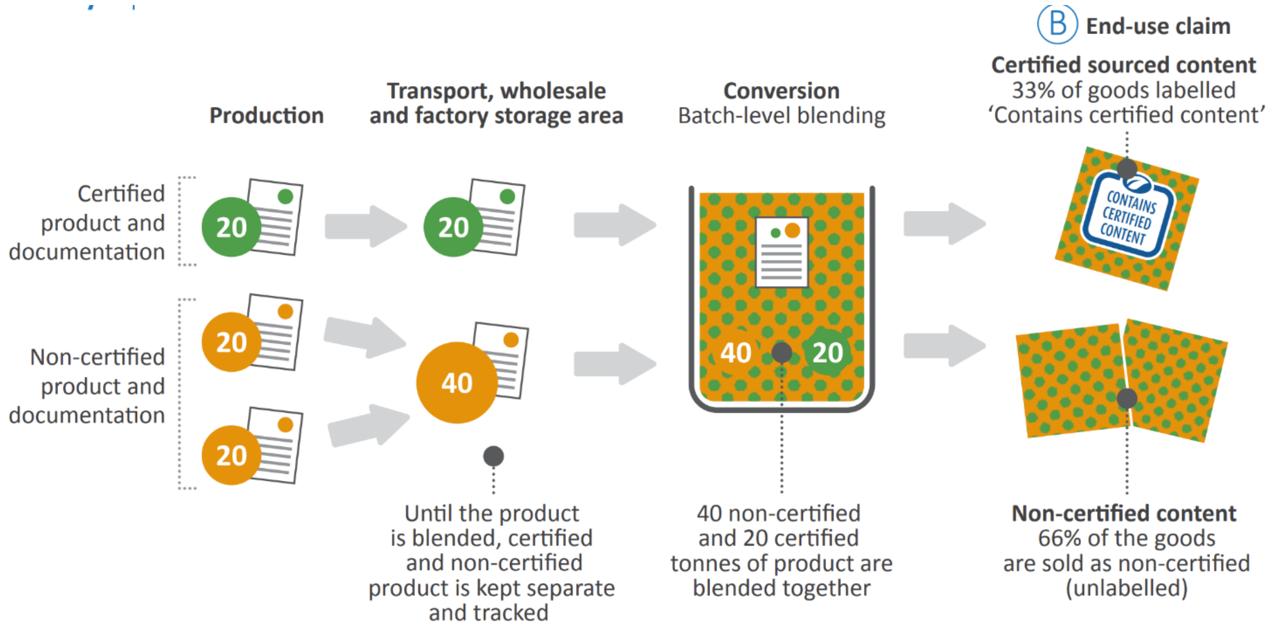


Figure 5. An example of mass balance based chain of custody (Certified sourced content' claim). The numbers represent a hypothetical unit or volume of product (source: ISEAL alliance[4]).

2.2 THE RENEWABLE ENERGY DIRECTIVE (RED III)

In October 2023, the Renewable Energy Directive 2023/2413 (RED III) entered into force, revising the alternative fuels targets set by the previous version (REDII) 2018/2001. Since the first edition, the Renewable Energy Directive has established a definition for the sustainability of alternative fuels. In particular, in the EU REDII, the sustainability concept is based on several criteria, such as a minimum GHG saving, the expected indirect land use change (ILUC), the biodiversity impact, etc. These criteria are used to define fuel eligibility against the GHG reduction targets.

For fuels produced from biogenic feedstock, specific provisions are set. Biofuels must not be obtained from land with a high biodiversity; land with high-carbon stock, or land that was peatland before January 2008. For forestry-derived feedstock, the resulting biofuels must demonstrate the legality of harvesting operations; allowing for forest regeneration of harvested areas; the respect of the designated nature protection areas, including wetlands and peatlands; additionally, that the harvesting maintains or improves soil quality, biodiversity and the long-term production capacity of the forest.

Another important sustainability aspect for biofuels is the indirect land use change (ILUC). The background of this concept is related to the possibility that biofuels production may trigger the need for additional land to cover the feed and food demand, indirectly pushing for a change in the current use of land with potential related CO_2 emissions. To address the issue of ILUC in the Clean Energy for All Europeans package, the revised Renewable Energy Directive introduces **a** risk-based approach: it sets limits on high ILUC-risk biofuels, bioliquids and biomass fuels with a significant expansion in land with high carbon stock. These limits will affect the amount of the fuels that Member States can count towards their national targets when calculating the overall national share of renewables and the share of renewables in transport. The

[4] ISEAL Guidance: Chain of custody models and definition. https://isealalliance.org/get-involved/resources/iseal-guidance-chain-custody-models-and-definitions

directive also introduces an exemption from these limits for biofuels, bioliquids and biomass fuels certified as low ILUC-risk. For the implementation of this approach, as required by the directive, the Commission has adopted the Delegated Regulation (EU) 2019/807. It has to be highlighted that, conversely from other approaches (i.e. CORSIA), ILUC is not calculated under REDII.

Under the Renewable Energy Directive (REDIII), feedstocks are categorised as per Annex IX. In particular, the Annex IX is divided into two parts: Part A, which contains feedstock from which "advanced biofuels" are derived, and Part B. Within the overall renewable energy target for transport, a dedicated share is reserved for advanced biofuels derived from the feedstocks listed in Part A of Annex IX. To further incentivize the use of advanced biofuels and biogas from Annex IX Part A, their contribution may be counted at twice their actual energy content. However, for biofuels and biogas from feedstocks in Part B of Annex IX, their counted contribution is generally capped at 1.7% of the total energy content of transport fuels. Member States can adjust this limit if justified by feedstock availability.

Specifically, biofuels, bioliquids, and biomass fuels made from food or feed crops are subject to a cap: their share cannot exceed one percentage point above their 2020 level in each Member State, and in any case must stay below 7% of the energy used in road and rail transport. For biofuels associated with a high risk of indirect land-use change (ILUC), their share is limited to 2019 consumption levels, unless certified as having a low ILUC risk and progressively phased out.

As for the ReFuelAviation EU regulation, eligible SAF includes:

- **Biofuels**, *excluding those produced from food and feed crops*
- **Recycled Carbon Aviation Fuels (RCAFs)**
- **Synthetic aviation fuels (e.g., Power-to-Liquid or PtL fuels)**

To be accounted for towards the goals for transport (i.e., 29% renewable energy share volume or 14.5% GHG emission reduction by 2030), these fuels must meet sustainability and greenhouse gas (GHG) emissions criteria as outlined in the Renewable Energy Directive (RED II and RED III).

It has to be stressed that ReFuelEU explicitly excludes food and feed crop-based biofuels from eligibility. This includes conventional bioethanol from corn or biodiesel from rapeseed or soybean oil, as these raise concerns over indirect land-use change (ILUC) and food competition.

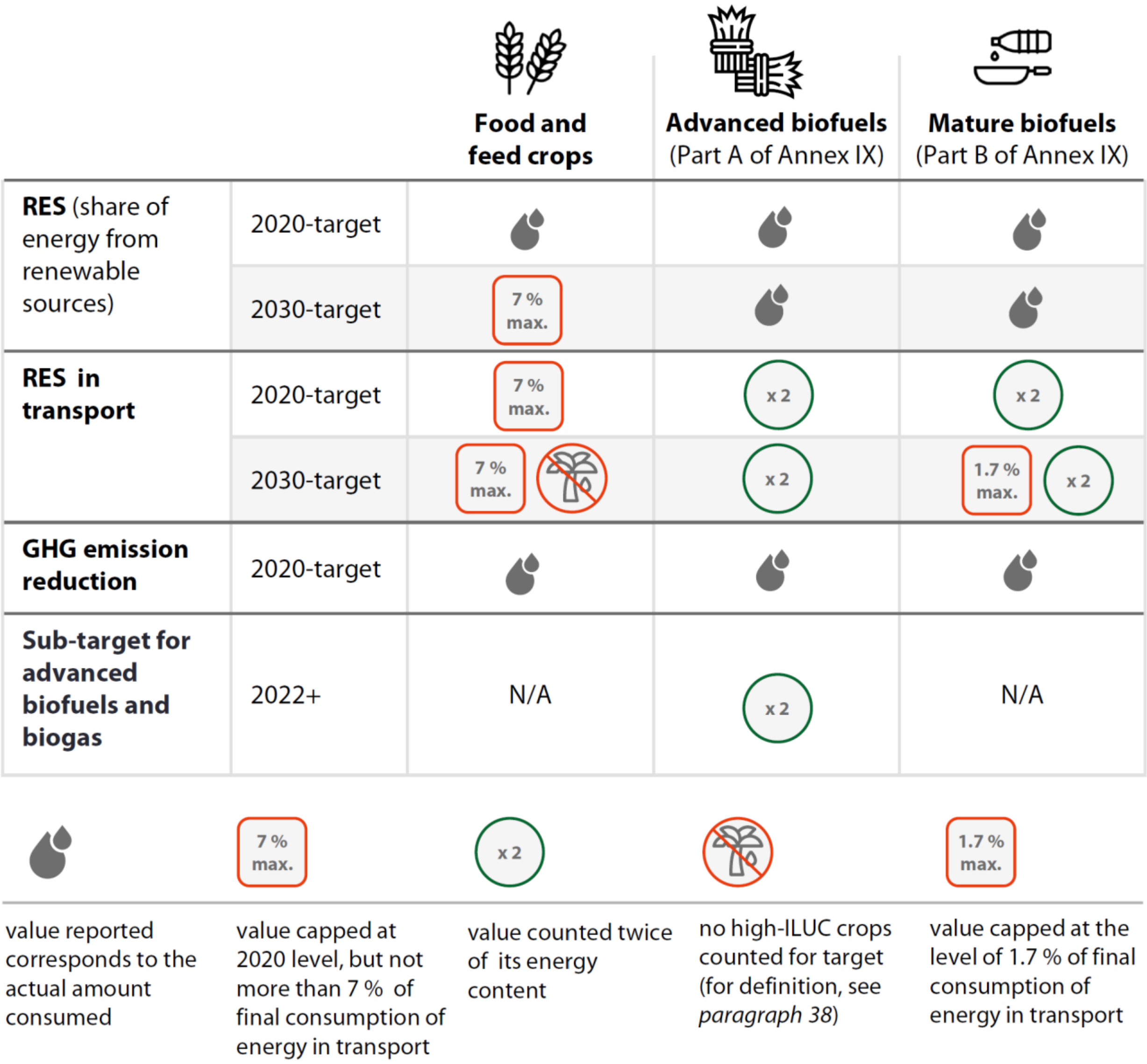


Figure 6 How biofuel types count towards EU targets, in relation to the feedstock used, based on the FQD, RED I, RED II and RED III (Source: ECA[5]).

