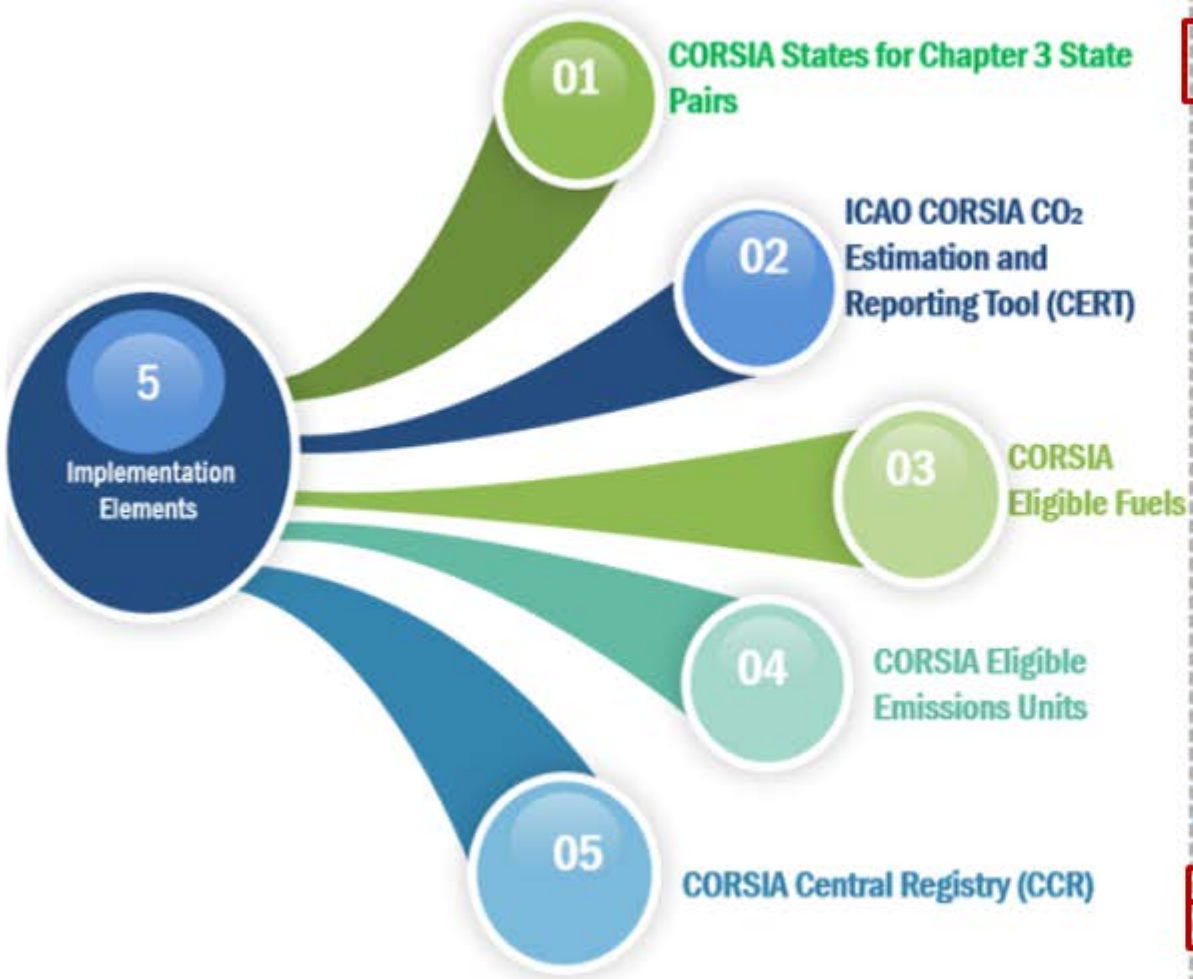
ICAO ENVIRONMENT

CORSIA Offsetting requirements:
calculations

ICAO Secretariat

Ms. Chinga Mazhetese: ESAF RO: ENV/MET

Cairo CORSIA Workshop (Virtual, 19 Dec 2021)



ICAO Documents

1. *CORSIA States for Chapter 3 State Pairs*

2. *ICAO CORSIA CO_2 Estimation and Reporting Tool*

3. *CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes*
4. *CORSIA Approved Sustainability Certification Schemes*
5. *CORSIA Sustainability Criteria for CORSIA Eligible Fuels*
6. *CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels*
7. *CORSIA Methodology for Calculating Actual Life Cycle Emissions Values*

8. *CORSIA Eligible Emissions Units*
9. *CORSIA Emissions Unit Eligibility Criteria*

10. *CORSIA Central Registry: Information and Data for the Implementation of CORSIA*
11. *CORSIA Aeroplane Operator to State Attributions*
12. *CORSIA 2020 Emissions*
13. *CORSIA Annual Sector's Growth Factor (SGF)*
14. *CORSIA Central Registry (CCR): Information and Data for Transparency*

Applicability of CO_2 Offsetting Requirements

Offsetting requirements shall be applicable:

- From 01 January 2021 to 31 December 2035;
- To an Aeroplane Operator (AO) with international flights as defined between States defined in the ICAO document entitled, "CORSIA States for Chapter 3 State Pairs."

States that have notified ICAO of their decision to voluntarily participate

- Shall be included in the ICAO document entitled, "CORSIA States for Chapter 3 State Pairs."
- The doc will also contain States which meet the compliance criteria for Phase II (from 01 Jan 2027-31 Dec 2035)-with the exception of LDCs, LLDCs and SIDS.

CORSIA

CO_2 OFFSETTING REQUIREMENTS

Sector-wide offsetting requirements

- **Route-based;**
- **For each given year**

- Total amount of sector-wide offsetting requirements in a given year *y* (from 2021) under CORSIA
  1. Calculate the 2019 to 2020 average levels of sector-wide emissions, with the route-coverage by CORSIA in year *y*
  2. Calculate the year *y* levels of sector-wide emissions, with the route-coverage by CORSIA in year *y*
  3. Difference between 1 and 2 is the total amount of sector-wide offsetting requirements in year *y*

Total amount of sector-wide offsetting requirements = Total amount of Emissions of Year y- Baseline for Year y

Offsetting requirements:

