CORSIA

The first international adopted approach to calculate and credit lifecycle GHG emissions for aviation fuels

IEA AMF ONLINE WEBINAR Dec 1, 2022

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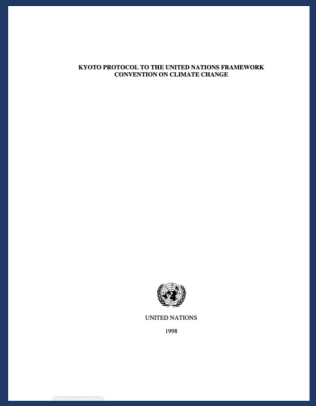
Why CORSIA?


KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

UNITED NATIONS

1998

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

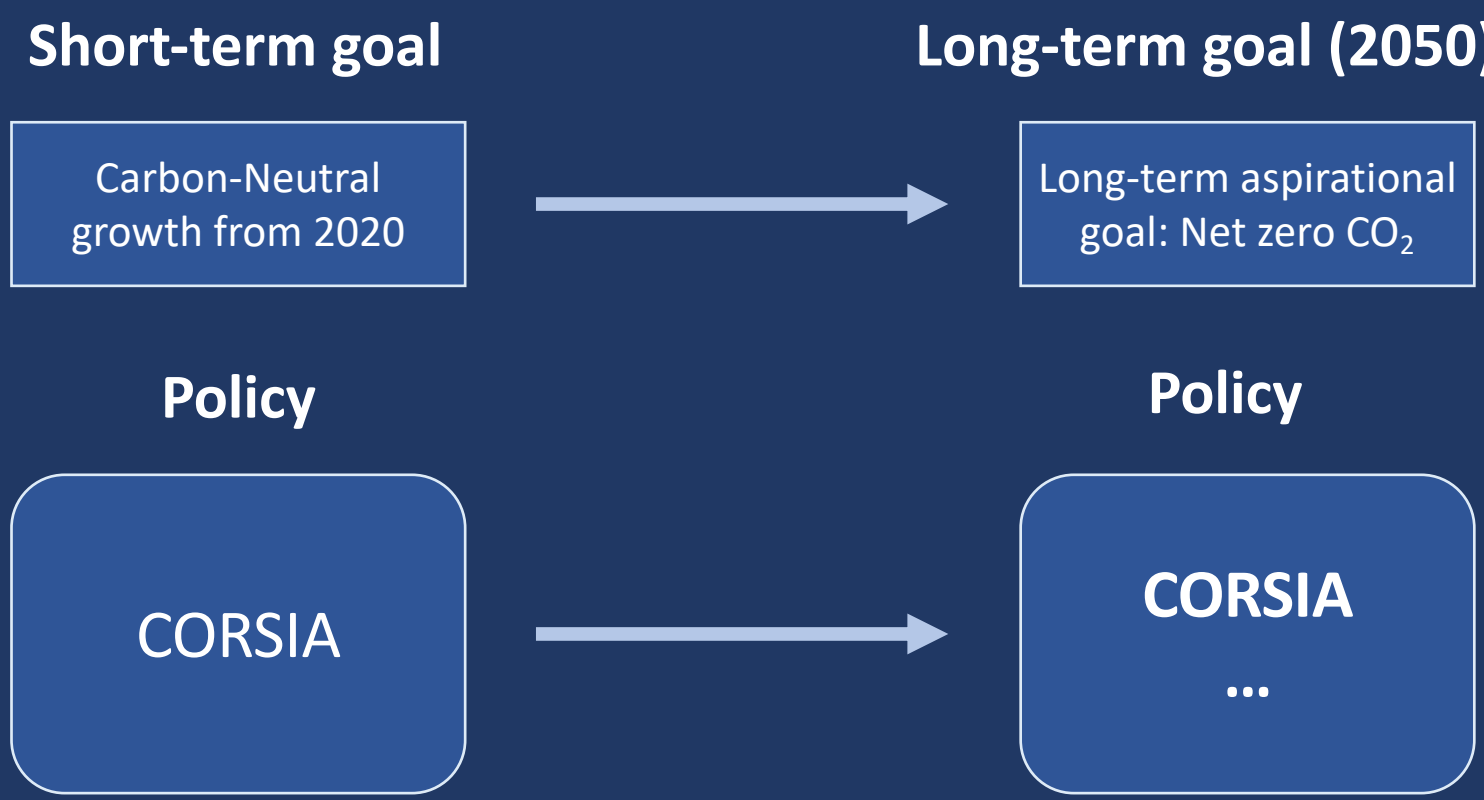
Emissions from **international aviation** are **not included in nationally determined (emission reductions) contributions**

