



Politecnico
di Torino



The Concept of Sustainability pertaining to SAF in the EU Context



EU SAF CLEARING HOUSE





EU SAF Clearing House Services

Pillar 1: Fuel Prescreening

- Offer early stage SAF evaluation data & expert recommendations to fuel producer at low cost.

Pillar 2: ASTM D4054 Service

- Everything a fuel producer requires for efficient D4054 evaluation will be offered, including prescreening & partial funding.
- D4054 service ensures availability & integrity of data.
- Improve & streamline D4054 process, with OEMs, US & UK CHs, EASA, FAA +.

Pillar 3: Sustainability Assessment

- Support SAF producers in assessing the sustainability of their product towards gaining formal certification (e.g. RSB, ISCC).

Pillar 4: Champion SAF

- Disseminate & explain challenges in SAF deployment.
- Advise on research & innovation questions, investments, policy coherence.

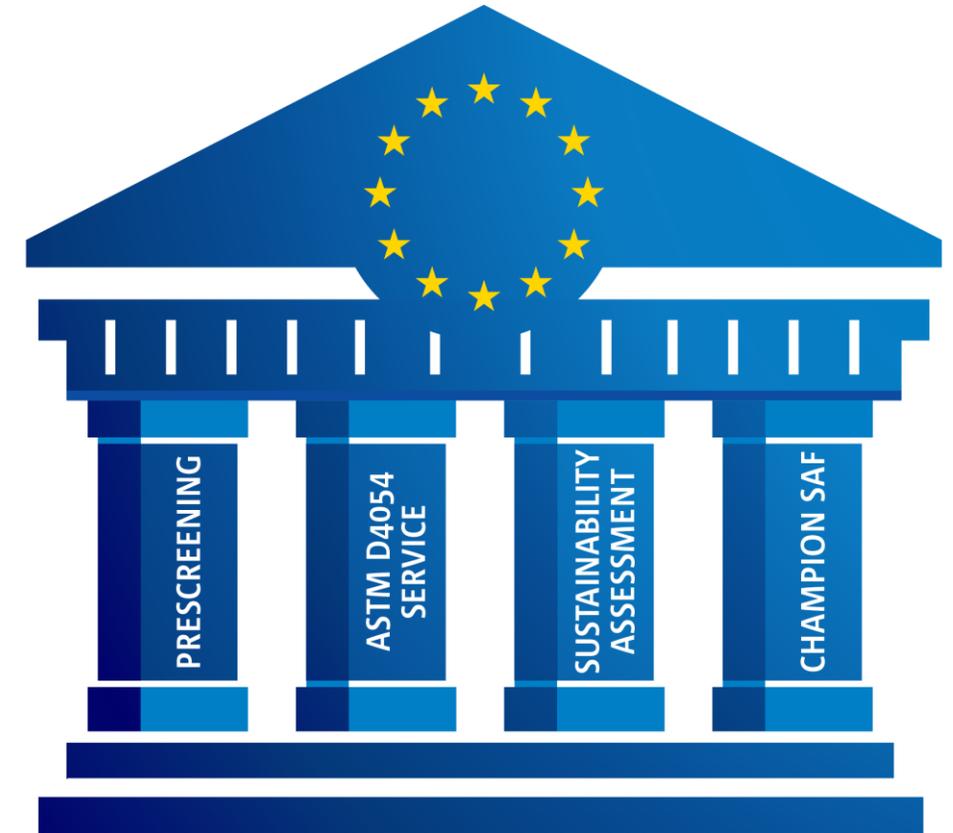


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The EU SAF Clearing House

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Why sustainability of SAF matters in the EU context