- The amount of emissions to be offset by the sector **in any given year (y), from 2021**, will be the difference between the baseline emissions and the emissions in the given year (y):

$$SE_Y = Emissions\ in\ year\ y - SE_B$$

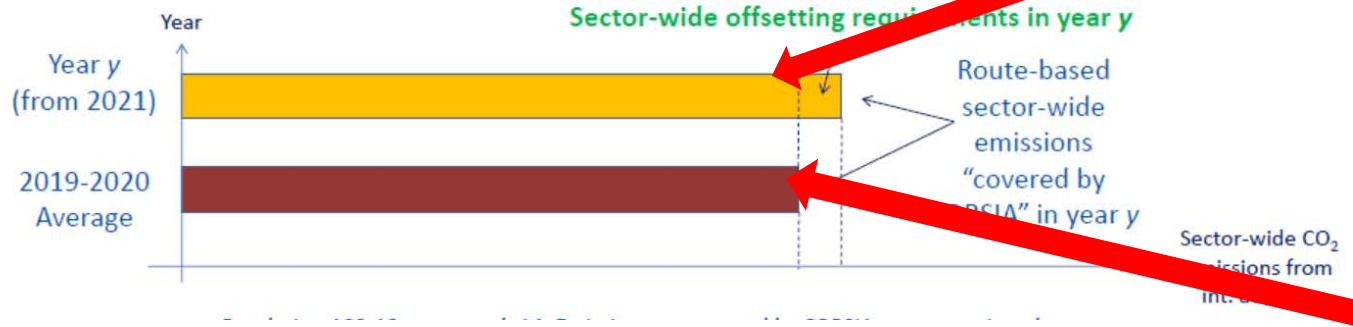
Where SE_y is the Sector-wide offsetting requirements in a given year y

For illustrative purposes only	
Sectoral Baseline	200 tonnes
Sectoral 2023 emissions	230 tonnes
SEy for 2023	230-200= tonnes

Sector-wide offsetting requirements

- Total amount of sector-wide offsetting requirements in a given year *y* (from 2021) under CORSIA

1. Calculate the 2019 to 2020 average levels of sector-wide emissions, with the route-coverage by CORSIA in year *y*
2. Calculate the year *y* levels of sector-wide emissions, with the route-coverage by CORSIA in y
3. Difference between 1 and 2 is the total amount of sector-wide offsetting requirem in year *y*



Example:
Emissions for Year y (2023) are 230 tonnes

Example:
Baseline for Year y (2023) is 200 tonnes

Total amount of sector-wide offsetting requirements = Total amount of Emissions of Year y- Baseline for Year y

Total amount of sector-wide offsetting requirements = 230- 200 = 30 tonnes

CO_2 Offsetting Requirements

- **Sectoral Baseline**
  - The average of 2019 and 2020 emissions from routes covered by CORSIA in a given year (from 2021)

$$SE_B = \frac{(2019 + 2020)emissions}{2}$$

Will need to be recalculated when the routes included in CORSIA change e.g. when new States volunteer to participate

- Paragraph 11(g) of the Assembly Resolution A40-19 notes that the sectoral baseline will be re-calculated when the routes included in the CORSIA change.
  - For example, when new States volunteer to participate or States decide to withdraw their participation.
- Calculation of the baseline will be done by ICAO

Illustration: calculating the Baseline emissions per given Year y

a) Calculate the **average of total CO_2 emissions covered by CORSIA between 2019 and 2020 for the year 2021**

(316 + 334) / 2 = **325.0**

b) Calculate the **average of total CO_2 emissions covered by CORSIA between 2019 and 2020 for the year 2024**

(488 + 519) / 2 = **503.5**

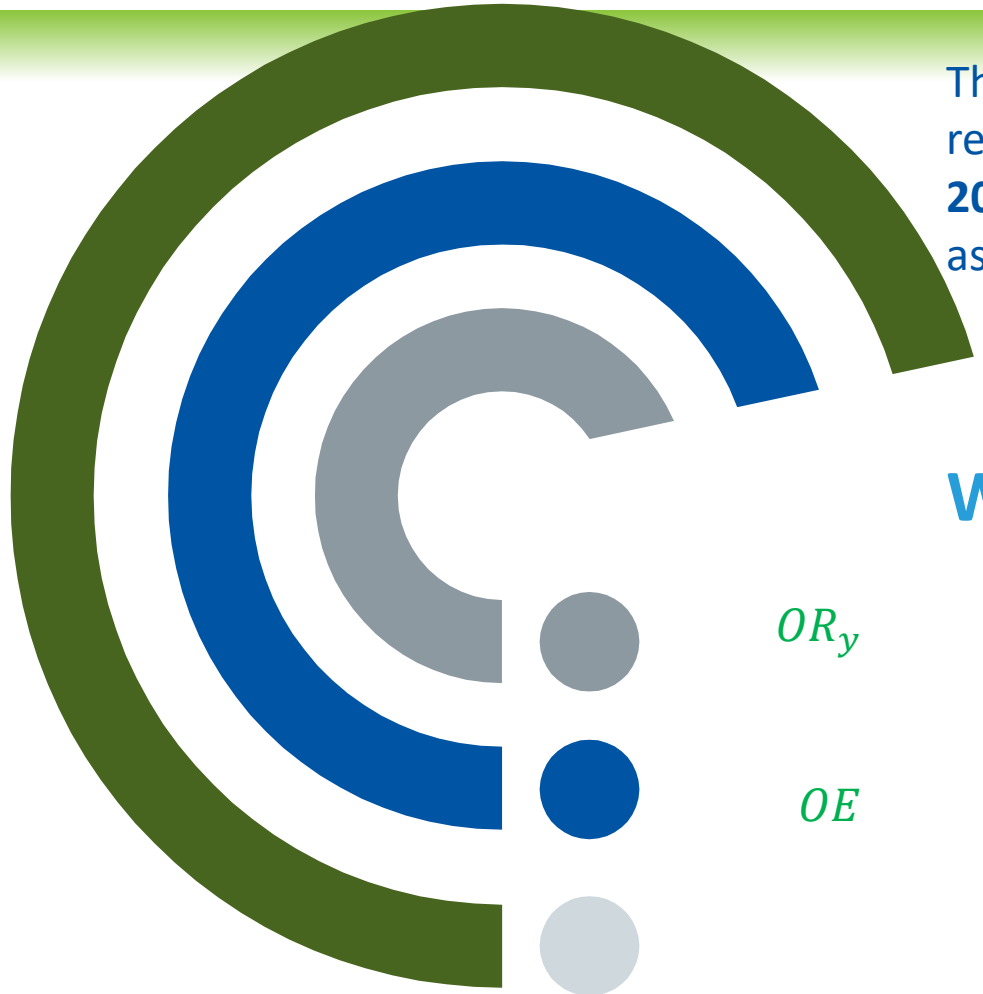
Route-based approach		Pilot phase				First phase			
From	To	Route Covered?	CO_2 (2019)	CO_2 (2020)	CO_2 (2021)	Route Covered?	CO_2 (2019)	CO_2 (2020)	CO_2 (2024)
A	B	Yes	52	54	55	Yes	52	54	60
A	C	No	52	54	55	No	52	54	60
A	D	Yes	52	54	55	Yes	52	54	60
A	E	No	53	56	58	No	53	56	68
A	F	No	53	56	58	Yes	53	56	68
A	G	No	53	56	58	Yes	53	56	68
A	H	No	54	59	63	No	54	59	80
A	I	Yes	54	59	63	Yes	54	59	80
A	J	No	54	59	63	No	54	59	80
B	A	Yes	52	54	55	Yes	52	54	60
B	C	No	52	54	55	No	52	54	60
B	D	Yes	52	54	55	Yes	52	54	60
B	E	No	52	54	55	No	52	54	60
B	G	No	54	59	63	Yes	54	59	80
B	H	No	54	59	63	No	54	59	80
B	I	Yes	54	59	63	Yes	54	59	80
B	J	No	54	59	63	No	54	59	80
C	A	No	53	56	58	No	53	56	68
C	D	No	53	56	58	No	53	56	68
D	E	No	32	34	35	No	32	34	41
E	F	No	9	10	11	No	9	10	14
F	A	No	7	8	9	Yes	7	8	12
G	B	No	5	6	7	Yes	5	6	10
H	I	No	2	3	3	No	2	3	5
Total international aviation CO_2		-	1062	1132	1181	-	1062	1132	1402
TOTAL CO_2 COVERED BY CORSIA		-	**316**	**334**	**346**	-	**488**	**519**	**638**