ICAO ◦ OACI ◦ ИКАО
国际民航组织 ◦ منظمة الطيران المدني الدولي ◦ ايكاو

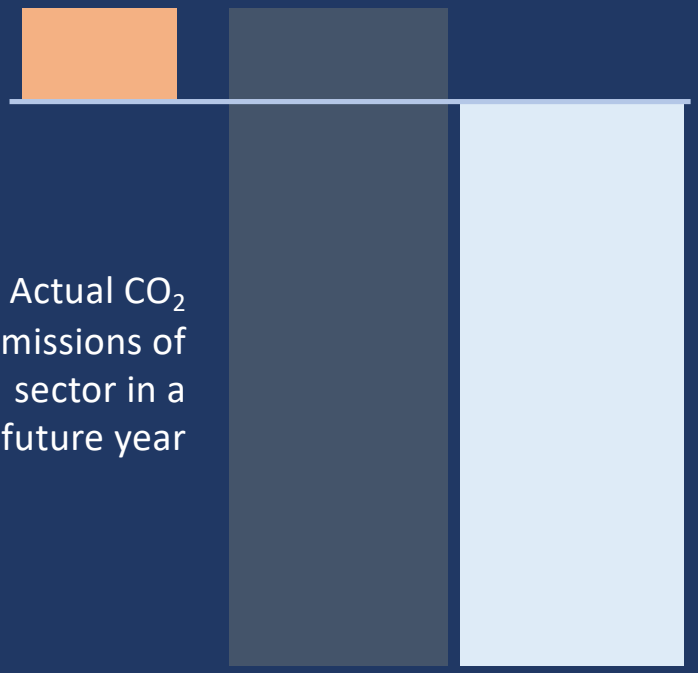
A ‘mandate’ has been given to **ICAO** to **address international aviation greenhouse gas emissions**

Logos: https://en.wikipedia.org/wiki/File:2015_Climate_Conference.svg#filelinks,
https://en.wikipedia.org/wiki/International_Civil_Aviation_Organization#/media/File:International_Civil_Aviation_Organization_logo.svg

CORSIA and the long-term goal

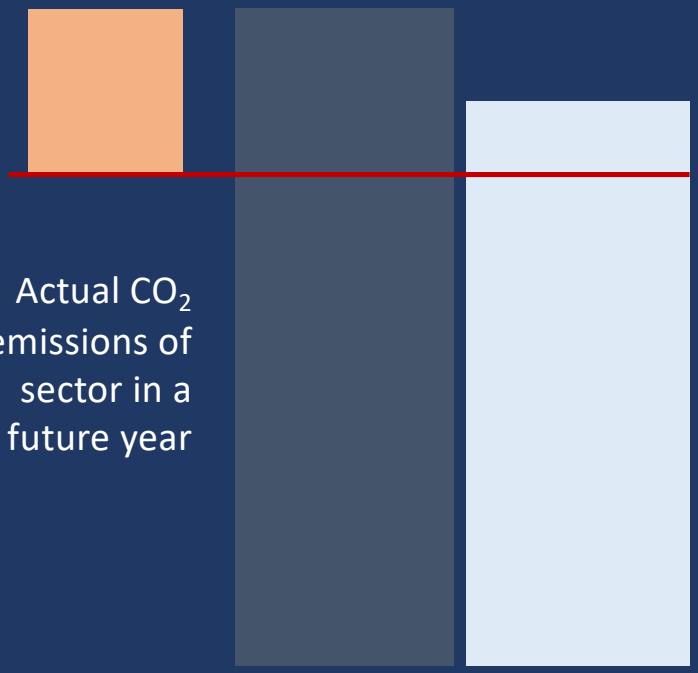


CORSIA mechanism



Simplified schematic at the sector level. Actual process more complicated.