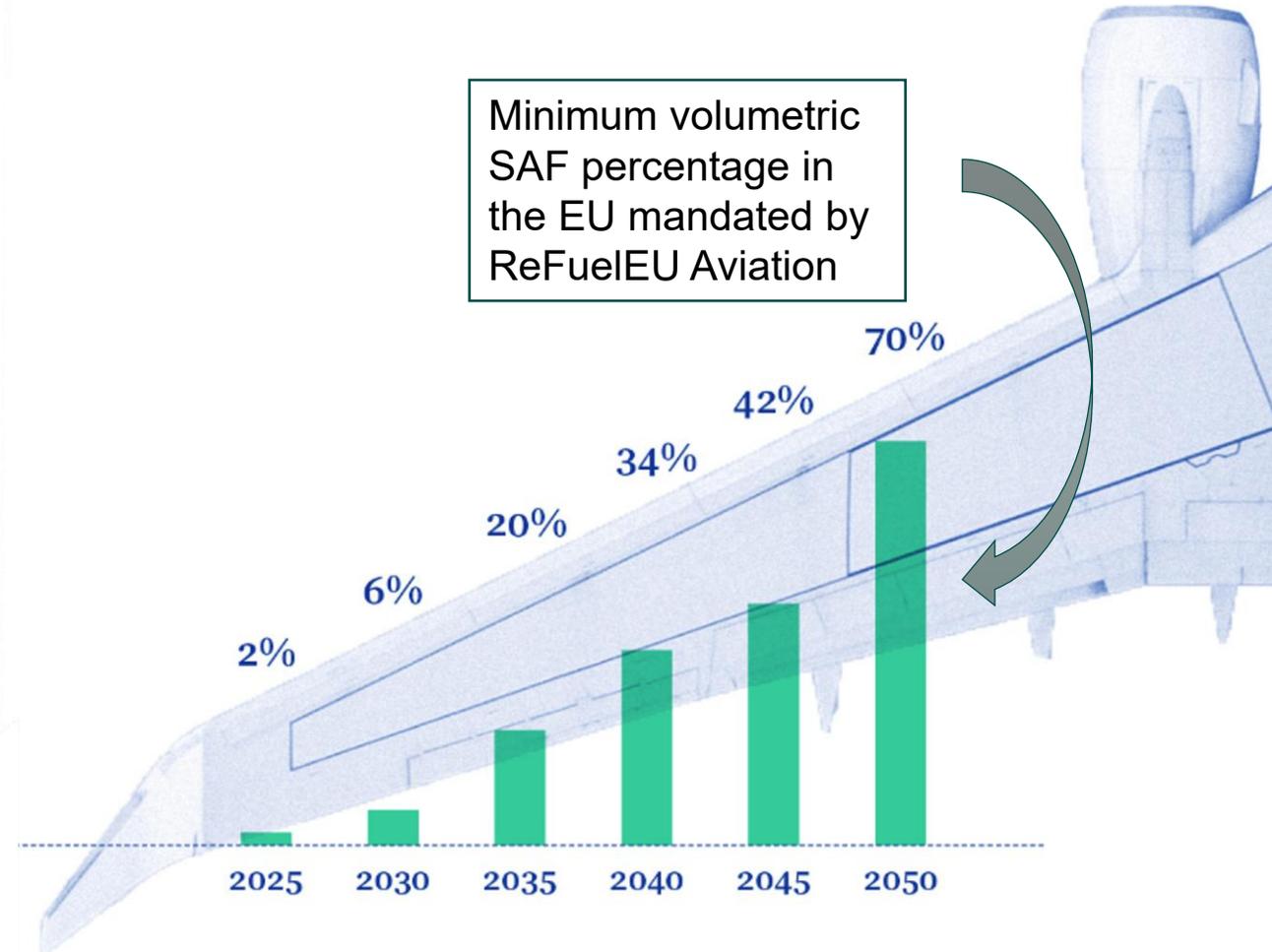
Definition of SAF

- **SAF is Sustainable Aviation Fuel.**
- **SAF is an alternative aviation fuel, meeting specific sustainability criteria.**
- **Criteria** for sustainability compliance may **vary depending** on the **region it is to be used in,** and/or specific **policies.**
- With respect to the **mandates** set by **ReFuel Aviation EU,** **sustainability criteria** are those **defined** in the **Renewable Energy Directive (RED).**



Sustainability recognition is key

- With respect to the **mandates** set by **ReFuelEU Aviation**, **only fuels deemed to be “sustainable”**, as defined by **specific criteria and methodologies**, are **permitted to contribute** to achieving the mandates.
- A **fuel that is not formally certified as sustainable is not eligible under ReFuelEU Aviation** in the EU context, at least with respect to the environmental targets set by REDIII, ETS and ReFuelEU Aviation.



What sustainability means,
in practice,
in the EU SAF context



The “sustainability” under the Renewable Energy Directive (RED III)



- Since the first edition, the **Renewable Energy Directive (RED)** 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:
 - Use of **eligible feedstock**.
 - A **minimum GHG saving**.
 - The expected indirect land use change (**ILUC**).
 - The **biodiversity** impact.