Besides fuels produced by using biogenic feedstocks, the Renewable Fuels of Non-Biological Origin (RFNBO) (eFuels or Power-to-Liquid) are expected to be key players in the SAF market. The revised REDIII defines RFNBOs, which are liquid and gaseous fuels derived from renewable sources other than biomass. A specific delegated regulation outlines the necessary GHG calculations, as described in the following section.

2.3 RFNBOS FOR THE EU AVIATION SECTOR

The decarbonisation of the aviation sector is central to achieving the European Union's climate goals and international commitments under ICAO. A key innovation in this transition is the development and deployment

[5] The EU's support for sustainable biofuels in transport
An unclear route ahead. https://www.eca.europa.eu/en/publications?ref=SR-2023-29

of Renewable Fuels of Non-Biological Origin (RFNBOs), often referred to as Power-to-Liquid (PtL), synthetic fuels or e-fuels, outside the EU context. These synthetic fuels are derived from renewable electricity and non-biological carbon sources and are considered critical to reducing emissions in sectors where direct electrification may be challenging in the short term. Under the Renewable Energy Directive (EU) 2018/2001 (RED II), RFNBOs are defined as liquid or gaseous fuels used in the transport sector, whose energy content is derived entirely from renewable sources other than biomass. Their role in transport decarbonisation is recognised through their eligibility to contribute to the EU's renewable energy share target in transport by 2030. The updated RED II and related delegated acts also establish a specific GHG emissions savings threshold: RFNBOs must demonstrate at least a 70% reduction compared to the fossil fuel baseline of 94 gCO_2e/MJ.

The Commission Delegated Regulation (EU) 2023/1184 specifies the conditions for the electricity used to produce RFNBOs. In particular, the delegated act (DA) details the rules for the key principles: the additionality and the temporal and geographical correlation between the electricity production unit and RFNBOs production, with the rationale of minimizing the GHG emissions associated with the additional electricity demand caused by the RFNBOs production and limiting potential stress to the electricity grid. Regarding the source of Carbon, the DA defines the conditions under which the emissions of captured CO_2 incorporated in RFNBOs may be subtracted; the rules for co-processing and co-production with conventional fuels and biomass; and the default GHG emissions intensities for common inputs, such as the national grid electricity emissions intensity.

Specification related to RFNBOs establish that the electricity used in their production must be from renewable sources such as wind, solar, or hydropower, but not from biomass. This electricity must be proven to be renewable through temporal and geographical correlation with production, under rules established by the Delegated Act 2023/1184[6].

RFNBOs are relevant for the EU aviation sector, as the ReFuelEU Aviation Regulation (EU 2023/2405) mandates a progressive incorporation of Sustainable Aviation Fuels (SAF) in jet fuel blends, starting at 2% in 2025 and rising to 70% by 2050. A sub-target has been set specifically for synthetic aviation fuels (i.e. RFNBOs), with a minimum share of 0.7% in 2030 and 1.2% in 2032. This reflects the growing strategic importance of RFNBOs within the EU policy mix and positions them as a central pillar of aviation decarbonisation. ReFuelEU Aviation Regulation make use of the REDII structure to define fuel eligibility against the defined targets.

A slightly different case, still regulated by the same Delegated Acts, is the Recycled Carbon Fuels (RCF). 'Recycled Carbon Fuels' (RCFs) are, by definition, derived from non-renewable sources and therefore do not count towards the EU's overarching target for the share of renewable energy in gross final energy consumption. Nevertheless, Member States have the discretion to include RCFs in their renewable energy quotas for the transport sector. This acknowledges the potential of RCFs to reduce greenhouse gas (GHG) emissions by extending the carbon lifecycle, preventing direct atmospheric release. To ensure their climate benefit, both RCFs and RFNBOs must meet a minimum GHG emissions reduction threshold of 70% compared to the fossil fuel comparator set out in RED II. To qualify, inputs must be of non-renewable origin and derived from liquid or solid waste streams that are not suitable for material recovery, or from waste processing gases

[6] Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin

and exhaust gases produced unintentionally in industrial processes. These inputs must comply with the definitions set out in Article 2(35) of RED II. Importantly, the use of these inputs must not result in deliberate production or diversion for fuel use; rather, they must stem from unavoidable waste or by-products, ensuring the circular use of carbon and preventing misuse of the RCF classification.

2.3.1 Specific requirements for RFNBOs certification

RFNBOs, or "renewable fuels of non-biological origin" include liquid and gaseous fuels the energy content of which is derived from renewable sources other than biomass. The exclusion of biomass feedstock implies that RFNBOs are "no food/feed" alternative fuels.

A key element to understand RFNBOs requirements is related to the hydrogen used for their production: the Delegated Act on RFNBOs explicitly states that, in practice, the energy content of nearly all RFNBOs is based on renewable hydrogen produced via electrolysis. This consequently has implications with respect to the electricity used for H_2 production. It is worth noting that IEA in the recent "*Global Hydrogen Review 2024*" identified a large number of schemes available for hydrogen certification[7].

The conditions for confirming the electricity used for RFNBOs production are fully renewable, are set by the RED II and the Delegated Acts on RFNBOs. The rules under which electricity can be considered fully renewable depend on the sourcing scenarios. A basic distinction is made as to whether the electricity is obtained via a direct connection to an installation generating renewable electricity or whether the electricity is obtained via the grid.

The following scenarios for sourcing renewable electricity for the production of RFNBOs are considered:

- **Electricity from directly connected installations**: to qualify, the electricity must be supplied via a direct line or generated on-site, the renewable installation must have commenced operation no more than 36 months before the RFNBO facility, and, if grid-connected, a smart metering system must confirm that no electricity was drawn from the grid. Proper documentation and verification are required to ensure compliance with these criteria.
- **Electricity from a grid with a renewable energy share exceeding 90%**: the RFNBO production facility must be located in a bidding zone where this threshold was met in the previous calendar year, and its annual operating hours must not exceed the proportionate share of renewable electricity. Compliance must be demonstrated using official statistical data, and Guarantees of Origin (GoOs) must be cancelled for the electricity claimed as renewable.
- **Electricity via a grid with an emission intensity lower than 18 gCO2eq/MJ with further requirements**: to qualify, the RFNBO producer must have one or more Power Purchase Agreements (PPAs) with installations generating renewable electricity, covering at least the volume of electricity claimed. Additionally, the requirements for temporal and geographical correlation must be met, and Guarantees of Origin (GoOs) associated with the electricity must be cancelled to avoid double counting.

[7] IEA (2024), Global Hydrogen Review 2024, IEA, Paris https://www.iea.org/reports/global-hydrogen-review-2024, Licence: CC BY 4.0

- **Electricity from the grid avoiding or reducing the need of downward redispatching of installations generating renewable electricity**: electricity from the grid can be counted as fully renewable if its use helps avoid or reduce the need for downward redispatching of renewable energy installations. The RFNBO producer must provide evidence from the national transmission system operator showing that renewable generation was curtailed during the relevant imbalance settlement period and that the electricity used for RFNBO production directly mitigated this curtailment. Guarantees of Origin (GOs) for the electricity must also be cancelled to ensure traceability and prevent double counting.
- **Electricity via the grid with further requirements**: the RFNBO producer must comply with three key requirements: additionality, temporal correlation, and geographical correlation. This involves demonstrating that the renewable electricity was sourced through a Power Purchase Agreement (PPA) with newly built, unsupported renewable installations, and that the electricity used for production aligns in time and location with the generation. Cancellation of Guarantees of Origin (GoOs) is also required to validate the renewable claim.

The key requirements: additionality, temporal correlation, and geographical correlation are of particular importance. Specifically, they are defined as:

- **additionality**: the requirement that the renewable electricity used for RFNBO production must come from installations that contribute to an increase in renewable energy capacity. This condition is met if the RFNBO producer either generates the electricity on-site or contracts it through a Power Purchase Agreement (PPA) with a renewable installation that began operation no earlier than 36 months before the RFNBO production facility. Furthermore, the renewable installation must not have received operating or investment aid, except under specific exclusions such as repowering support or support for research and demonstration purposes. The aim is to ensure that the claimed renewable electricity adds new capacity to the system rather than drawing from existing supported installations.
- **temporal correlation**: the requirement that the renewable electricity used for RFNBO production must be generated within a specific timeframe relative to when it is consumed. Until 31 December 2029, this correlation must be demonstrated on a monthly basis, meaning the electricity claimed as fully renewable must have been generated within the same calendar month as its use. From 1 January 2030, this requirement becomes stricter, mandating an hourly correlation between electricity generation and consumption. This ensures a direct temporal link between renewable electricity production and its application in RFNBO processes, strengthening the integrity of the renewable claim.
- **geographical correlation**: the requirement that the renewable electricity used for RFNBO production must be generated within the same bidding zone where the RFNBO production facility is located. This ensures that the electricity is physically deliverable to the production site within the relevant electricity market. In specific cases, such as long-term congestion or structural limitations within a bidding zone, further evidence may be required to demonstrate that the electricity could reasonably have reached the RFNBO facility. This criterion is essential to ensure

that the claimed renewable electricity has a tangible and traceable connection to the location of RFNBO production.