CORSIA mechanism

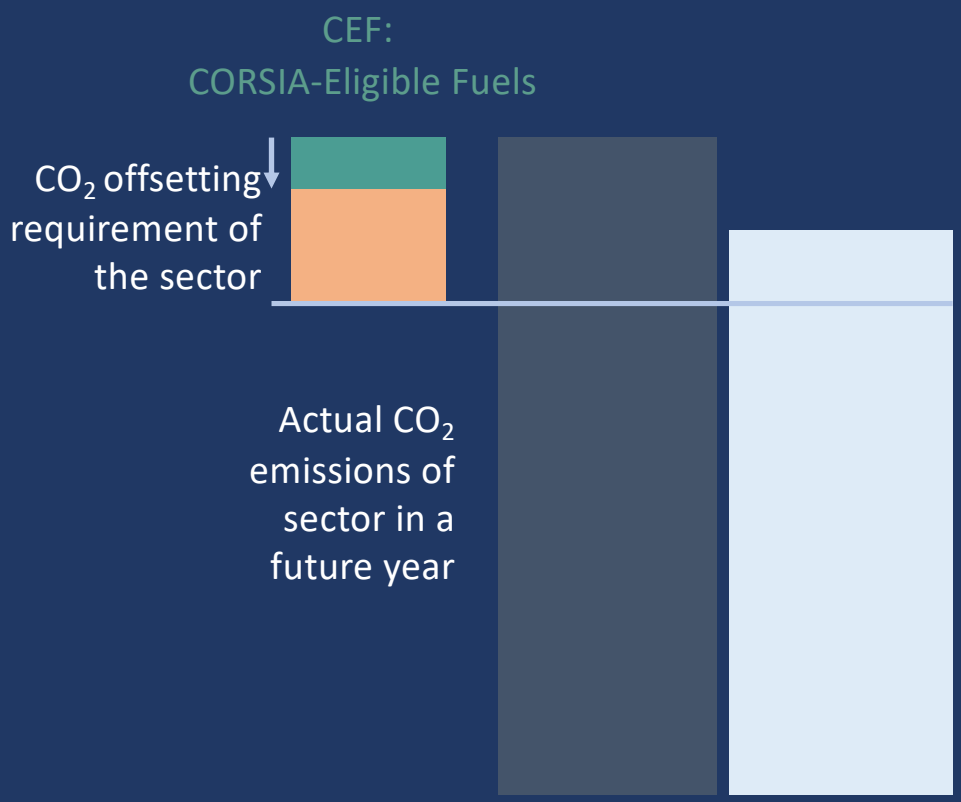


85 % of annual CO_2 emissions of sector in **2019** (**from 2024 to 2035**)

Simplified schematic at the sector level. Actual process more complicated.

The SAF-link in CORSIA

CORSIA-Eligible Fuels
"A CORSIA sustainable aviation fuel or a CORSIA lower carbon aviation fuel, which an operator may use to reduce their offsetting requirements"



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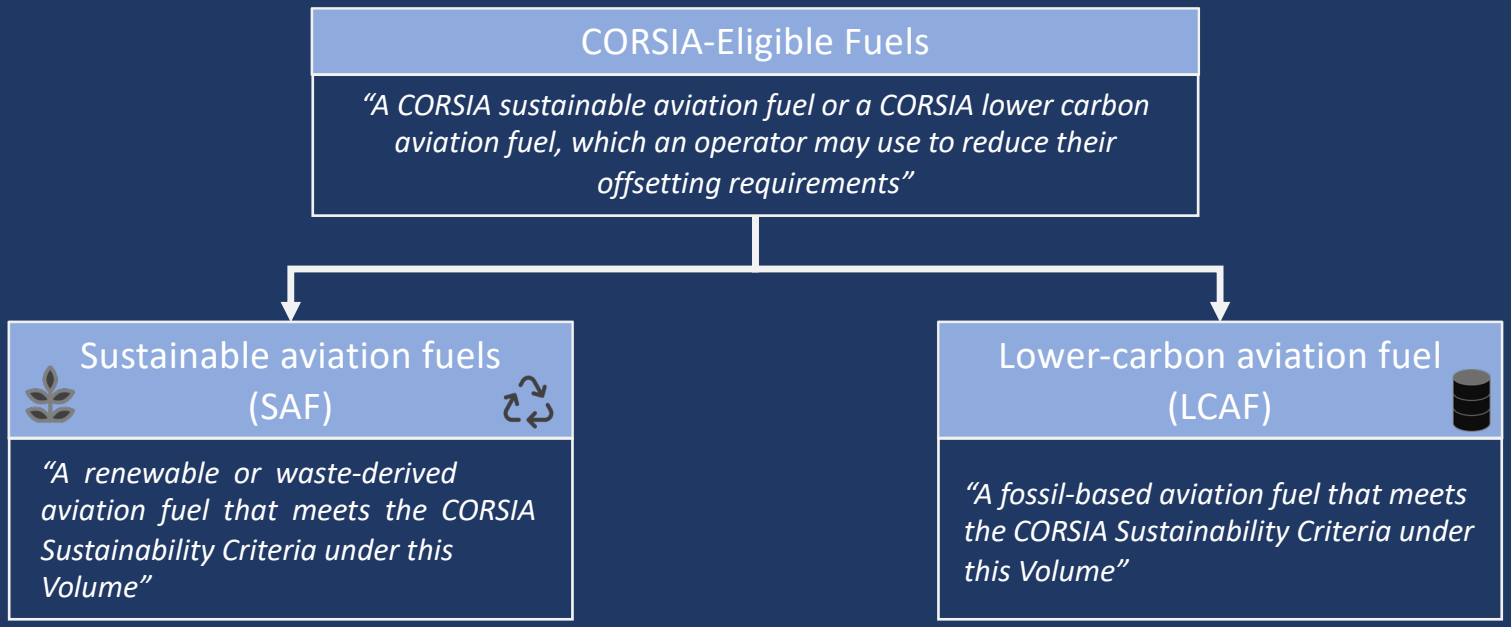
Quotes from Annex 16, Volume IV