Overview of CO_2 offsetting requirements

Year of applicability	$\%S_y$	$\%O_y$
1 Jan 2024- 31 Dec 2029	100%	0%
1 Jan 2030- 31 Dec 2032	(100%-$\%O_y$)	A specified % of at least 20%
1 Jan 2033- 31 Dec 2035	(100%-$\%O_y$)	A specified % of at least 20%

The specified percentage (i.e. $\%O_y$)will be determined by the ICAO Assembly in 2028

Offsetting Requirements for AOs



The State will calculate the AO's amount of CO2 emissions required to be offset in a given year **from 01 Jan 2021 to 31 Dec 2023 (Pilot Phase)** prior to consideration of CORSIA eligible fuels, as follows:

$$OR_y = OE \times SGF_y$$

Where:

OR_y	AO's offsetting requirements in the given year y;
OE	AO's CO_2 emissions covered in the given year y or AO's CO_2 emissions covered by a State in 2020, depending upon the option selected by the State which will be applied to all AOs that have been attributed to it; and
SGF_y	Sector's Growth Factor.

The SGF_y will be provided by ICAO in the ICAO document entitled, " CORSIA Annual Sector's Growth Factor (SGF)"

CO_2 Offsetting Requirements

$$OR_y = OE \times SGF_y$$

- **Sector's Growth Factor (SGF):**

$$SGF = \frac{(SE_y - SE_{B,y})}{SE_y}$$

Where:

SE_y= total sectoral CO_2 emissions covered in the given year y

$SE_{B,y}$ = average total annual sectoral CO_2 emissions during 2019 and 2020 covered in the given year y

The State will use the SGF applicable for any given year (SGF_y) and this will be provided in the ICAO Doc entitled, "CORSIA Annual Sector's Growth Factor (SGF)"

Sectoral emissions in a given year (SE_y) do not include the CO_2 emissions from new entrants during their exception period

CO_2 Offsetting Requirements

$$OR_y = OE \times SGF_y$$

01 The State will use the SGF applicable for any given year (SGFy) and this will be provided in the ICAO Doc entitled, "CORSIA Annual Sector's Growth Factor (SGF)"

02 Sectoral emissions in a given year (SEy) do not include the CO2 emissions from new entrants during their exception period

- Sector's Growth Factor (SGF):

$$SGF = \frac{(SE_y - SE_{B,y})}{SE_y}$$

$$SE_B = \frac{(2019 + 2020)emissions}{2}$$

Where:

SE_y= total sectoral CO_2 emissions covered in the given year y

$SE_{B,y}$ = average total annual sectoral CO_2 emissions during 2019 and 2020 covered in the given year y

Illustration: Calculating the SGF

$$SGF = \frac{(SE_y - SE_{B,y})}{SE_y}$$

a) Calculate the **sectoral growth factor** for the year 2021

The Baseline for the year 2021:(316 + 334) / 2 = **325.0**

SGF for 2021 = (346 – 325) / 346 = 0.061 = **6.1%**

b) Calculate **the sectoral growth factor** for the year 2024

The Baseline for the year 2024:(488 + 519) / 2 = **503.5**

SGF for 2024 = (638 - 503.5) / 638 = 0.211 = **21.1%**

Route-based approach		Pilot phase				First phase			
From	To	Route Covered?	CO_2 (2019)	CO_2 (2020)	CO_2 (2021)	Route Covered?	CO_2 (2019)	CO_2 (2020)	CO_2 (2024)
A	B	Yes	52	54	55	Yes	52	54	60
A	C	No	52	54	55	No	52	54	60
A	D	Yes	52	54	55	Yes	52	54	60
A	E	No	53	56	58	No	53	56	68
A	F	No	53	56	58	Yes	53	56	68
A	G	No	53	56	58	Yes	53	56	68
A	H	No	54	59	63	No	54	59	80
A	I	Yes	54	59	63	Yes	54	59	80
A	J	No	54	59	63	No	54	59	80
B	A	Yes	52	54	55	Yes	52	54	60
B	C	No	52	54	55	No	52	54	60
B	D	Yes	52	54	55	Yes	52	54	60
B	E	No	52	54	55	No	52	54	60
B	G	No	54	59	63	Yes	54	59	80
B	H	No	54	59	63	No	54	59	80
B	I	Yes	54	59	63	Yes	54	59	80
B	J	No	54	59	63	No	54	59	80
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Total international aviation CO_2		-	1062	1132	1181	-	1062	1132	1402
TOTAL CO_2 COVERED BY CORSIA		**-**	**316**	**334**	**346**	**-**	**488**	**519**	**638**

Illustration: Calculating the AO's offsetting requirements

Assumption Table 2: Emissions of Individual Airlines in selected years (illustrative example)

State	Airline	From	To	CO_2 (2019)	CO_2 (2020)	CO_2 (2021)	CO_2 (2024)
A	A1	A	B	52	54	55	60
A	A1	A	C	52	54	55	60
A	A1	A	D	52	54	55	60

b) Calculate the **amount of offsetting requirements in 2024 by the airline A1**:

$$OR_y = OE \times SGF_y$$

SGF for 2024 was 21.1%

What is OE for airline A1 if it operates routes **A-B, A-C, A-D**; **route A-C is not covered by CORSIA**?
CO_2 emissions covered by CORSIA in 2024 by the airline A1: 60 + 60 = **120 t CO_2**