These criteria are used to define fuel eligibility against the Greenhouse Gas (GHG) reduction targets.



Eligible SAF feedstocks in the EU

Under the Renewable Energy Directive (**REDIII**), feedstocks are categorised as per Annex IX, of which **part A covers** feedstocks to derive “**advanced biofuels**”.

Annex IX part B can also be used, within the limits set.

In **ReFuelEU Aviation**, eligible SAF includes:

- **Biofuels**, *excluding those produced from food and feed crops.*
- **Recycled Carbon Aviation Fuels (RCAFs).**
- **Synthetic aviation fuels, also known as Renewable Fuels of Non-Biological Origin (RFNBO) or Power-to-Liquid (PtL).**



Land use criteria for biogenic SAF under the EU framework

SAF from biogenic feedstock 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, [..]; additionally, that the harvesting maintains or improves soil quality, biodiversity and the long-term production capacity of the forest.**





Recognising ILUC in the EU SAF framework

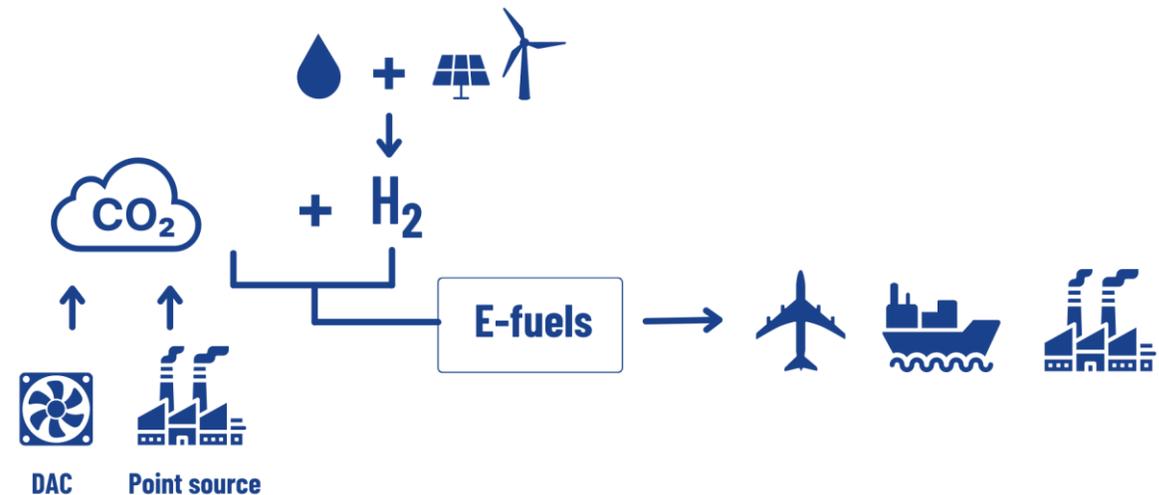
Another important sustainability aspect for biofuels is **indirect land-use change (ILUC)**.

The background of this concept is related to the possibility that biofuel production may trigger the need for additional land to cover feed and food demand, indirectly pushing for a change in the current use of land with potential related CO₂ 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.

Renewable Fuels of Non-Biological Origin (RFNBO)

- **RFNBO** are expected to be key players in the SAF market.
- A **specific delegated regulation (DR 2023/1184 and 2023/1185)** on RFNBOs sets out the rules for production and GHG calculations, as described in the following section.
- 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 gCO₂e/MJ.





Renewable Fuels of Non-Biological Origin (RFNBO)

Commission **Delegated Regulation** (EU) 2023/1184 supplementing Directive (EU) 2018/2001 by **establishing a Union methodology** setting out **detailed rules** for the **RFNBO production**.

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 minimising the GHG emissions associated with the additional electricity demand caused by the RFNBOs production and limiting potential stress to the electricity grid [Delegated Act 2023/1184].
- About the **source of Carbon**, the **DA defines the conditions** under which the emissions of captured CO₂ incorporated in RFNBOs may be subtracted.