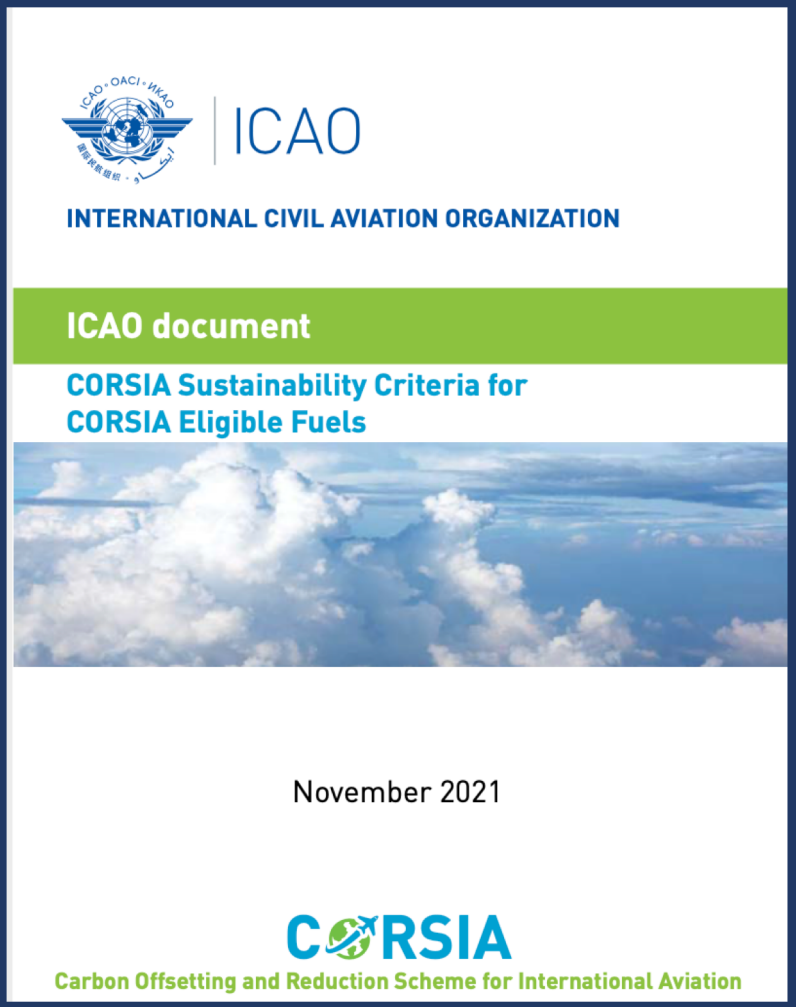
CORSIA-Eligible Fuels



Fuels qualify as CEF if they meet a list of Sustainability Criteria.