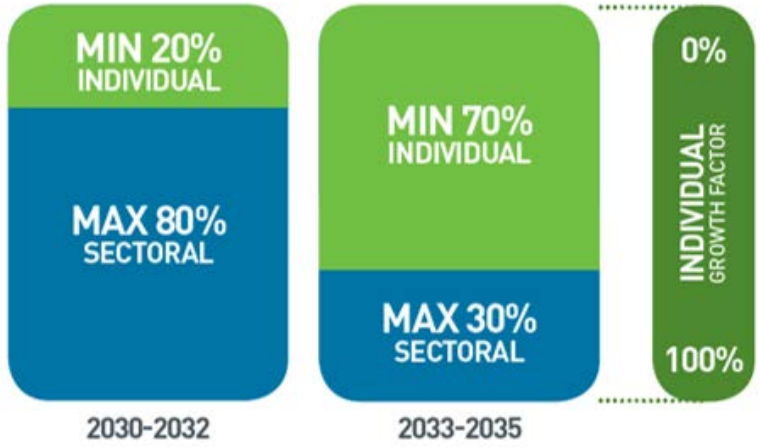
Offsetting Requirements = $OE \times SGF_y$ = 120 x 21.1% = **25.3 tonnes of CO_2 to be offset**

Offsetting Requirements for AOs

The State will calculate the AO's amount of CO_2 emissions required to be offset in a given year (*y*) ***from 01 Jan 2024 -31 Dec 2035 (1st & 2nd Phases)*** *prior to the consideration of CORSIA eligible fuels, every year as follows*:

$$\boldsymbol{OR_y} = \%S_y * (\boldsymbol{OE_y} \times \boldsymbol{SGF_y}) + \%O_y * (\boldsymbol{OE_y} \times \boldsymbol{OGF_y})$$

- Where:
- OR_y= AO's offsetting requirements in the given year y;
- OE_y= AO's CO_2 emissions covered in the given year y;
- $\%S_y$= % Sectoral in the given year y;
- $\%O_y$= % Individual in the given year y;
- SGF_y= Sector's Growth Factor; and
- OGF_y= AO's Growth Factor.



The SGF_y will be provided by ICAO in the ICAO document entitled, " CORSIA Annual Sector's Growth Factor (SGF)"

Offsetting Requirements for AOs

From ***01 Jan 2024 -31 Dec 2029 (1st & part of the 2nd Phases)*** *prior to the consideration of CORSIA eligible fuels, every year as follows*:

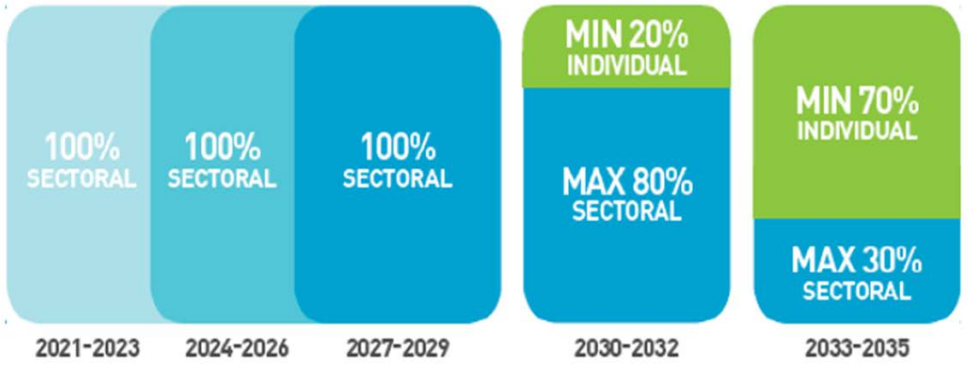
$$\boldsymbol{OR_y} = \%S_y * (\boldsymbol{OE_y} \times \boldsymbol{SGF_y}) + \%O_y * (\boldsymbol{OE_y} \times \boldsymbol{OGF_y})$$

- Where:
- OR_y= AO's offsetting requirements in the given year y;
- OE_y= AO's CO_2 emissions covered in the given year y;
- $\%S_y$= % Sectoral in the given year y;
- $\%O_y$= % Individual in the given year y;
- SGF_y= Sector's Growth Factor; and
- OGF_y= AO's Growth Factor.

100% Sectoral: for 2024 to 2029

Accounts only for the sectoral **and not for the individual operator's emissions growth**

∴ the part in brackets is equal to Zero (0)



Offsetting requirements

	Baseline	Year Y	Growth factor Year Y	Offsetting requirements in year Y (0% individual; 100% sectoral) (2021-29)
Airline X1	100	125	20%	16
Airline Y1	100	105	4.8%	14
International Aviation Sector	200	230	13%	30

$125 \times \left(\frac{230-200}{230}\right)$

Operator Offsetting Requirements (2021-2029):

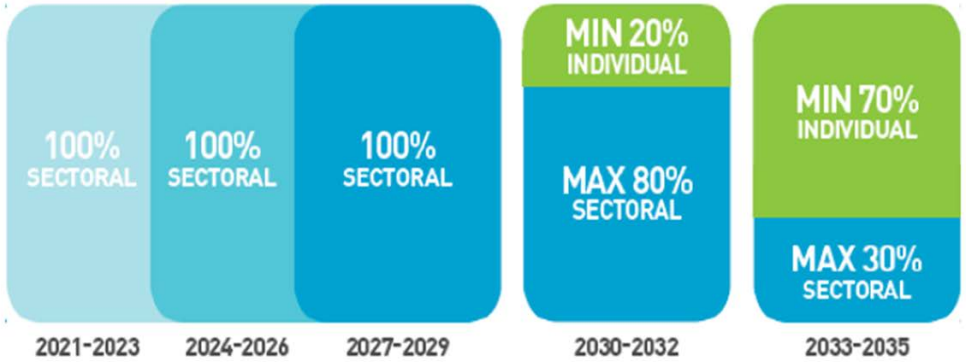
- $OR_y = \%S_y * (OE_y \times SGF_y) + \%O_y * (OE_y \times OGF_y)$

$\left(\frac{230-200}{230}\right)$

- $OR_y = \%S_y * (OE_y \times SGF_y) + 0$
- $OR_y = \%S_y * (OE_y \times SGF_y)$
- $OR_y = 1 * (OE_y \times SGF_y)$
- $OR_y = OE_y \times SGF_y$

100% sectoral growth

Offsetting requirements Cont.