How sustainability certification works

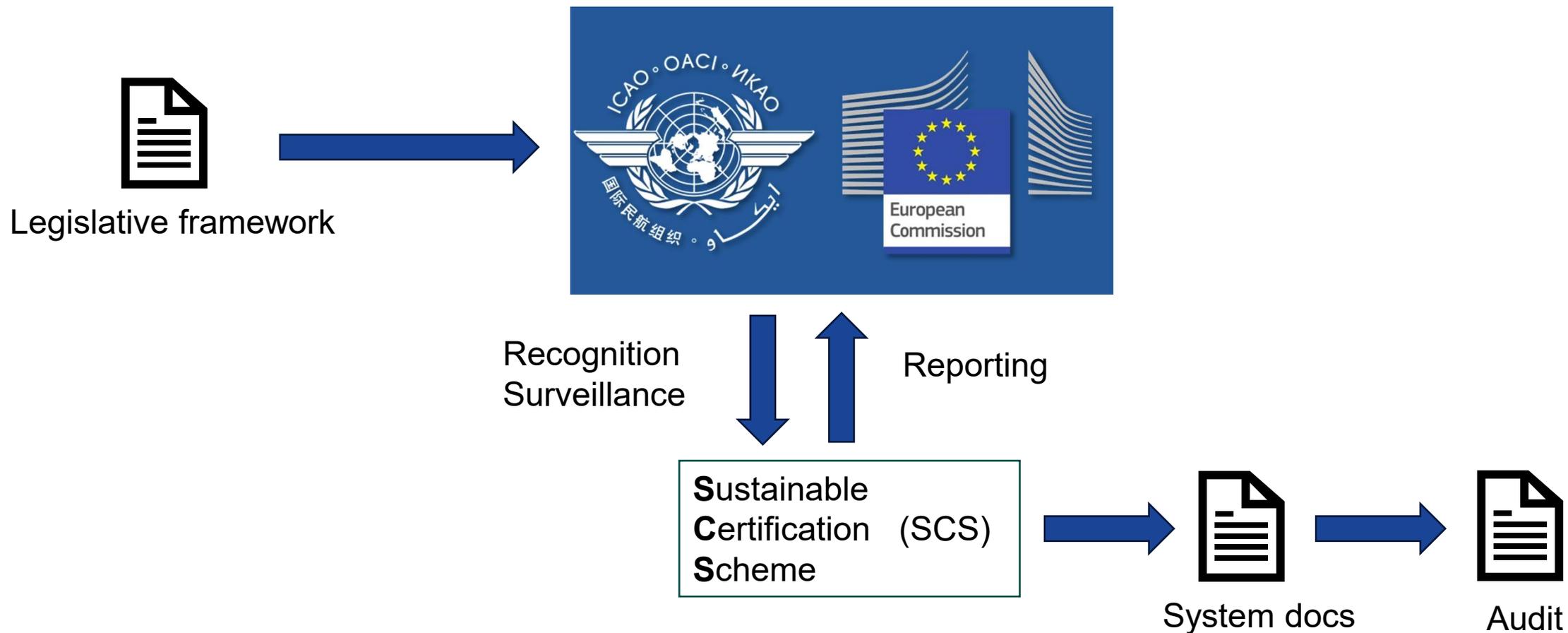




Certification process

- The **certification** is the process of **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. InvestEU, EU ETS SAF incentive mechanisms, etc.).
- The “**certificates**” typically **provide information** about **key attributes** such as the origin of the energy, as well as the time and place of production.
- 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.
- As of today, **18 voluntary schemes** are [recognised by the European Commission](#).

The certification “ecosystem”