Quotes from Annex 16, Volume IV

The CORSIA Sustainability Themes



1. Greenhouse Gases
2. Carbon Stock

for CEF produced before Jan 1, 2024

3. Water
4. Soil
5. Air
6. Conservation
7. Waste and Chemicals
8. Human Rights and labour rights
9. Land use rights and and land use
10. Water use rights
11. Local and social development
12. Food security

additional themes for CEF produced from Jan 1, 2024

Pilot-phase sustainability themes, principles and criteria

Theme	Principle	Criteria
1. Greenhouse gases	CORSIA eligible fuel should generate lower carbon emissions on a life cycle basis.	1.1: CORSIA eligible fuel 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 eligible fuel should not be made from biomass obtained from land with high carbon stock.	2.1: CORSIA eligible fuel will not be made from biomass obtained from land converted after 1 January 2008 that was primary forest, wetlands, or peat lands and/or contributes to degradation of the carbon stock in primary forests, wetlands, or peat lands as these lands all have high carbon stocks. 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.

Pilot-phase sustainability themes, principles and criteria

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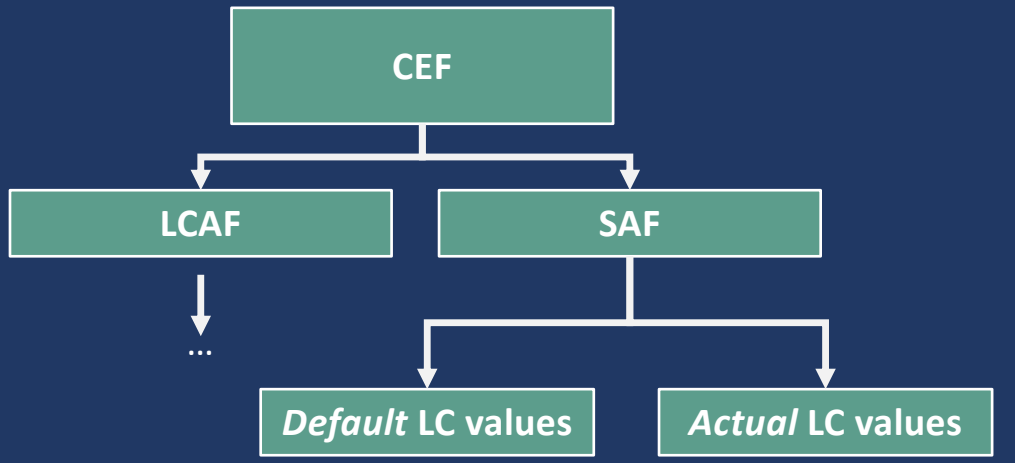
Criterion 1.1: Greenhouse gas emissions reduction

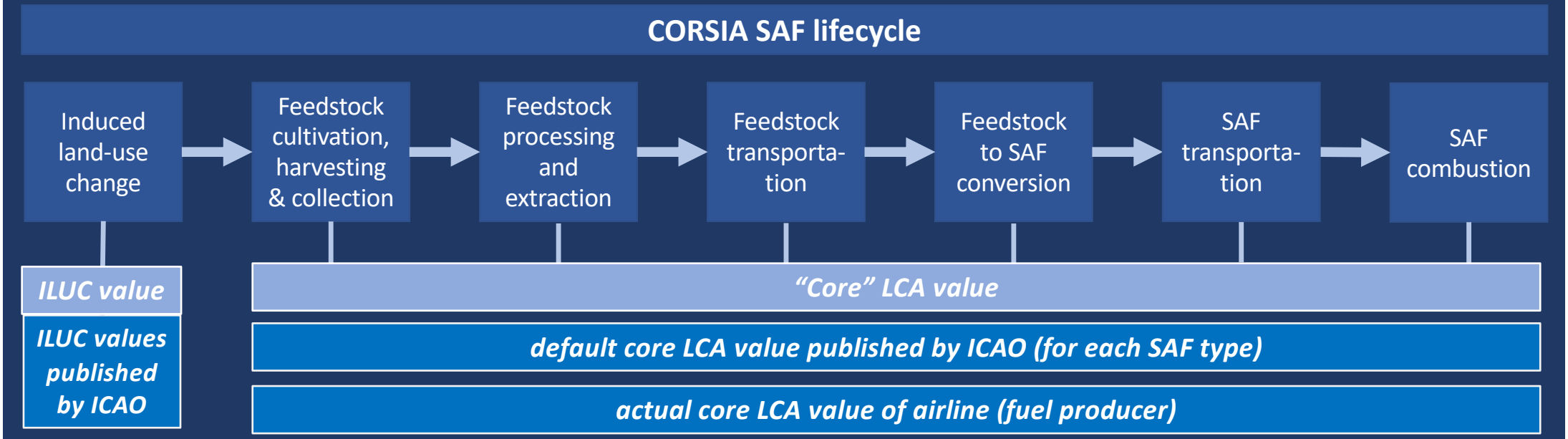
1.1: CORSIA eligible fuel will achieve net greenhouse gas emissions reductions of at least 10% compared to the baseline life cycle emissions values for aviation fuel on a life cycle basis.