- **From 2030**, the growth factor will change every year taking into account both the sectoral and the individual operator's emissions growth and will be applied as follows:
  - From **2030-2032**,at least 20% Individual and 80% Sectoral;
  - From **2033-2035**, at least 70% Individual and 30% Sectoral

Offsetting Requirements for AOs

$$\boldsymbol{OR_y} = \%S_y * (\boldsymbol{OE_y} \times \boldsymbol{SGF_y}) + \%O_y * (\boldsymbol{OE_y} \times \boldsymbol{OGF_y})$$

The State will calculate, when applicable, the AO's Growth Factor for a given Year y (OGF_y) in accordance with the CO_2 emissions from the verified Emissions Reports submitted by AOs attributed to it, *as follows*:

$$OGF_y = \frac{(OE_y - OE_{B,Y})}{OE_y}$$

Where:

- OE_y= total AO's CO_2 emissions covered in the given year y; and
- $OE_{B,y}$= average total AO's CO_2 emissions during 2019 and 2020 covered in the given year y.

Offsetting requirements

Dynamic approach-the quantity of an operator's offsetting requirements in a given year y (ORy) from 2030 will be calculated based on the sectoral growth and individual growth

- From 2030 to 2032: Maximum 80% Sectoral Approach + At least 20% Individual Approach*

Operator's Requirements in year y (from 2030)

$$OR_y = \leq 0.8 \times \left[OE_y \times \frac{(SE_y - SE_B)}{SE_y} \right] + \geq 0.2 \times \left[OE_y \times \frac{(OE_y - OE_B)}{OE_y} \right]$$

Share of Sectoral Approach

Share of Individual Approach

Operator's Requirements in year y (from 2030) with Sectoral Approach

Operator's Requirements in year y (from 2030) with Individual Approach

Offsetting requirements

Operator Offsetting Requirements 2030-32:

$$OR_y = 80\% * [OE_y \times (\frac{SE_y - SE_B}{SE_y})] + 20\% * [OE_y \times (\frac{OE_y - OE_B}{OE_y})]$$

	Baseline	Year Y	Growth factor Year Y	Offsetting requirements in year Y (20% individual; 80% sectoral) (2030-32)
Airline X1	100	125	20%	18
Airline Y1	100	105	4.8%	12
International Aviation Sector	200	230	13%	30

$$OR_y = 80\% * \left[105 * \frac{(230 - 200)}{230}\right] + 20\% * \left[105 * \frac{(105 - 100)}{105}\right]$$

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Offsetting requirements

From 2033-2035, at least 70% individual and 30% sectoral

- From 2033 to 2035: Maximum 30% Sectoral Approach + At least 70% Individual Approach*

Operator's Requirements in year y (from 2033)

$$OR_y = \leq 0.3 \times \left[OE_y \times \frac{(SE_y - SE_B)}{SE_y} \right] + \geq 0.7 \times \left[OE_y \times \frac{(OE_y - OE_B)}{OE_y} \right]$$

* The Council will recommend to the Assembly in 2028 whether and to what extent to adjust the percentages

Offsetting requirements

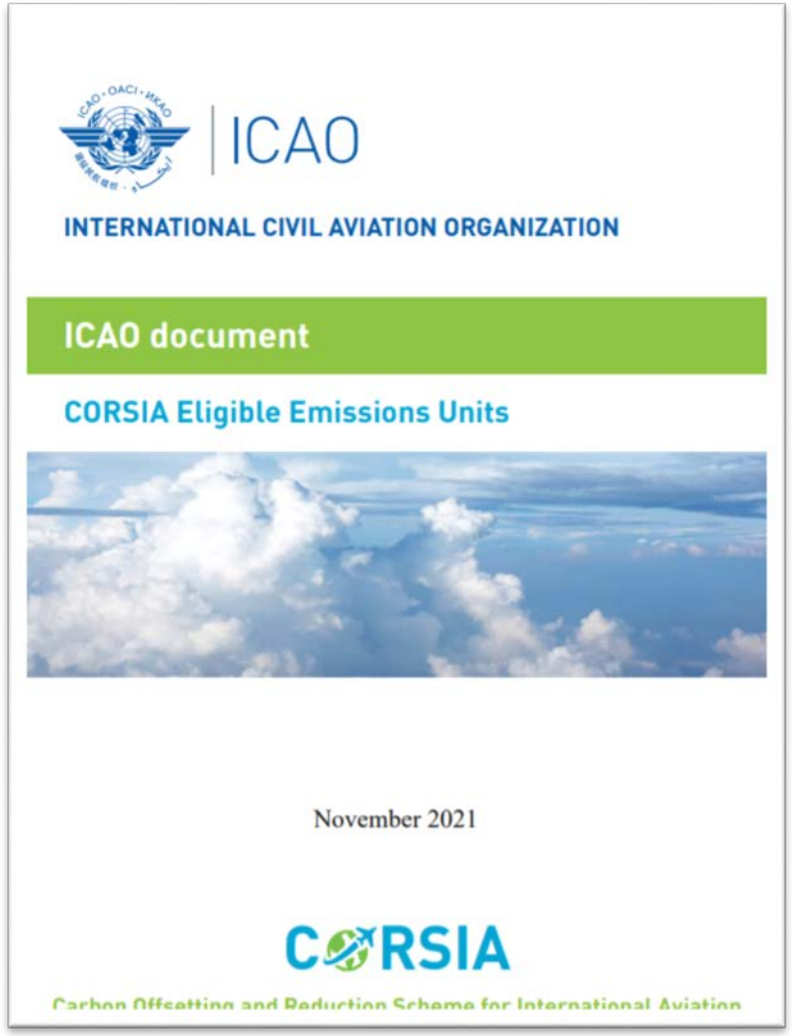
Operator Offsetting Requirements 2033-35:

$$\boldsymbol{OR_y} = 30\% * [\boldsymbol{OE_y} \times (\frac{\boldsymbol{SE_y - SE_B}}{\boldsymbol{SE_y}})] + 70\% * [\boldsymbol{OE_y} \times (\frac{\boldsymbol{OE_y - OE_B}}{\boldsymbol{OE_y}})]$$

	Baseline	Year Y	Growth factor Year Y	Offsetting rqts in year Y (20% individual; 80% sectoral) (2033-35)
Airline X1	100	125	20%	22
Airline Y1	100	105	4.8%	8
International Aviation Sector	200	230	13%	30

$$\boldsymbol{OR_y} = 30\% * \left[105 * \frac{(230 - 200)}{230}\right] + 70\% * \left[105 * \frac{(105 - 100)}{105}\right]$$

How does offsetting work?