According to the Delegated Act on RFNBOs, storage units cannot be considered as installations generating renewable electricity.

While the installation generating the renewable electricity does not have to be certified individually, the RFNBO producer needs to demonstrate to the auditor that the renewable electricity sourced from that installation fulfils the requirements for counting sourced electricity as fully renewable.

	Direct connection	Grid connection			
		>90% RES	<18 gCO_2eq/MJ	Imbalance settlement period	Electricity from the grid with further requirements
Additionality	✓*	✗	✗	✗	✓**
Temporal correlation	✗	✗	✓	✗	✓
Geographical correlation	✗	✗	✓	✗	✓
Renewable PPA	✗	✗	✓	✗	✓

* 36 months
** 36 months (transition period criteria applicable to plant installated by 01 January 2028), no operating or investment aid

Figure 7. Type of electricity sources for REFNBOs production, as per the REDII DA (source ISCC)

Another element needed for RFNBOs production is CO_2. When CO_2 is used as a carbon source in the production of RFNBOs or RCFs, such as in reactions with renewable hydrogen to form hydrocarbon fuels, three main types of CO_2 origin can be identified:

1. **Fossil-based waste streams**, such as flue gases from industrial or combustion processes. The CO2 is captured in industries covered by the EU ETS but is allowed only if the full CO_2 price was paid under the ETS (or an alternative CO_2 pricing system, if its imported CO_2 or RFNBO).
2. **Biogenic sources**, CO_2 captured from the production or the combustion of biofuels, bioliquids or biomass fuels, including emissions from processes like alcohol fermentation or anaerobic digestion;
3. **Atmospheric or naturally occurring/geothermal sources**.

Furthermore, in case CO_2 is sourced from non-sustainable sources (fossil fuels), this is allowed only until 2035. Crucially, the CO_2 must not be intentionally produced for the sole purpose of being used in RFNBO or RCF production. If the CO_2 originates from fossil fuels solely to serve as an input for fuel synthesis, the resulting fuel is classified as a fossil fuel. Conversely, if the CO_2 is derived intentionally from biomass for this purpose, the fuel is considered a biofuel, not an RFNBO or RCF.

2.3.2 Carbon accounting rules for RFNBOs

For Renewable Fuels of Non-Biological Origin (RFNBOs) and Recycled Carbon Fuels (RCFs) certified under the EU approved schemes, the greenhouse gas (GHG) emissions must be calculated in accordance with the methodology established by the European Commission under the Renewable Energy Directive (EU) 2018/2001 (recast), annex V and related DAs[8,9]. Given the distinct characteristics of RFNBOs and RCFs, compared to biofuels, bioliquids, or biomass-based fuels, a tailored, though consistent, calculation approach is required.

The carbon intensity (gCO_2e/MJ_{fuel}) from the production and use of RFNBOs or RCFs shall be calculated as:

$$E = e_i + e_p + e_{td} + e_u - e_{ccs}$$

where:

- E total emissions from the use of the fuel,
- ei: emissions from supply of inputs include emissions from different input types and shall be differentiated as: rigid inputs, elastic inputs and emissions from inputs' existing use or fate.
  - ei elastic + ei rigid – $e_{ex\text{-}use}$
    - ei elastic = emissions from elastic inputs: are those whose supply can be expanded to meet additional demand, such as electricity, hydrogen, natural gas, and CO_2 from scalable sources. Emissions from these inputs must be calculated based on the full supply chain, including extraction, processing, and transportation, but excluding combustion-related emissions (which are accounted for separately). When elastic inputs are sourced from within an integrated production system, actual data should be used. If not, default emission values from established databases (e.g. JEC-WTW, Ecoinvent, IPCC) or calculated values provided by input suppliers may be used. Notably, renewable electricity, when properly qualified under RED II criteria, can be counted with zero emissions. However, when using grid electricity that does not meet renewable criteria, a standard emission factor applies—either 0 or 183 gCO_2eq/MJ, depending on temporal correlation with renewable generation.
    - ei rigid = emissions from rigid inputs: are those whose supply cannot be increased on demand - such as waste gases or residues from industrial processes - and are often diverted from existing uses (e.g. energy generation). The section explains that emissions associated with these inputs must include the environmental impact of their

[8] Commission Delegated Regulation (EU) 2023/1185 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a minimum threshold for greenhouse gas emissions savings of recycled carbon fuels and by specifying a methodology for assessing greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuels

[9] Q&A for the certification of RFNBOs and RCF, published on March 14th 2024, in the Voluntary Schemes webpage: https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/voluntary-schemes_en, In the following referred to as Q&A RFNBOs

diversion from prior or alternative uses, such as lost electricity or heat generation, and any additional emissions from transport or treatment. Where direct measurement is not possible, simulations or data based on Best Available Technologies (BAT) should be used to estimate lost outputs. The methodology also distinguishes between existing installations and new ones, applying different rules for estimating emissions based on historical performance or standard benchmarks. Overall, these ensures that the GHG impacts of using rigid inputs reflect the full environmental cost of displacing their original use.

- $e_{ex\text{-}use}$ = emissions from inputs' existing use or fate: this category accounts for avoided emissions that would have occurred if the input had not been used for fuel production. For example, using captured CO_2 that would otherwise be released into the atmosphere can result in GHG savings.

- ep emissions from processing: this covers all direct atmospheric emissions that occur during the fuel production process itself, including those from combustion, waste treatment, and leakages (e.g. from CO_2 or hydrogen). While fully renewable electricity can be accounted with zero emissions, electricity sourced from the grid without meeting the requirements for fully renewable electricity will not be accounted with zero emissions.
- etd emissions from transport and distribution: emissions from transport and distribution shall include the emissions from storage and distribution of finished fuels.
- eu emissions from fuel in use: are generally considered net emissions when combustion produces greenhouse gases such as CO_2, N_2O, and CH_4, regardless of whether the fuel's carbon source is fossil, biogenic, or synthetic. These emissions can be derived from default values or calculated using the existing use (e_{ex-use}) approach. In some cases, e_u and e_{ex-use} may offset each other. However, if combustion does not produce these gases, as with hydrogen or ammonia, the e_u is considered zero.
- $eccs$ emission savings from CO_2 capture and geological storage: carbon emissions from the RFNBO or RCF production are permanently stored in accordance with Directive 2009/31/EC[10], these emissions may be considered as savings under $eccs$ for the products of the process. Emissions from storage operations (including transport of the CO_2) have to be considered under ep.

Additional info about the GHG calculation as well as the rules for the verification schemes that cover each step of the RFNBO supply chain can be found in certification bodies documentation (e.g. ISCC[11]). Certification is mandatory for participation in EU support mechanisms and eligibility for counting towards national and sectoral renewable energy targets.

[10] Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EE.

[11] ISCC EU 205-1 Renewable Fuels of Non-Biological Origin (RFNBO) and Recycled Carbon Fuels (RCF) Greenhouse Gas Emissions

3. SUSTAINABILITY REQUIREMENTS AND CERTIFICATION PROCESS AT INTERNATIONAL LEVEL

At international level, the concept of sustainable alternatives fuel is based on different approaches, in particular in relation to the evaluation of the carbon intensity along the fuel production value-chain. Two main components are key: emission associated with the various steps of the fuel production value-chain, excluding land use change impacts (referred to as "core LCA values" under the CORSIA framework and the California LCFS) and Land Use Change (LUC) impacts. These methodologies are central to sustainability certification schemes and carbon accounting frameworks used in the EU, CORSIA, IMO, and various national systems (e.g., the US, UK, Brazil, Canada, and India).

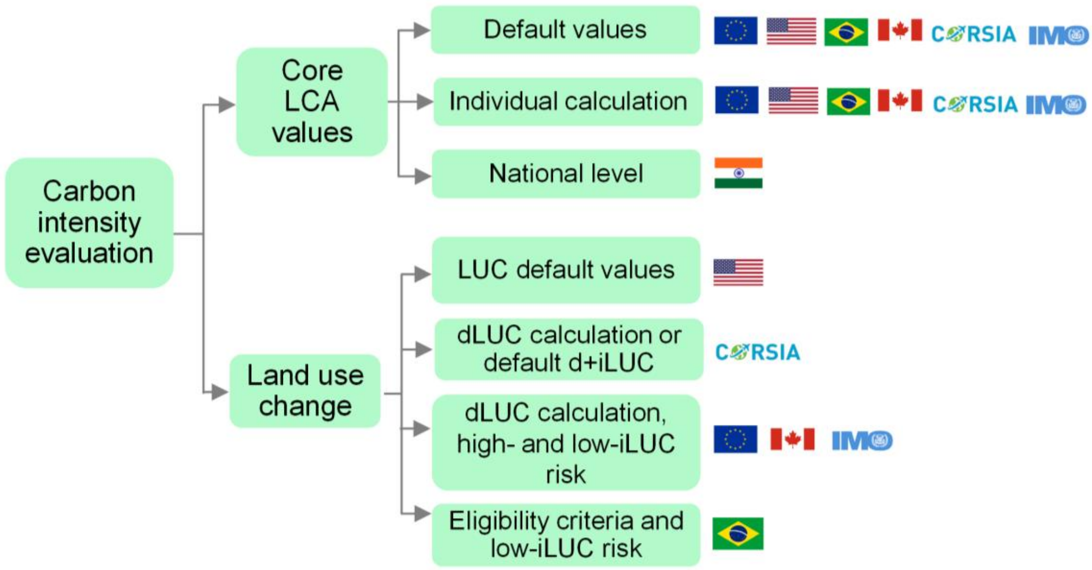
About the core-LCA values, three primary methodologies are adopted for calculating the baseline GHG emissions associated with fuel production:

- **Default values**, predefined and generally conservative estimates, are recognized by the EU, US, Brazil, Canada, CORSIA, and IMO.
- **Individual calculation** methods (or Actual values), which allow producers to use specific data for a tailored emissions profile, are permitted by the EU, US, Brazil, Canada, CORSIA, and IMO.
- **National level** calculations, based on country-wide averages or models, are currently applied by India.