Baseline life-cycle emissions values
Jet fuel: 89 gCO_{2e}/MJ
Avgas: 95 gCO_{2e}/MJ



All values are **lifecycle values**, encompassing combustion CO_2 emissions, and non-combustion CO_2, N_20 and CH_4 emissions

Criterion 1.1: Greenhouse gas emissions reduction



Default LC value: *ILUC value published by ICAO* + *default core LCA value published by ICAO*

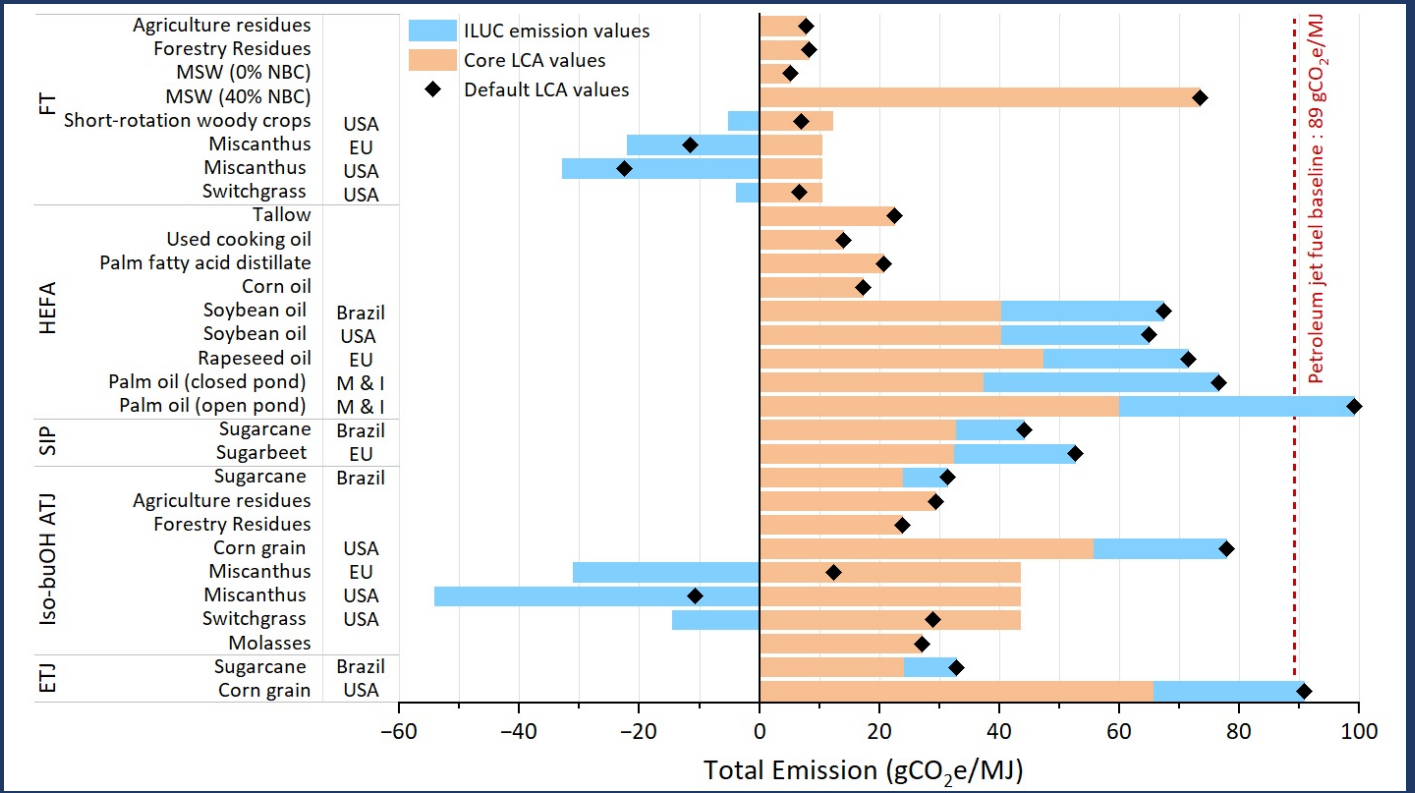
Actual LC value: *ILUC value published by ICAO* + *actual core LCA value of airline (fuel producer)*

Default LC emission values in CORSIA

Goal is the establishment of default values for all relevant ASTM-approved SAF pathways (i.e. feedstock and conversion technology combinations): Each of those has/should have a dedicated default LC value.