- **Offsetting**
  - through the **purchase** and **cancellation** of emissions units:
- Different sources of emissions reductions (*mechanisms, programmes, projects*)
  - Buying and selling of **CORSIA eligible emissions units** through the **carbon market**

The Carbon Market

One emissions unit represents one tonne of CO_2 emissions reduced.

- The buying and selling of eligible emissions units happens **through the carbon market.**
  - The **price of the emissions units** in the carbon market is **influenced by the law of supply** (availability of emissions units) **and demand** (level of offsetting requirements).

- "**Cancelling**" means the **permanent removal and single use of an emissions unit** so that the same emissions unit cannot be used more than once. This is done after an aeroplane operator has purchased emissions units from the carbon market.

- For CORSIA, an aeroplane operator is required to **meet its offsetting requirements by cancelling CORSIA Eligible Emissions Units in a quantity equal to its total final offsetting requirements for a given compliance period.**

CORSIA Eligible Emissions Units

Associated ICAO Documents

CORSIA Emissions Unit Eligibility Criteria

CORSIA Eligible Emissions Units

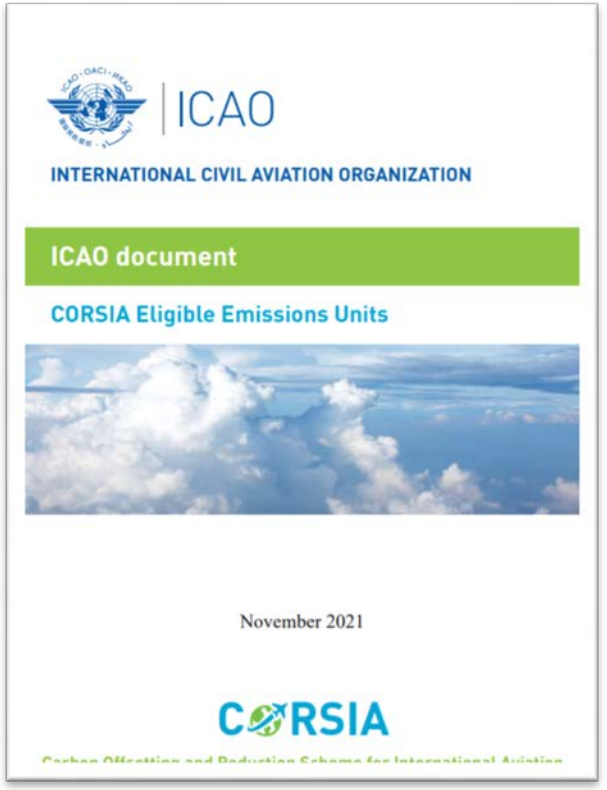


Illustration: Calculating the costs for Offsetting requirements

Cost related to the emissions (*for illustrative purposes*)

	Baseline	Year Y	Growth factor Year Y	Offsetting requirements in year Y (0% individual; 100% sectoral) (2021-29)	If one EU cost $5
Airline X1	100	125	20%	16	**16 X 5= $80**
Airline Y1	100	105	4.8%	14	**14 X 5= $70**

CORSIA

EMISSIONS REDUCTIONS FROM THE USE OF CORSIA ELIGIBLE FUELS

What is a CORSIA eligible fuel? (A.16 Vol IV, Part I)

CORSIA eligible fuel: a **CORSIA sustainable aviation fuel** OR a **CORSIA lower carbon aviation fuel**, which an operator may use to reduce their offsetting requirements

CORSIA sustainable aviation fuel

- A renewable or waste-derived aviation fuel that meets the CORSIA Sustainability Criteria under Annex 16, Vol IV
- Extensive information on ICAO initiatives on SAF: https://www.icao.int/environmental-protection/pages/SAF.aspx

CORSIA lower carbon aviation fuel

A fossil-based aviation fuel that meets the CORSIA Sustainability Criteria under Annex 16, Vol IV

- Research is ongoing on possible technologies that may allow the production of fossil fuels with a smaller carbon footprint,
  - such as Carbon Capture, Utilization and Storage (CCUS) and the use of renewable energy in oil refineries.
- More detailed information on the LCAF technologies were provided during the ICAO Stocktaking Seminars 2019-2021.
- ICAO is closely following the evolution of such technologies and investigating the development of proper methodologies to assess their potential environmental benefits.
- More information on this work: https://www.icao.int/environmental-protection/Pages/CAEP-FTG.aspx

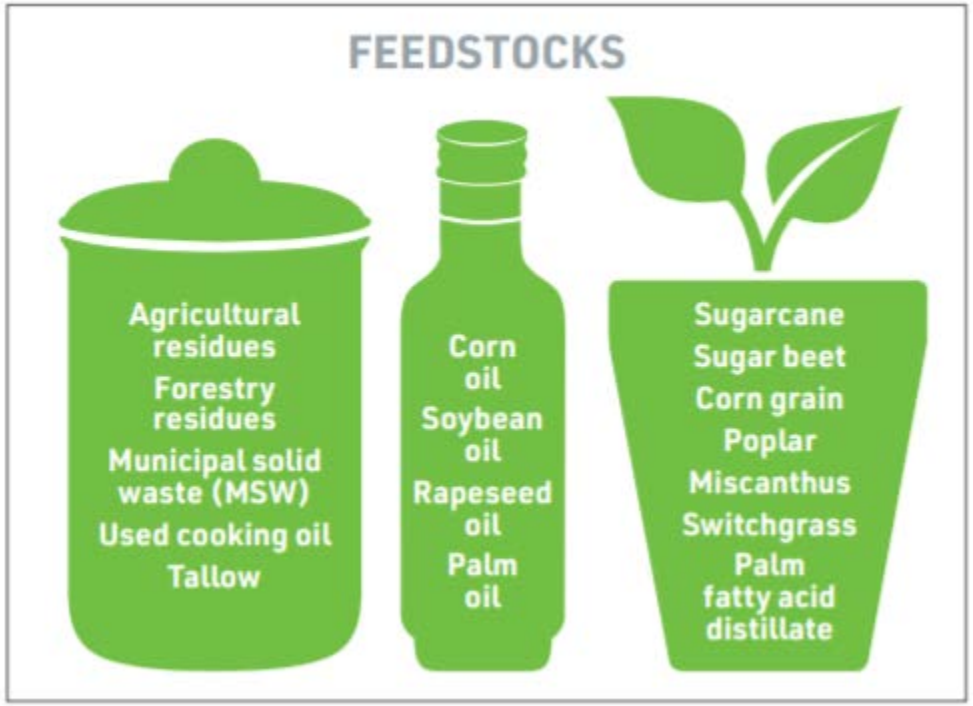
Feedstocks

Feedstock:

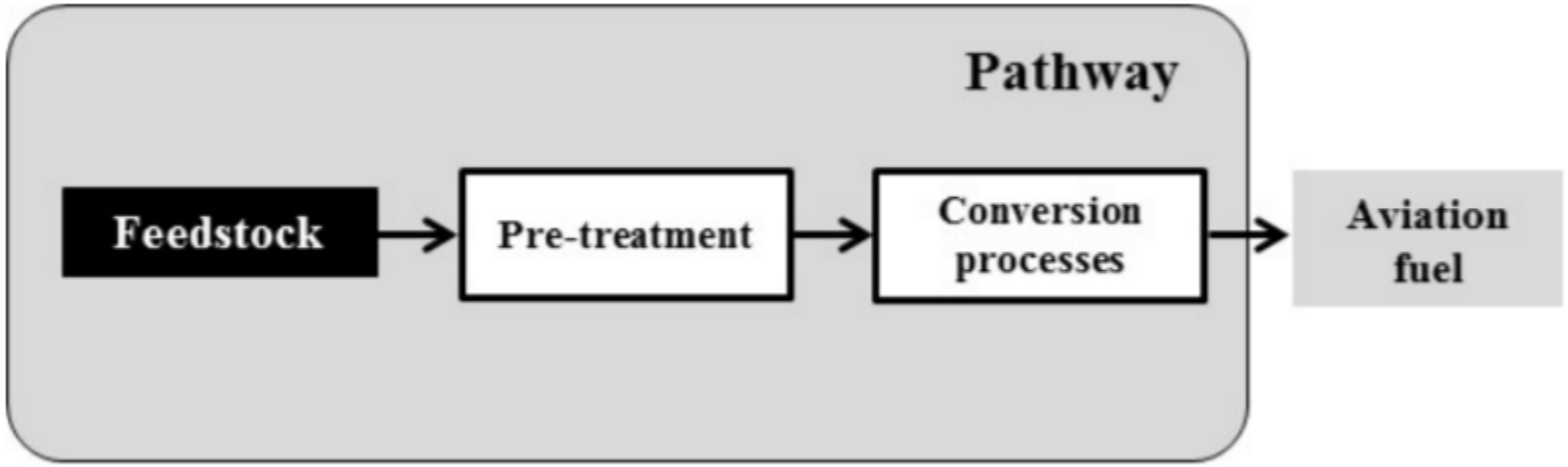
- a type of unprocessed raw material used for the production of aviation fuel.

Several feedstock types have the potential to produce a CEF.

- As of February 2019,
  - CAEP had developed default life cycle emission values for CORSIA sustainable aviation fuels produced from sixteen distinct feedstocks.
- Work is ongoing in CAEP
  - to develop specific methodologies for the consideration of CORSIA lower carbon aviation fuels.
- More feedstock types may become available to fuel producers as the CEF industry evolves.