With respect to Land Use Change (LUC), especially direct (dLUC) and indirect (iLUC) effects, several approaches are adopted:

- the **US** uses default LUC values in its accounting system.
- **CORSIA** allows either default or calculated values for dLUC and iLUC.
- The **EU, Canada, and IMO** require differentiation between high- and low-iLUC risk, with calculated values for each.
- **Brazil** uses eligibility criteria to define low-iLUC risk within its RenovaBio system.

This classification highlights the diversity in methodological rigor and regional preferences for handling carbon accounting. It reflects both the technical flexibility and the policy stringency that various jurisdictions apply to ensure the environmental credibility of biofuels and SAF pathways.



Notes: LCA = lifecycle assessment. dLUC/iLUC = direct/indirect land use change. In core LCA values, Brazil's RenovaBio presents default values for the agricultural phase only. INDICATE SOURCE CARBON ACCOUNTING REPORT

Figure 8. Carbon accounting approaches in main biofuel policy frameworks (Source IEA[12])

Focusing on Sustainable Aviation Fuels (SAF), in December 2020, the International Civil Aviation Organisation (ICAO) issued the sustainability guidelines, for feedstock producers, refineries and traders globally to certify CORSIA-eligible SAF[13] - CORSIA Eligible Fuels (CEF). This encompasses both SAF and Lower Carbon Aviation Fuels (LCAF). LCAF are fossil derived fuels that meet CORSIA's sustainability criteria and achieve net greenhouse gas (GHG) emissions reductions compared to conventional jet fuel, on a lifecycle basis.

Similarly, a SAF is defined as "**A renewable or waste-derived aviation fuel that meets CORSIA's sustainability criteria and achieves net greenhouse gas (GHG) emissions reductions compared to conventional jet fuel, on a lifecycle basis**". It is important to stress that the definition of SAF is bounded with the concept of Sustainability. In this text, SAF is used as umbrella term, actually referring to all CEF under CORSIA.

3.1 CORSIA SUSTAINABILITY CERTIFICATION PROCESS

CORSIA documentation[14] specifies that SAF must:

- be produced from feedstocks that do not compete with food and feed and avoid significant negative environmental and social impacts (e.g. deforestation, land degradation).
- demonstrate a net GHG emissions reduction of at least 10% compared to fossil jet fuel (89 gCO_{2e}/MJ_{fuel}).

[12] IEA (2024), Towards Common Criteria for Sustainable Fuels, IEA, Paris https://www.iea.org/reports/towards-common-criteria-for-sustainable-fuels, Licence: CC BY 4.0

[13] https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Eligible-Fuels.aspx

[14] CORSIA Sustainability Criteria for CORSIA Eligible Fuels. https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Eligible-Fuels.aspx

- be subject to certified “sustainability certification scheme (SCS)” approved by ICAO.
- Undergo a lifecycle analysis (LCA) of emissions, covering all stages from feedstock production to end use, including land use change (dLUC and iLUC) emissions.

For the verification of the minimum 10% threshold, a specific methodology has been defined by the ICAO CAEP’s nominated experts. The LCA is the chosen tool to quantitatively assess the GHG emission savings offered by a specific alternative fuel (Prussi, 2021[15]). Specifically, based on an extensive evaluation of the global petroleum jet fuel production, the average life-cycle GHG intensity baseline has been set at 89 gCO2e/MJ from Well To Wake (WTW), including crude oil recovery, transportation and refining, jet fuel transportation, and jet fuel combustion.

The core LCA methodology can be summarized in Equation (1), including terms for:

- feedstock cultivation (**efe_c**);
- feedstock harvesting and collection (**efe_hc**);
- feedstock processing (**efe_p**);
- feedstock transportation to processing and fuel production facilities (**efe_t**);
- feedstock-to-fuel conversion processes (**efefu_p**);
- fuel transportation and distribution (**efu_t**);
- fuel combustion in an aircraft engine (**efu_c**).

For purposes of reporting or accounting emissions from biofuels combustion, the latter term (**efu_c**) is considered as being zero for the fuel fraction produced from biomass.

Core LCA = $e_{fe\ c} + e_{fe\ p} + e_{fe\ t} + e_{fefu}\ p + e_{fe\ t} + e_{fu\ c}$ (eq.1)

The functional unit is MJ (lower heating value [LHV]) of fuel produced and combusted, and the results are expressed in grams of CO_2 equivalent per MJ of fuel (gCO_2e/MJ) combusted in the aircraft engine. GHG emissions from stages included in the fuel life-cycle include CO_2, N2O, and CH4 (with the exception of fuel combustion, which only includes CO_2), are expressed in terms of CO_2e using their 100-year global warming potentials, according to the Fifth Assessment Report (AR5) of Intergovernmental Panel on Climate Change (IPCC).

[15] Prussi, M., Lee, U., Wang, M., Malina, R., Valin, H., Taheripour, F., ... & Hileman, J. I. (2021). CORSIA: The first internationally adopted approach to calculate life-cycle GHG emissions for aviation fuels. *Renewable and Sustainable Energy Reviews*, *150*, 111398.

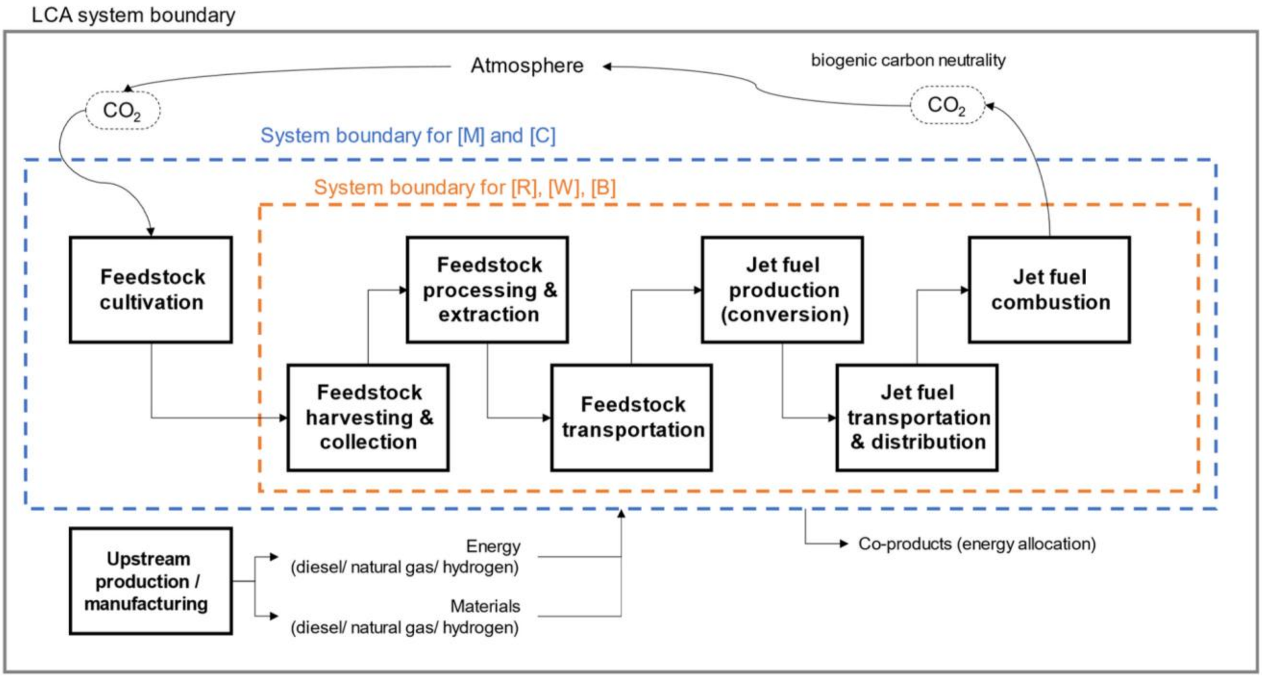


Figure 9. Carbon accounting approaches rules in CORSIA (Prussi et al. 2021)

One-time emissions associated with construction or manufacturing facilities (the so-called infrastructure-related emissions) are not included; their contribution to the LCA results of fuel products is usually small. Various institutions (Argonne National Laboratory, Joint Research Centre [JRC], Massachusetts Institute of Technology [MIT], University of Hasselt, Politecnico di Torino, University of Toronto, and Universidade Estadual de Campinas) performed LCA calculations for SAFs to support ICAO's CAEP. These institutions were tasked to assess core LCA values (carbon intensities [CIs]) of the same fuel pathways to reflect their LCA models and regionally-specific parameters, among other factors.

CORSIA allows for the use of "default values" or "individual LCA calculations" for carbon intensity, as per the recognition of SAF certified under schemes such as "ISCC and RSB", provided they are approved by ICAO and meet the CORSIA Sustainability Certification Criteria (SCCs). Calculated ICAO default values demonstrate that SAF pathways offer potentially significant GHG emission reductions in attributional life-cycle GHG emissions, relative to petroleum jet fuel (**Error! Reference source not found.**) presents the impact of each process along the supply chain of a given SAF on the core LCA values. The GHG reduction benefits of SAFs compared to fossil-derived jet fuels are due to the CO2 uptake of biomass feedstocks. In these cases, CO2 from fuel combustion is offset by carbon uptake during photosynthesis, resulting in net-zero fuel combustion CO2 emissions (**efu_c**). Since the combustion emissions of petroleum jet fuels consist of 83% (74 gCO2e/MJ) of its total life-cycle GHG emissions, avoiding this provides significant GHG emissions benefits.