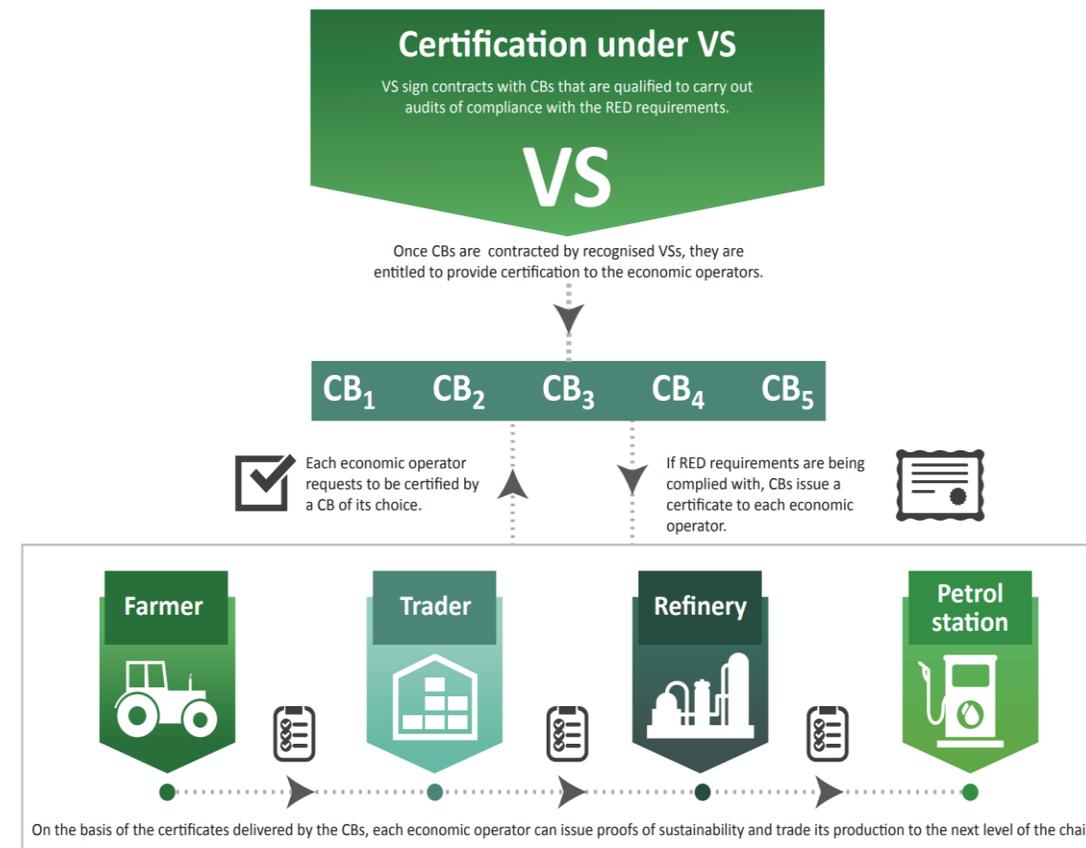
Elaborated from ISCC material



Certification process

- For the purpose of **certification**, the **whole production chain** from the **feedstock** producer **up to** the alternative **fuels producer** should be **checked**.
- 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 documentary and on-the-spot checks on farmers, first biomass collecting points, warehouses, oil mills, alternative fuels plants and biomass or fuels traders.