Current core gaps:

- CHJ
- FT-coprocessing
- HC-HEFA
- Power to SAF



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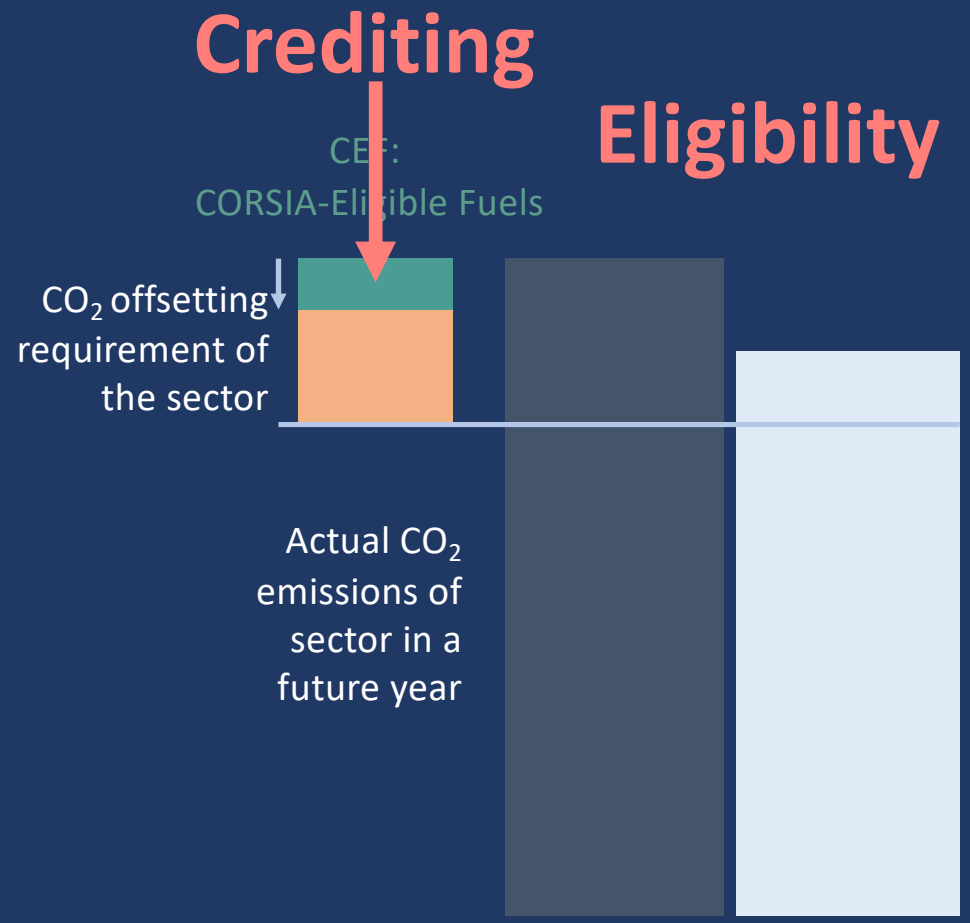

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The crediting formula

Fuel Conversion Factor:
fixed value: 3.16 for jet fuel, 3.10 for AvGas
(kg CO_2 / kg fuel)

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

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

Emissions reduction
in year y

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.

The crediting formula: Example

In 2022, an operator uses 10,000 tones of HEFA fuel from Used Cooking Oil (default LS_f=13.9 g CO_{2e}/MJ).