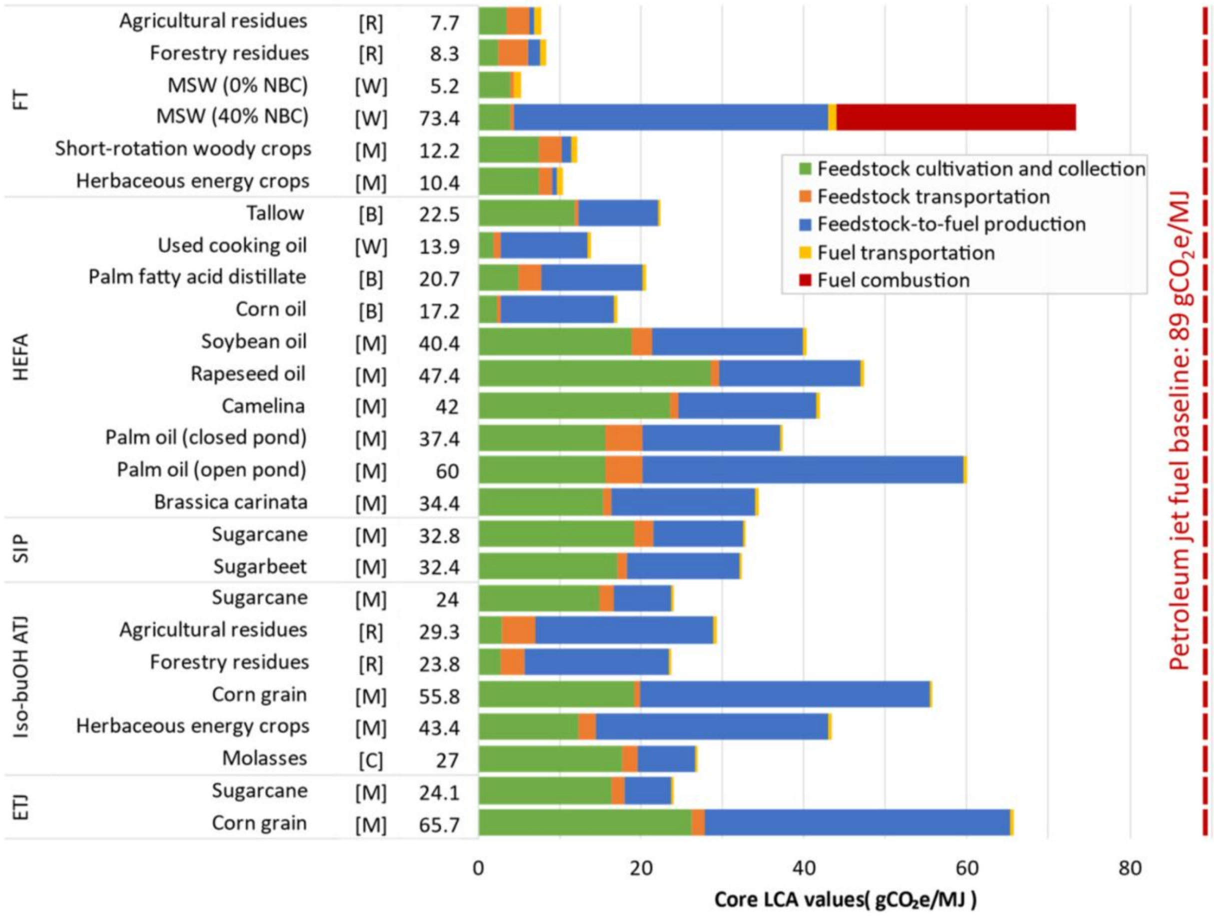


Figure 10 Default core LCA values of SAF production pathways approved by ICAO to date. (NBC: non-biogenic carbon content) (Prussi et al. 2021)

For what concern ILUC, due to complexity and the huge variability in calculated figures, the CORSIA methodology does not allow ILUC actual values; the ILUC CORSIA default values are reported in the CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels[16].

[16] CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels. https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Eligible-Fuels.aspx

Table 1. Example of CORSIA default value table

Table 8. CORSIA Default ILUC Values for CORSIA Eligible Fuels produced with the Hydroprocessed Esters and Fatty Acids (HEFA) Conversion Process

Region	Fuel Feedstock	Pathway Specifications	Default ILUC value
USA	Soybean oilseed		24.5
Brazil	Soybean oilseed		27.0
Global	Soybean oilseed		25.8
EU	Rapeseed/Canola oilseed		24.1
Global	Rapeseed/Canola oilseed		26.0

ILUC default value are added to CoreLCA calculated values to determine the carbon intensity of the specific fuel pathway. Any fuel that have life-cycle GHG emissions lower than 80.1 gCO2e/MJ and that respect the sustainability criteria are eligible for CORSIA.

Apart from the GHG emissions aspect, all the other sustainability elements are verified during the fuel producer certification. The certification process aims at verifying the requirements of the operators along the supply chain to produce SAF to be eligible under the Carbon Offsetting and Reduction Scheme for International Aviation. The CORSIA sustainability framework requires an operator to comply with the requirements such as food security, environmental protection and human rights. Following the terminology as defined by the ISO 13065, in the ICAO/CORSIA initiative the sustainability is structured in terms of:

- **Sustainability themes**: e.g. impact on water quality and availability
- **Sustainability objectives**: e.g. production of sustainable fuels should maintain or enhance water quality and availability.
- **Sustainability indicators**: e.g. implementation of operational practices to use water efficiently and to avoid the depletion of surface or groundwater resources beyond replenishment capacities.

CORSIA sustainability framework contains 14 themes, and related criterions, to comply with. In the CORSIA currently two Sustainability Certification Schemes have been approved by the ICAO Council:

- International Sustainability and Carbon Certification (ISCC)
- Roundtable on Sustainable Biomaterials (RSB)

These schemes meet "CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes"[17], and they are eligible to certify CORSIA eligible fuel producers for compliance with the first edition of the ICAO document "CORSIA Sustainability Criteria for CORSIA eligible fuels"[18], and to ensure that the

[17] CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes. https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Eligible-Fuels.aspx

[18] CORSIA Sustainability Criteria for CORSIA Eligible Fuels. www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Eligible-Fuels.aspx

methodology defined in the first edition of the ICAO document “CORSIA Methodology for Calculating Actual Life Cycle Emissions Values”[19] has been applied correctly.

The Table 2 reports the CORSIA sustainability criteria for fuel produced after the 1st of January 2024. As shown, the CORSIA sustainability themes cover:

1. **Greenhouse Gases (GHG)**
2. **Carbon Stock**
3. **Greenhouse Gas Emissions Reduction Permanence**
4. **Water**
5. **Soil**
6. **Air**
7. **Conservation**
8. **Waste and Chemicals**
9. **Human and Labour Rights**
10. **Land Use Rights and Land Use**
11. **Water Use Rights**
12. **Local and Social Development**
13. **Food Security**
14. **Energy Use Efficiency**

These themes, together with the principles and the criteria for assessment, collectively ensure that SAF production under CORSIA contributes to environmental protection, social responsibility, and economic viability.

The demonstration of the compliance of an operator, with respect to these sustainability themes is a process involving several stakeholders. For instance, themes 10-12 can be demonstrated by an attestation of a State, in whose territory the SAF is producer.

[19] CORSIA Methodology for Calculating Actual Life Cycle Emissions Values. www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Eligible-Fuels.aspx

Table 2. CORSIA sustainability criteria applicable for SAF produced after the 1 January 2024.

ICAO document — CORSIA Sustainability Criteria for CORSIA Eligible Fuels

Chapter 2: CORSIA SUSTAINABILITY CRITERIA APPLICABLE FOR BATCHES OF CORSIA SUSTAINABLE AVIATION FUEL PRODUCED BY A CERTIFIED FUEL PRODUCER ON OR AFTER 1 JANUARY 2024

Theme	Principle	Criteria
1. Greenhouse Gases (GHG)	Principle: CORSIA SAF should generate lower carbon emissions on a life cycle basis.	Criterion 1.1: CORSIA SAF will achieve net greenhouse gas emissions reductions of at least 10% compared to the baseline life cycle emissions values for aviation fuel on a life cycle basis.
2. Carbon stock	Principle: CORSIA SAF should not be made from biomass obtained from land/aquatic systems with high biogenic carbon stock.	Criterion 2.1: CORSIA SAF will not be made from biomass that is either obtained/extracted from land or aquatic ecosystems converted after 1 January 2008 that was primary forest, wetlands, peat lands, coral reefs, kelp forests, seagrass meadows, estuaries, tidal salt marshes or mangrove forests or contributes to degradation of the carbon stock in primary forests, wetlands, peat lands, coral reefs, kelp forests, seagrass meadows, estuaries, tidal salt marshes or mangrove forests as these systems all have high carbon stocks.
		Criterion 2.2: In the event of land use conversion after 1 January 2008, as defined based on the Intergovernmental Panel on Climate Change (IPCC) land categories, direct land use change (DLUC) emissions will be calculated. If DLUC greenhouse gas emissions exceed the default induced land use change (ILUC) value, the DLUC value will replace the default ILUC value.
3. Greenhouse gas Emissions Reduction Permanence	Principle: Emissions reductions attributed to CORSIA SAF should be permanent.	Criterion 3.1: Operational practices will be implemented to monitor, mitigate and compensate any material incidence of non-permanence resulting from carbon capture and sequestration (CCS) activities.
4. Water	Principle: Production of CORSIA SAF should maintain or enhance water quality and availability.	Criterion 4.1: Operational practices will be implemented to maintain or enhance water quality.
		Criterion 4.2: Operational practices will be implemented to use water efficiently and to avoid the depletion of surface or groundwater resources beyond replenishment capacities.