Certification under VS



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

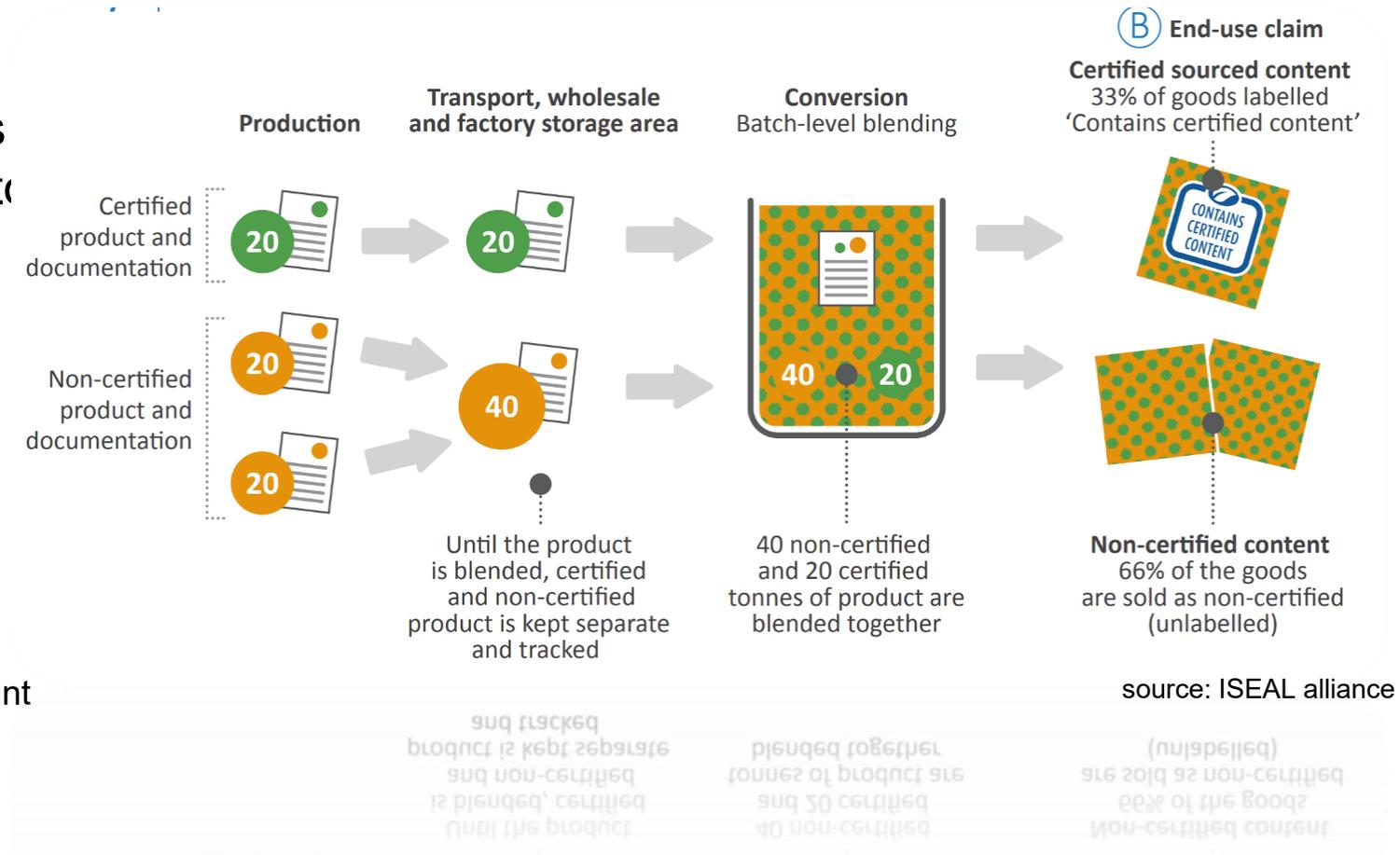


Examples required information for certification process

- **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, and 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

Chain of custody

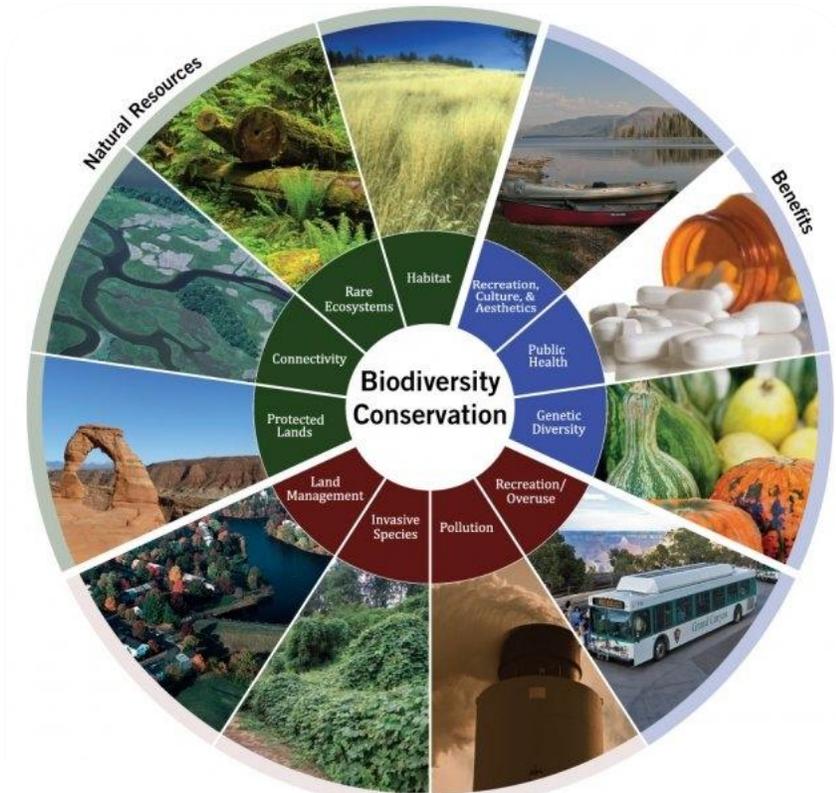
- **Chain of Custody (CoC)** refers to the system that ensures sustainability claims and attributes of SAF are reliably linked to the physical product as it moves through the supply chain.
- Various **CoC** models can be allowed.
- **Mass balance** is the wider used for fuel production in EU:
 - Under 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**.