The emissions reduction that can be claimed under CORSIA will be:

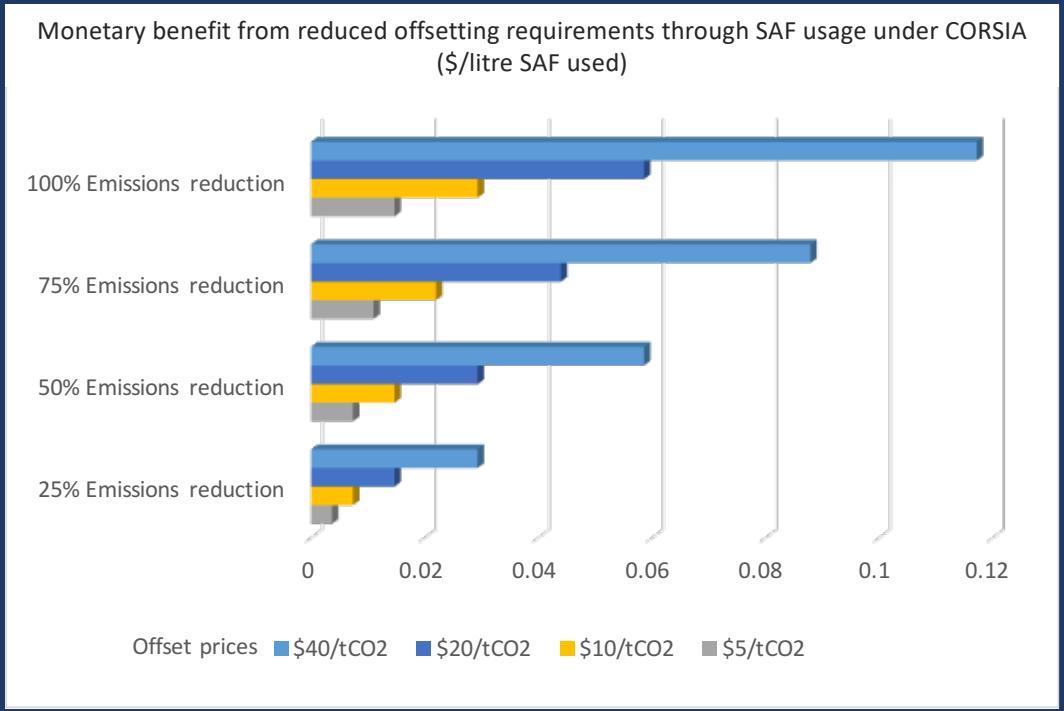
$$ER_{2022} = 3.16 \times \left[10{,}000_{HEFA\ UCO,2022} \times \left(1 - \frac{13.9}{89}\right)\right] = 26.665 \text{ tonnes of } CO_2$$

Example taken from ICAO 2019 Environmental report

How much are SAF emission reductions worth in CORSIA?

The monetary benefit per unit of emission reduction is a factor of the **price for CORSIA offsets** that do not need to be bought because of the use of SAF. This price is set on the offset market and, therefore, uncertain.

The monetary benefit per unit of SAF is then a function of the **emission reduction achieved** by this SAF and the **price of the offsets**.

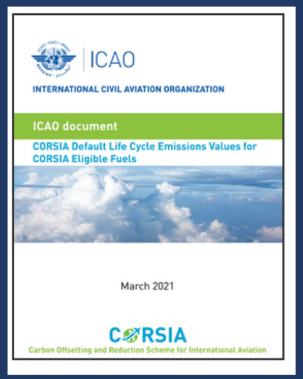


Note: ICAO assumes future prices CORSIA offsets to be in the range of $6 to $40 per t CO_2 .

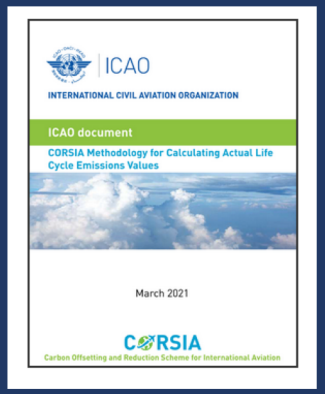
Current price gaps between SAF and conventional kerosene are significantly higher than the expected monetary benefit provided through CORSIA, so CORSIA will not be able to close this gap on its own.

Key CORSIA documents

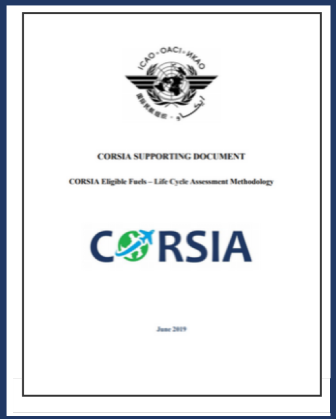
CORSIA Sustainability Criteria for CORSIA Eligible Fuels



CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels



CORSIA Methodology for Calculating Actual Life Cycle Emissions Values



CORSIA Supporting Document "CORSIA Eligible Fuels - Life Cycle Assessment Methodology"

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

Thank you!

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