5. Soil	Principle: Production of CORSIA SAF should maintain or enhance soil health.	Criterion 5.1: Agricultural and forestry best management practices for feedstock production or residue collection will be implemented to maintain or enhance soil health, such as physical, chemical and biological conditions.
6. Air	Principle: Production of CORSIA SAF should minimize negative effects on air quality.	Criterion 6.1: Air pollution emissions will be limited.
7. Conservation	Principle: Production of CORSIA SAF should maintain biodiversity, conservation value, and ecosystem services.	Criterion 7.1: CORSIA SAF will not be made from biomass obtained from areas that, due to their biodiversity, conservation value, or ecosystem services, are protected by the State having jurisdiction over that area, unless evidence is provided that shows the activity does not interfere with the protection purposes.
		Criterion 7.2: Low invasive-risk feedstock will be selected for cultivation and appropriate controls will be adopted with the intention of preventing the uncontrolled spread of cultivated alien species and modified microorganisms
		Criterion 7.3: Operational practices will be implemented to avoid adverse effects on areas that, due their biodiversity, conservation value, or ecosystem services, are protected by the State having jurisdiction over that area.
8. Waste and Chemicals	Principle: Production of CORSIA SAF should promote responsible management of waste and use of chemicals.	Criterion 8.1: Operational practices will be implemented to ensure that waste arising from production processes as well as chemicals used are stored, handled, and disposed of responsibly.
		Criterion 8.2: Responsible and science-based operational practices will be implemented to limit or reduce pesticide use.
		Criterion 8.3: Operational practices will be implemented to prevent, minimize, and mitigate any damage from unintentional release of fossil resources, fuel products, and/or other chemicals.
9. Seismic and Vibrational Impacts	Not applicable	Not applicable
10. Human and labour rights	Principle: Production of CORSIA SAF should respect human and labour rights.	Criterion 10.1: CORSIA SAF production will respect human and labour rights.

11. Land use rights and land use	Principle: Production of CORSIA SAF should respect land rights and land use rights including indigenous and/or customary rights.	Criterion 11.1: CORSIA SAF production will respect existing land rights and land use rights including indigenous peoples' rights, both formal and informal.
12. Water use rights	Principle: Production of CORSIA SAF should respect prior formal or customary water use rights.	Criterion 12.1: CORSIA SAF production will respect the existing water use rights of local and indigenous communities.
13. Local and social development	Principle: Production of CORSIA SAF should contribute to social and economic development in regions of poverty.	Criterion 13.1: CORSIA SAF production will strive to, in regions of poverty, improve the socioeconomic conditions of the communities affected by the operation.
14. Food security	Principle: Production of CORSIA SAF should promote food security in food insecure regions.	Criterion 14.1: CORSIA SAF production will, in food insecure regions, strive to enhance the local food security of directly affected stakeholders.

A key aspect of the Certification process is the traceability, implemented thought the concept of the "chain of custody". Traceability and chain of custody are essential components in ensuring the integrity and transparency of sustainable aviation fuel (SAF) supply chains. These concepts revolve around two fundamental capabilities:

- First, the ability to trace SAF throughout its entire supply chain, both upstream and downstream, from the point of origin to its final delivery;
- Second, the ability to assign detailed, product-specific information to individual consignments or batches of sustainable materials and fuels.

Traceability involves maintaining comprehensive documentation and data on the sustainability characteristics of the materials, which include — but are not limited to — the type of raw material used, the country of origin, quantities handled, and associated lifecycle greenhouse gas emissions. These sustainability characteristics must be accurately recorded and transferred along the supply chain to ensure that the sustainable nature of the fuel is preserved and verifiable at every stage. To achieve this, two chain of custody models can be applied: mass balance and physical segregation. The mass balance approach allows for the physical mixing of sustainable and non-sustainable materials, provided that the volumes and sustainability characteristics of each input are properly documented and accounted for in the final output. This method permits flexibility while maintaining a clear link between input and output sustainability data. In contrast, the physical segregation model requires that sustainable materials be kept entirely separate from non-sustainable ones throughout the supply chain, ensuring that the physical integrity of the sustainable product is preserved. Under the mass balance system, economic operators must implement robust procedures to document the sustainability characteristics and volumes of all batches involved in the mixture, ensuring that this information is maintained and transferred along with the product. These traceability and chain of custody requirements are universally applicable across all raw material types and their respective supply chains, and they necessitate comprehensive internal systems to ensure full compliance, accuracy, and accountability throughout the SAF certification and verification process.

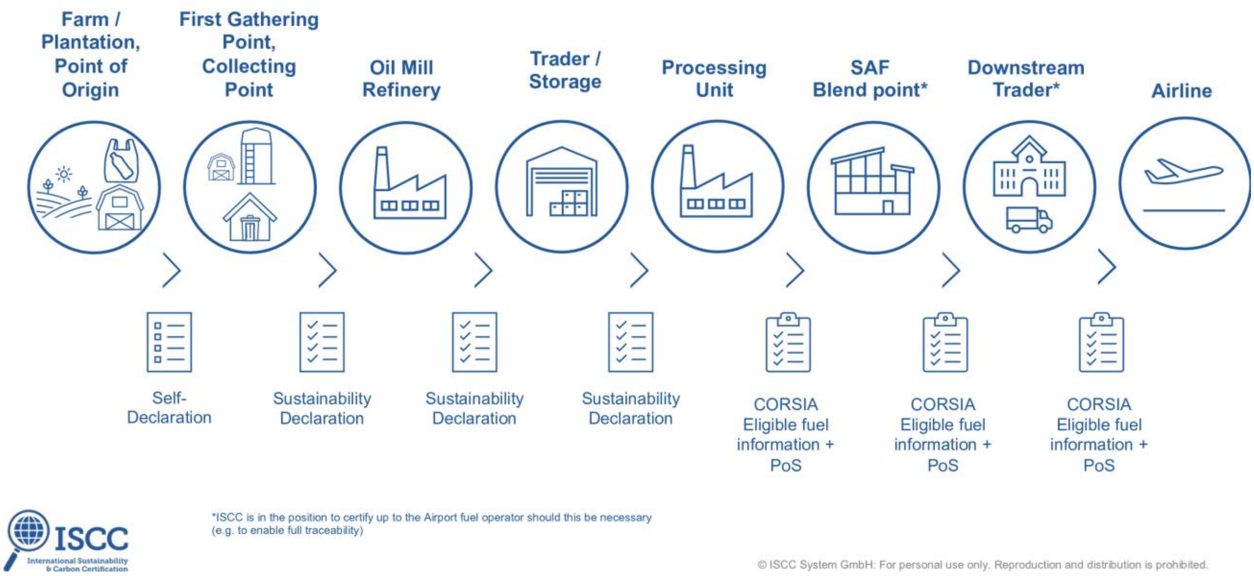


Figure 11. Example of documents flow, ensuring traceability (source: ISCC)

The economic operator is required to transmit relevant information necessary for the aeroplane operator to demonstrate compliance with the CORSIA sustainability criteria. This refers to all of the relevant reporting elements listed below for which the economic operator has information. Economic operators are required to go through this list, to fill in all the elements of the template on which they have information and to pass it along in the supply chain[20]. The information is related to a specific physical quantity of material, e.g.:

1. Purchase date of the neat (unblended) CORSIA eligible fuel
2. Identification of the producer of the neat CORSIA eligible fuel:
    a. Name of the producer
    b. Contact information of the producer
3. Fuel production:
    a. Production date of the neat CORSIA eligible fuel
    b. Production location of the neat CORSIA eligible fuel
    c. Batch number of each batch of neat CORSIA eligible fuel
    d. Mass of each batch of neat CORSIA eligible fuel produced
4. Fuel type
    a. Type of fuel (i.e., Jet-A, Jet-A1, Jet-B, Aviation Gasoline (AvGAS))
    b. Feedstock used to create the neat CORSIA eligible fuel
    c. Conversion process used to create the neat CORSIA eligible fuel
5. etc.

[20] ISCC CORSIA 203 TRACEABILITY AND CHAIN OF CUSTODY. www.iscc-system.org/wp-content/uploads/2023/12/ISCC_CORSIA_203_Traceability_and_Chain-of-Custody_2.0.pdf

4. COMPARATIVE ANALYSIS

As of today, sustainability frameworks are implemented through Sustainability Certification Schemes (SCSs), both at the European and International scales. Specifically for Sustainable Aviation Fuels (SAF), SCSs have been recognised by the EC and by ICAO. Differences exist among the certification schemes and implementation processes.

4.1 REGULATORY AND REPORTING OBLIGATIONS

The European Union and ICAO's CORSIA framework both rely on third-party certification to ensure compliance with sustainability criteria for SAF. However, there are notable differences in how certification is structured and what documentation is required. In particular, regarding certification and documentation requirements, through the European approach (RED III / ReFuelEU), certification is carried out by voluntary schemes recognised by the European Commission (e.g., ISCC EU, RSB EU RED). A key requirement is the demonstration of compliance with specific sustainability and GHG reduction criteria. Certification covers the entire supply chain, from feedstock production to fuel delivery, and must include evidence of land-use status, origin, GHG calculations, and traceability records. Certified economic operators must maintain detailed documentation such as purchase orders, transport records, production logs, and sustainability declarations. For Renewable Fuels of Non-Biological Origin (RFNBOs), additional documentation on electricity sourcing and CO_2 origin is required, with compliance to delegated acts (e.g., RED II Art. 27 and 28, Delegated Reg. 2023/1184 and 2023/1185).

In CORSIA, the certification is conducted under Sustainability Certification Schemes (SCS) approved by ICAO, currently ISCC CORSIA, RSB CORSIA and ClassNK. SAF producers must demonstrate compliance with CORSIA Sustainability Criteria (covering 14 environmental and social themes) and GHG reduction requirements (≥10% vs fossil baseline). The required documentation focuses on life cycle analysis (LCA), feedstock classification, process description, and batch-level fuel characteristics. ICAO requires a standard template of traceability elements (e.g., batch ID, production date, producer information, feedstock used), which must be passed along the supply chain.

While both systems require end-to-end traceability and third-party verification, the EU approach emphasizes strict procedural documentation and compliance with feedstock-specific rules, whereas CORSIA adopts a broader sustainability scope, with more flexibility in feedstock selection but rigorous LCA-based reporting.