Certification process

- The **Certification Bodies check** that the fuel producer **respect the sustainability criteria** set under EU context.
- **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.



Drivers of change

Drivers of change

The concept of Sustainability in CORSIA



The logo for CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation). It consists of the word 'CORSIA' in a bold, blue, sans-serif font. The letter 'O' is replaced by a stylized green globe with a blue airplane flying over it, symbolizing aviation and environmental sustainability. The entire logo is set against a white background with a subtle reflection effect below it.



The crediting formula: every gram counts!

Fuel Conversion Factor:

*fixed value: 3.16 for jet fuel, 3.10 for AvGas
(kg CO₂ / kg fuel)*

*Lifecycle emissions value for CEF type
(actual or default)*

*Emissions reduction
in year y*

$$ER_y = FCF \times \left[\sum_f MS_{f,y} \times \left(1 - \frac{L_{CEF}}{LC} \right) \right]$$

*Total Mass of CEF claimed
in year y, by fuel type f*

*Baseline life cycle emissions:
89 g for jet fuel, 95 for avgas
(gCO_{2e}/MJ)*

The reduction of offsetting obligations from the use of SAF scales with the life-cycle GHG emissions benefit per unit SAF, and with the amount of SAF used.

What are the CORSIA sustainability criteria?

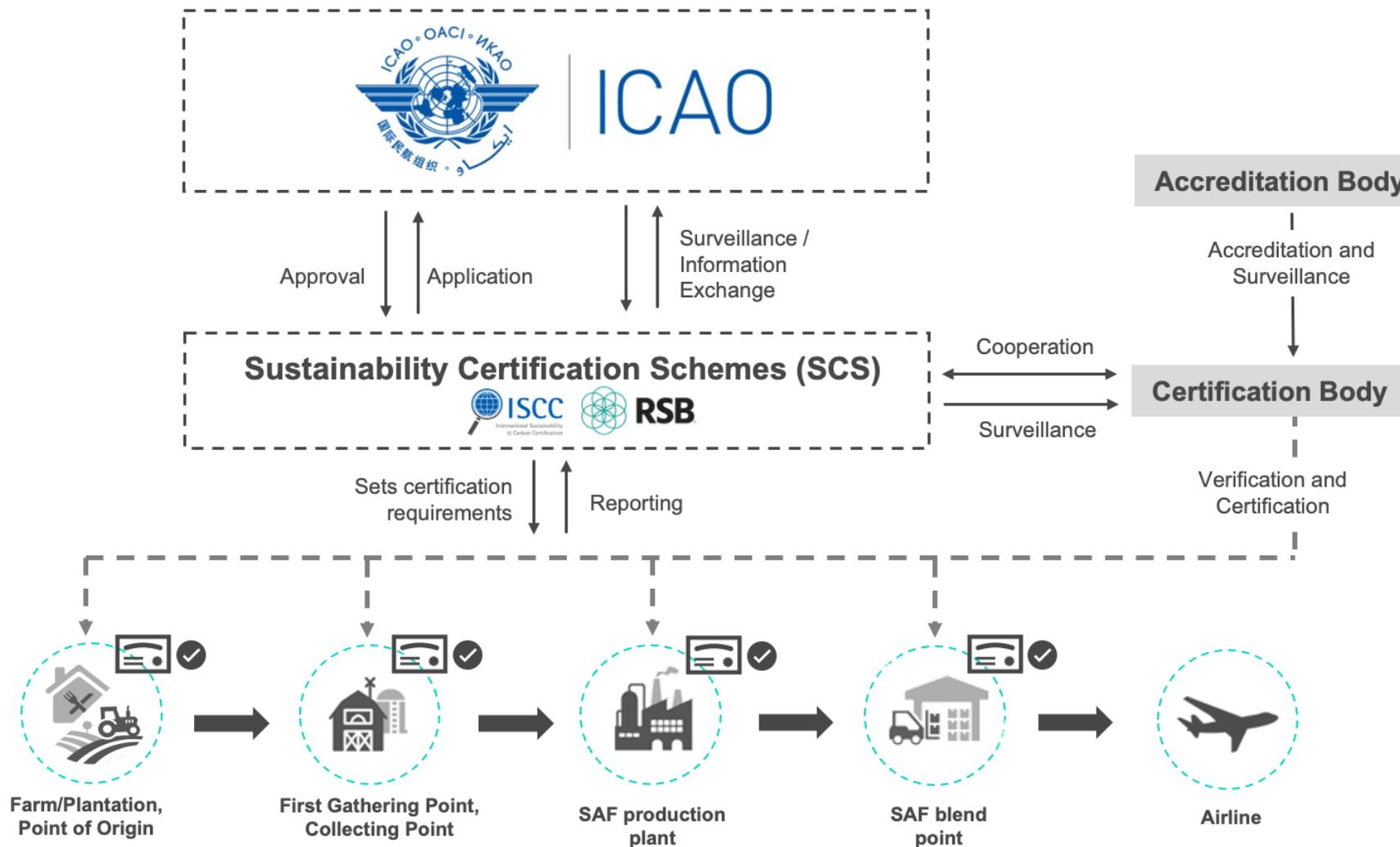
The CORSIA sustainability themes cover:

1. GHGs
2. Carbon Stock
3. GHG 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

Theme	Principle	Criteria
1. Greenhouse Gases (GHG)	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	CORSIA SAF should not be made from biomass obtained from land/aquatic systems with high biogenic carbon stock.	<p>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 (...).</p> <p>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. (...)</p>
...

All criteria available on ICAO's document "[CORSIA Sustainability Criteria for CORSIA Eligible Fuels](#)"

The certification process



CORSIA themes and principles

Carbon reduction themes and principles

Theme 1: Greenhouse gases

- CORSIA eligible fuel should generate lower carbon emissions on a life cycle basis

Theme 2: Carbon stock

- CORSIA eligible fuel should not be made from biomass obtained from land with high carbon stock

Environment themes and principles

Theme 3: GHG emissions reductions permanence

- Emissions reductions attributed to CORSIA CEF should be permanent.

Theme 4: Water

- Production of CORSIA CEF should maintain or enhance water quality and availability

Theme 5: Soil

- Production of CORSIA CEF should maintain or enhance soil health

Theme 6: Air

- Production of CORSIA CEF should minimize negative effects on air quality

Theme 7: Conservation

- Production of CORSIA CEF should maintain biodiversity, conservation value and ecosystem services

Theme 8: Waste and chemicals

- Production of CORSIA CEF should promote responsible management of waste and use of chemicals

Theme 9: Seismic and Vibrational Impacts (applicable to LCAF only)

- Production of CORSIA LCAF should minimize seismic, acoustic, and vibrational impacts

Socio-economic themes and principles

Theme 10: Human and labour rights

- Production of CORSIA CEF should respect human and labour rights

Theme 11: Land use rights and land use

- Production of CORSIA CEF should respect land and land use rights including indigenous and/or customary rights

Theme 12: Water use rights

- Production of CORSIA CEF should respect prior formal or customary water use rights

Theme 13: Local and social development

- Production of CORSIA CEF should contribute to social and economic development in regions of poverty

Theme 14: Food security

- Production of CORSIA CEF should promote food security in food insecure regions

Sustainability Certification Schemes currently approved by ICAO



The ICAO Council has adopted the sustainability certification schemes (SCS) to certify eligible fuels under CORSIA (CEF)



Name of the Sustainability Certification Scheme	Date of approval	Scope of approval
International Sustainability and Carbon Certification (ISCC)	16 Jun. 2023	Certification of CORSIA Sustainable Aviation Fuels economic operators covered by Chapters 1 and 2 of the ICAO document “CORSIA Sustainability Criteria for CORSIA eligible fuels”
Roundtable on Sustainable Biomaterials (RSB)	16 Jun. 2023	Certification of CORSIA Sustainable Aviation Fuels economic operators covered by Chapters 1 and 2 of the ICAO document “CORSIA Sustainability Criteria for CORSIA eligible fuels”
ClassNK SCS	28 Oct. 2024	Certification of CORSIA Sustainable Aviation Fuels economic operators covered by Chapter 2 of the ICAO document “CORSIA Sustainability Criteria for CORSIA eligible fuels”





Thank you

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