In terms of interfaces with National/Regional authorities, in the EU (RED III / ReFuelEU), the economic operators interface with national competent authorities designated by each Member State. Voluntary schemes report audited data to these authorities, which are responsible for verifying compliance with national renewable energy targets. Specifically, under ReFuelEU, fuel suppliers at EU airports are directly obligated to meet blending mandates. Compliance is monitored by Member States and reported to the European Commission. The European Union Database (UDB) has been developed to centralise sustainability data and streamline monitoring across Member States.

In CORSIA, the interface is primarily international, coordinated by ICAO rather than national authorities. Fuel producers and airlines must comply with the CORSIA Monitoring, Reporting, and Verification (MRV) system. National aviation authorities are responsible for aggregating emissions and SAF usage data from airline operators under their jurisdiction and submitting it to ICAO. There is no direct role for national environmental or energy agencies in certifying fuel production or feedstock compliance under CORSIA.

When it comes to Data Reporting Systems, the EU has developed the Union Database (UDB), which is a centralised EU platform intended to monitor the lifecycle and sustainability of biofuels and RFNBOs. It records transactions across the supply chain to avoid double-counting, supports mass balance systems, and enables verification of compliance with RED sustainability and GHG requirements. All certified parties (economic operators, voluntary schemes, certification bodies) are required to submit data, ensuring traceability across national borders.

Similarly, ICAO has developed a central CORSIA Registry system to track emissions, offsetting requirements, and SAF usage by airlines. The registry records data submitted through the MRV process by national authorities, including the amount and characteristics of CORSIA-eligible fuel used. While the registry tracks SAF volumes and sustainability certification, it does not directly record supply chain transaction data like the EU UDB.

In conclusion, the EU UDB provides granular, transaction-level data for fuels and feedstocks, supporting robust traceability. The CORSIA Registry is focused more on emissions accounting and SAF uptake by operators, with less emphasis on supply chain-level reporting.

4.2 GHG REDUCTION REQUIREMENTS AND METHODOLOGIES

The reduction of greenhouse gas (GHG) emissions is a core pillar of sustainability frameworks for Sustainable Aviation Fuels (SAF), both in the European Union and under the ICAO CORSIA scheme. While both systems rely on lifecycle-based assessments to quantify GHG impacts, they differ in thresholds, calculation methodologies, and the treatment of co-products and allocation.

Under the RED, the main elements of the Sustainability concept are the capability of an alternative fuel to ensure a minimum GHG saving, compared to fossil fuel, without negatively impacting the environment. In particular, a minimum GHG saving has to be proven. The economic operators have the option to either use the default GHG intensity values provided in RED II or to calculate actual values for their pathway. About thresholds, the EU framework imposes mandatory GHG savings thresholds for all fuels, relative to a fossil comparator of 94 gCO_2e/MJ.

These thresholds depend on the type of fuel and date of installation.

Table 3. GHG intensity values provided in RED II

Greenhouse gas savings thresholds in RED II			
Plant operation start date	Transport biofuels	Transport renewable fuels of non-biological origin	Electricity, heating and cooling
Before October 2015	50%	-	-
After October 2015	60%	-	-
After January 2021	65%	70%	70%
After January 2026	65%	70%	80%

ReFuelEU adopts these thresholds for aviation fuels, thus excluding any fuel pathway unable to meet these criteria from compliance counting.

CORSIA sets a lower GHG savings threshold of 10%, relative to its fossil comparator of 89 gCO_2e/MJ (from Well-to-Wake), but the LCA values includes the ILUC term. This minimum is applied to ensure that SAF used for emissions reduction claims genuinely delivers climate benefits. The threshold is applicable to all eligible SAF, regardless of the production method or feedstock, provided the fuel complies with the sustainability criteria.

Another difference is about the definition of Default values. Both schemes contains Default values, provided in RED Annex V (for biofuels) and CORSIA documentation, respectively, or Actual values.

While both frameworks rely on full lifecycle analysis, the EU approach is more granular and tailored, especially for non-biological fuels, incorporating dynamic elements like electricity sourcing and CO_2 reuse. At the same time, it has to be noted that the ICAO/CORSIA/Fuel Task Group worked on a specific methodology for e-fuels, which should be published soon.

4.3 FEEDSTOCK ELIGIBILITY

Among the key differences between European (as per REDIII and ReFuelEU Aviation) and International schemes, the approach on feedstocks stands out.

The EU framework adopts a feedstock-positive listing approach, categorising permissible raw materials based on sustainability criteria, land-use considerations, and greenhouse gas (GHG) savings potential. Under RED III, Annex IX defines two main groups of eligible feedstocks:

- part A lists advanced feedstocks derived from waste and residues, which are encouraged through target multipliers (counted double towards renewable energy targets).
- part B includes other waste-derived feedstocks but is capped in contribution (1.7% of energy content, adjustable by Member States).

Biofuels produced from food and feed crops are explicitly capped at 7% and further restricted to their 2020 share plus one percentage point per Member State.

Moreover food/feed feedstocks are excluded entirely from eligibility under the ReFuelEU Aviation Regulation, which further tightens sustainability criteria by disallowing any SAF derived, due to concerns over indirect land-use change (ILUC) and food security.

In contrast, the ICAO CORSIA framework adopts a more flexible, class-based approach to feedstock eligibility. This is also related to the fact that ILUC is explicitly accounted in CORSIA package. CORSIA does not maintain a definitive or exhaustive list of allowed feedstocks; instead, it defines permissible feedstock categories (e.g. waste, residues, etc). The CORSIA package does not specify individual feedstock types (leaving interpretation to the certified Sustainability Certification Scheme (SCS) and the scheme auditor): as long as a fuel meets the general sustainability criteria: minimum 10% GHG savings and compliance with the sustainability themes. Moreover, food and feed crops are not explicitly banned under CORSIA.

4.4 SUSTAINABILITY PRINCIPLES AND CERTIFICATION

Sustainability in the context of aviation fuels extends beyond greenhouse gas (GHG) emissions to encompass a broader set of environmental, social, and governance dimensions. Both the EU regulatory framework and the CORSIA scheme embed sustainability criteria within their certification processes.

With respect to the environmental criteria (e.g. land use, biodiversity, water), the EU sustainability framework is highly prescriptive and legal-binding, especially under Articles 29–31 of RED II and further reinforced in RED III. Key environmental criteria include:

- No-go land categories: feedstock must not be sourced from land with high biodiversity, high carbon stock, or land converted after January 2008 (e.g., peatland, primary forests).
- Forest biomass rules: must ensure legal harvesting, replanting, soil protection, and forest regeneration.
- ILUC mitigation: the EU adopts a risk-based approach, capping high ILUC-risk biofuels and progressively phasing them out unless certified as "low ILUC-risk" under Delegated Regulation 2019/807.
- GHG saving thresholds and full lifecycle carbon accounting are core criteria for compliance.

While optional, some voluntary schemes (e.g., ISCC PLUS) also include criteria on soil, air, and water protection and promote biodiversity safeguards beyond the legal minimum.

Similarly, CORSIA defines 14 Sustainability Themes, which include environmental topics such as:

- Water quality and availability
- Soil health
- Air quality
- Conservation of ecosystems and biodiversity
- Land and water use rights

Unlike the EU, CORSIA does not define specific feedstock exclusions by land type but requires risk assessments and mitigation strategies for feedstock impacts. ILUC is considered through default values, with no provision for calculated ILUC or land history auditing.

Together with these environmental aspects, the two schemes also contain social and economic considerations. RED III references socio-economic aspects primarily through voluntary sustainability schemes (e.g., RSB, ISCC PLUS), but these are not mandated under EU law. The legal framework focuses more on environmental and GHG performance, leaving social safeguards optional unless embedded in the selected certification scheme. Economic considerations are indirectly addressed through market incentives, mandates, and access to renewable energy targets, not through specific certification criteria.

Conversely, CORSIA explicitly includes social and economic themes as part of its sustainability pillars, covering:

- Human and labour rights
- Food security
- Local and social development
- Energy use efficiency

These themes are structured according to ISO 13065 principles, including objectives, criteria, and indicators that must be met and monitored by certified entities. Certification schemes approved by ICAO must demonstrate robust procedures to assess compliance with these themes. CORSIA places greater formal emphasis on social sustainability and local impacts, ensuring that SAF production does not compromise food access, labour conditions, or community well-being. The EU, while acknowledging these issues, delegates responsibility to voluntary schemes and does not enforce them uniformly across all operators.

All the sustainability certification is related to the verification and audit mechanisms. In the EU, the certification is based on voluntary schemes recognised by the European Commission. These schemes (e.g., ISCC EU, RSB EU RED) must meet rigorous technical criteria, including:

- Independent third-party audits
- Full traceability of feedstock origin and fuel batches
- Annual inspections and risk-based sampling
- Transparent documentation and chain-of-custody

Member States may also operate national systems, though most rely on recognised voluntary schemes. A centralised EU Union Database (UDB) supports tracking and reduces the risk of double-counting or fraud.

In CORSIA, only Sustainability Certification Schemes (SCSs) approved by ICAO Council can certify CORSIA-eligible SAF. Currently approved: ISCC CORSIA, RSB CORSIA, and ClassNK. Certification is scheme-specific but must adhere to ICAO guidance documents for:

- Sustainability criteria
- LCA methodology
- Audit and chain-of-custody systems

There is no Union-level registry equivalent to UDB, but certified producers must provide a standard traceability template with fuel consignments, which feeds into the national MRV systems and CORSIA registry.

Both systems rely on third-party certification and chain-of-custody models (mass balance or segregation). However, the EU combines decentralised certification with centralised data oversight (UDB), whereas CORSIA leverages international schemes under centralised ICAO guidance, with less granular supply chain tracking.

Table 4. EU and CORSIA Sustainability certification

Aspect	**EU (RED III / ReFuelEU)**	**CORSIA (ICAO)**

Environmental Criteria	Strict no-go land rules, ILUC caps, mandatory LCA	Principle-based, ILUC defaults, broader flexibility
Social Criteria	Optional via voluntary schemes	Mandatory themes (e.g., labour rights, food security)
Certification Body	EU-recognized Voluntary Schemes	ICAO-approved SCS (e.g., ISCC, RSB, ClassNK)
Verification Model	Annual audits, traceability, EU registry (UDB)	Traceability templates, CORSIA registry, MRV
Chain of Custody	Mass balance, segregation, full supply chain documentation	Mass balance or segregation, simplified documentation
Scope of Certification	Fuel type + feedstock + land origin	Fuel + process + compliance with sustainability themes

5. INTRODUCING THE SUSTAINABILITY CERTIFICATION READINESS LEVEL (SCRL)

5.1 CONCEPT AND PURPOSE OF SCRL

The proposed structure includes the development of a traffic light rating system to assess the level of support SAF producers require when engaging with the Clearing House (CH) about the aspect related to the Suitability certification process.

Building on the outcomes of previous tasks, key technical stage-gates will be defined to identify producers' specific sustainability-related needs. These findings will guide the CH in delivering tailored core support activities under Service 2, such as feedstock identification and lifecycle assessment (LCA) assistance (i.e. identification of existing default values, specific aspects of existing methodologies, etc.).

The Sustainability Certification Readiness Level (ScRL) is a practical indicator designed to assess the preparedness of Sustainable Aviation Fuel (SAF) producers for engaging in the sustainability certification process. Developed as part of the EU Clearing House (CH) support system, the ScRL uses a traffic-light rating scale (Green, Yellow, Red) to help identify and classify producers' technical needs and the level of support required to achieve certification compliance.

Additionally, through collaboration with certification bodies like ISCC and RSB, a checklist of essential sustainability certification requirements will be established, forming the basis of the CH's "Level 3" support offering.

5.2 SCRL STRUCTURE AND CRITERIA

The ScRL evaluation is structured around four key pillars, each representing a fundamental dimension of sustainability certification. Each dimension is scored individually, providing the CH and SAF producers with a visual and actionable understanding of readiness across the value chain.

5.2.1 Regulatory Compliance

This dimension evaluates the producer’s awareness of, and alignment with, relevant regulatory frameworks, including:

- EU RED III and ReFuelEU Aviation Regulation.
- ICAO CORSIA eligibility and sustainability criteria.
- Applicable Delegated Acts and national implementation rules.

Assessment Criteria:

- Understanding of legal requirements for SAF eligibility in target markets (EU, CORSIA).
- Identification of applicable certification schemes (e.g. ISCC EU, RSB, ISCC CORSIA).
- Existence of internal compliance protocols or assigned responsibilities.

ScRL Indicators:

- **Green**: Clear knowledge of applicable frameworks; proactive engagement with voluntary schemes; documented compliance roadmap
- **Yellow**: Partial understanding; initial regulatory mapping ongoing
- **Red**: Limited or no awareness of applicable legal and certification requirements

5.2.2 GHG Performance

This criterion focuses on the producer’s ability to assess and demonstrate greenhouse gas (GHG) emissions savings, including familiarity with lifecycle assessment (LCA) methodologies.

Assessment Criteria:

- Availability of pathway-specific GHG calculations (default or actual values)
- Use of recognised LCA methodologies (RED Annex V, CORSIA methodology)
- Capacity to meet minimum savings thresholds (70% for RED III; 10% for CORSIA)

ScRL Indicators:

- **Green**: GHG methodological compliance verified. Capability to assess the GHG of the production process.
- **Yellow**: Partial LCA completed or pending data; default values used without detailed assessment.
- **Red**: No GHG accounting initiated.

5.2.3 Feedstock and Process Readiness

This component evaluates the eligibility and sustainability of feedstock inputs and the maturity of the production process in terms of sustainability criteria.

Assessment Criteria:

- Identification of feedstock origin and classification (Annex IX, waste/residue, RFNBO criteria).
- Compliance with land-use and ILUC restrictions.
- Definition of the conversion process and related energy inputs (including RFNBO-specific electricity sourcing).

ScRL Indicators:

- **Green**: Feedstock fully eligible under selected framework; supply chain assessed; process meets sustainability rules (e.g. temporal/geographic correlation for RFNBOs).
- **Yellow**: Feedstock is potentially eligible, but further verification is required; partial process definition.
- **Red**: Use of non-eligible feedstocks (e.g., food/feed crops under REDIII); process details incomplete.

5.2.4 Traceability and Reporting Capabilities

Traceability is essential for robust certification and supply chain transparency. This dimension measures the producer's ability to implement appropriate chain-of-custody models and data tracking systems.

Assessment Criteria:

- Chain of custody system established (e.g. mass balance, segregation, identity preservation).
- Record-keeping systems in place for procurement, production and distribution.
- Capability to interface with data platforms (e.g. EU UDB, CORSIA registry).

ScRL Indicators:

- **Green**: documentation and audit readiness confirmed; digital tracking compatible with voluntary scheme standards.
- **Yellow**: Traceability principles identified but systems under development; manual records used.
- **Red**: No traceability system identified; risk of information gaps or non-compliance.

5.3 APPLICATION OF THE SCRL SCALE

The Sustainability Certification Readiness Level (ScRL) is designed not only as a diagnostic tool but also as a structured approach for engaging with the EU Clearing House (CH). Its primary function is to help identify a producer's position along the certification journey and to ensure that technical and regulatory support is tailored accordingly. The application of the ScRL is twofold: first, as a self-assessment tool to help SAF producers reflect on their internal preparedness; second, as a decision-support mechanism for the CH to deliver targeted assistance and optimise resource allocation.

5.3.1 Self-assessment by SAF Producers

The ScRL serves as a practical entry point for SAF producers to evaluate their certification readiness before formally engaging with a certification body or the CH. By examining their status across the four key dimensions—Regulatory Compliance, GHG Performance, Feedstock and Process Readiness, and Traceability and Reporting Capabilities—producers can identify both strengths and areas for improvement.

Benefits of self-assessment:

- Encourages proactive planning and early identification of gaps.
- Reduces the risk of certification delays due to unpreparedness.
- Improves understanding of applicable sustainability frameworks (EU RED III, ReFuelEU, CORSIA).

Producers can use a simplified traffic light scoring tool (Green / Yellow / Red) to rate themselves on each dimension, supported by guiding questions or checklists provided by the CH. This assessment may be documented and shared with the CH to initiate a support request or to align expectations.

Example outcome: A producer may score:

- **Green** on Regulatory Compliance (fully mapped and documented).
- **Yellow** on GHG Performance (using default values, with limited LCA experience).
- **Red** on Traceability (no existing system for tracking sustainability data).

This profile would then inform a focused engagement strategy with the CH.

5.3.2 Use by the Clearing House to Guide Support Levels

Once a producer's ScRL profile is established, either through self-assessment or a CH-led evaluation, the Clearing House can assign a support level and match it with the appropriate type and intensity of assistance. This ensures that support services are proportional, needs-based and technically relevant.

Support levels can be structured as follows:

- **Level 1 – Basic Support**: For producers at an early stage (Red indicators dominate). Support may include awareness-raising workshops, introductory guidance documents or one-on-one consultation to map key certification requirements.
- **Level 2 – Intermediate Support**: For producers with mixed readiness (mostly Yellow indicators). This may include technical reviews of GHG calculations, clarification of feedstock classification or advice on traceability system setup.
- **Level 3 – Advanced/Targeted Support**: For producers with high readiness (mainly Green indicators) who need specific input on final compliance elements. CH can offer detailed LCA assistance, access to default values or pre-audit checks in coordination with voluntary schemes (e.g. ISCC, RSB).

Operational use by CH:

- Facilitate triage and prioritisation of incoming support requests.
- Monitor producer progress over time, updating ScRL status accordingly.
- Generate anonymised benchmarking data to identify systemic challenges or training needs across the SAF sector.

By embedding ScRL into its operational model, the Clearing House can ensure that limited expert resources are deployed efficiently and that SAF producers receive fit-for-purpose, high-impact support throughout their certification journey.

6. CONCLUSION

For new producers entering the Sustainable Aviation Fuel (SAF) sector, understanding and navigating sustainability certification is a critical step toward regulatory compliance and market access. As outlined in this report, both the European Union (EU) and ICAO's CORSIA offer well-established, yet distinct, frameworks that define sustainability requirements and certification procedures for SAF.

The EU approach, governed primarily through the Renewable Energy Directive (RED III) and the ReFuelEU Aviation Regulation, provides a detailed and legally binding structure. It mandates strict feedstock eligibility, high GHG reduction thresholds, and rigorous environmental safeguards, including land-use restrictions and ILUC controls. Certification under the EU is carried out through recognised voluntary schemes and supported by a centralised Union Database (UDB) that enables transparent tracking of certified fuel across the supply chain.

In contrast, CORSIA, developed by ICAO to support global aviation decarbonization, offers a principles-based and globally harmonised approach. It is more flexible on feedstock classes, with a lower minimum GHG saving threshold (10%) and emphasises a broad set of social, environmental, and economic sustainability themes. Certification must be conducted by ICAO-approved schemes, with sustainability claims documented via standard templates and integrated into the CORSIA registry system.

For SAF producers, choosing the right certification pathway requires a strategic evaluation of:

- **Target market**(s): compliance requirements differ between EU-regulated and international/CORSIA-aligned operations.
- **Feedstock type**: EU rules strictly limit the use of food and feed crops; CORSIA permits broader interpretations.
- **GHG performance**: producers must demonstrate performance via lifecycle GHG calculations, using either default or actual values.
- **Readiness and support needs**: producers can assess their certification maturity using tools like the proposed Sustainability Readiness Level (SRL) scale introduced in this document.

Ultimately, being certified is not only a regulatory requirement but also a strategic advantage. It enables access to incentive mechanisms, builds credibility with partners and investors, and ensures alignment with evolving climate and energy policy objectives. As the SAF market is rapidly evolving, the sustainability certification is a foundational pillar for participating in and benefiting from this transformation.

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