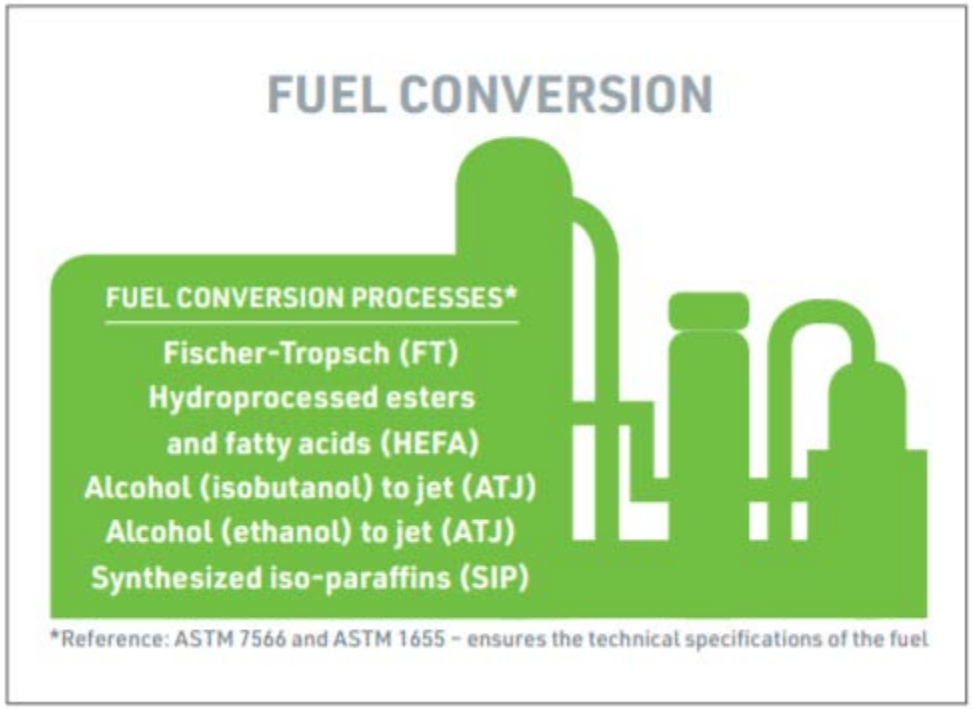
Background: How to produce a SAF



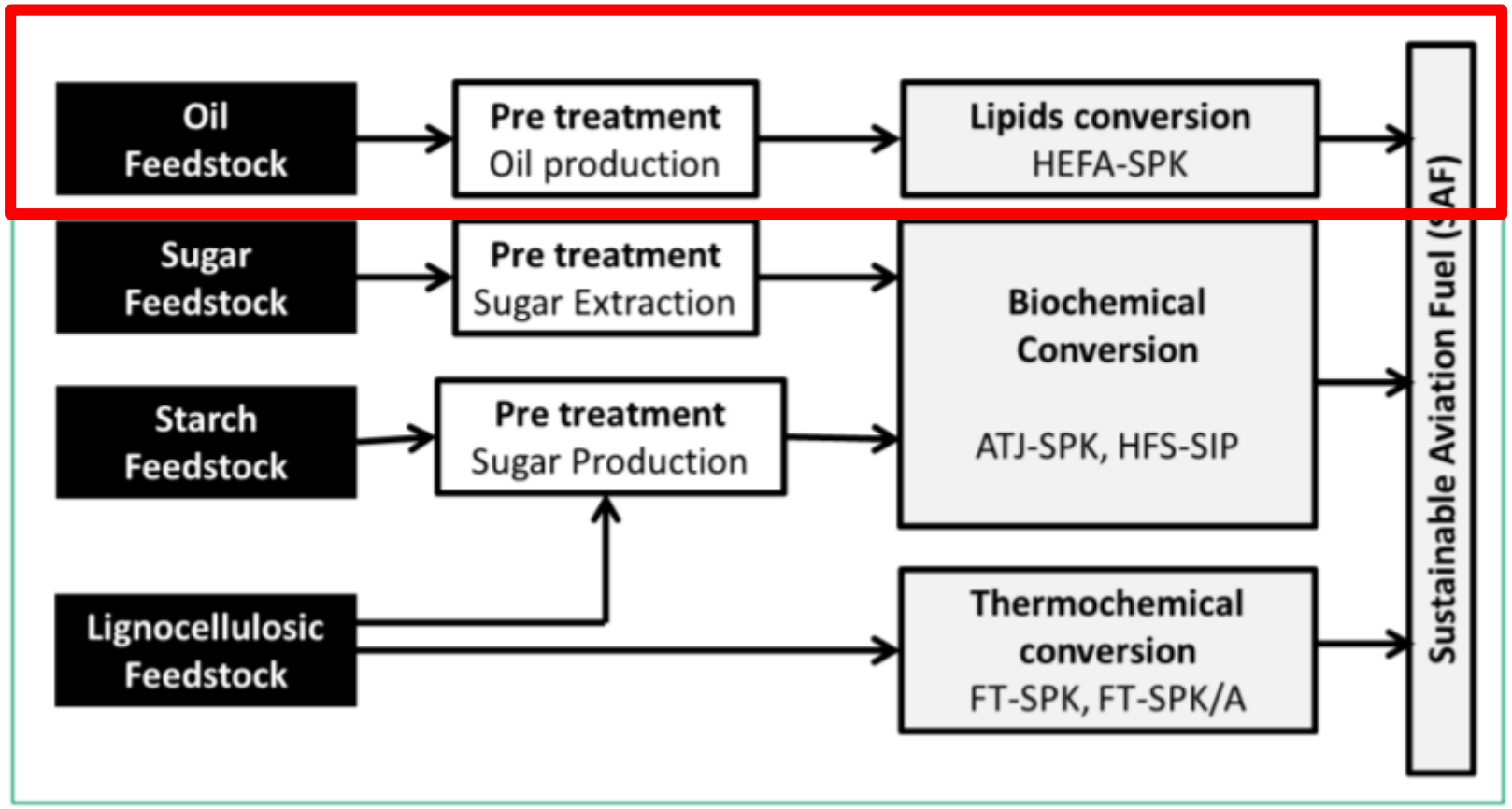
- A fuel "**production pathway**" contains a sequence of stages, starting with **feedstock production**, followed by **its pre-treatment** in order to achieve the requirements of the conversion processes, and finally **the conversion processes** to produce aviation fuel
  - The feasibility of fuel production is strongly linked to the configuration of the production pathway, which includes the transport of products through the stages.
  - As of December 2018, there were six conversion processes approved for SAF production

Fuel conversion

- The identified feedstock types:
  - are converted into aviation fuel **through a fuel conversion process**.
  - The international standard-setting organization, ASTM International,
    - Has certified six fuel conversion processes for use in aircraft,



Background: General overview of SAF pathways



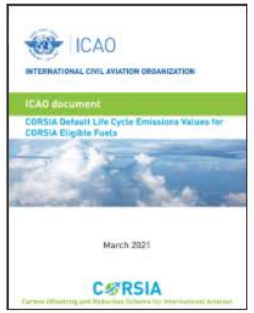
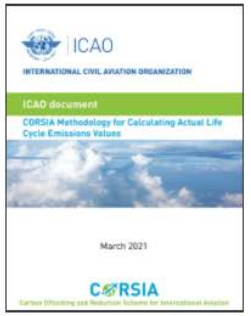
Example of the Solaris tobacco plant:

- Solaris is a nicotine and GMO free crop variety that yields significant amounts of sustainable oil (*as feedstock for bio jet fuel*)
- Extraction of lipids;
- https://www.icao.int/environmental-protection/GFAAF/Pages/Project.aspx?ProjectID=36

Sustainability Certification

- Beyond the technical certification process,
  - fuels must also go through **a sustainability certification process** if they are to be used in CORSIA.
- Following the request of the ICAO Assembly:
  - ICAO developed a CORSIA-specific sustainability certification process based on existing sustainability approaches, whether regulatory or voluntary, for the sustainability demonstration of aviation fuels.

Sustainability Certification Schemes

				
CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes First Edition, November 2019	**CORSIA Approved Sustainability Certification Schemes*** First Edition, November 2020	**CORSIA Sustainability Criteria for CORSIA Eligible Fuels**** Second Edition, November 2021	**CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels***** Third Edition, November 2021	**CORSIA Methodology for Calculating Actual Life Cycle Emissions Values** Second Edition, March 2021

- Sustainability Certification Schemes (SCSs) will ensure that:
  - a CEF meets the CORSIA Sustainability Criteria (Doc 3),
  - the Life Cycle Emission Value of the CEF is obtained correctly (Docs 4 and 5).

SCSs must be approved by the ICAO Council to perform this sustainability certification process (Doc 1), (Doc 2).

Emissions reductions from the use of CEFs

- An aeroplane operator can reduce its CORSIA offsetting requirements by claiming emissions reductions from the use of CEF through the following process:
  - **1. The operator obtains the life cycle emissions value (LS_f) of the CEF.**
    - This is determined during the CEF sustainability certification process, as described previously.

Calculation of CEF Emissions Reductions

- **2. The operator calculates the CEF emissions reductions (ERy) as follows:**
  - An AO can claim for emissions reductions from the use of CORSIA eligible fuels:

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

Also called the emissions reduction factor (ERF_f) of a CORSIA eligible fuel

Where:

- ER_y= emissions reductions from the use of CORSIA eligible fuels in the given year y (tonnes);
- FCF= fuel conversion factor, equal to 3.16kg CO_2 /kg fuel for Jet-A / Jet-A1 fuel and 3.10kg CO_2 /kg fuel for AvGas / Jet-B fuel;
- $MS_{f,y}$= Total mass of a neat CEF claimed in the given year y by fuel type f (in tonnes);
- LS_f= Life cycle emissions value for a CORSIA eligible fuel (in gCO_2e /MJ); and
- LC = Baseline life cycle emissions values for aviation fuel, fixed value, 89 for jet fuel or 95 for AvGas [gCO_2e/MJ].

For each CEF claimed:

The total mass of the neat CEF claimed in the given year y is multiplied by its emissions reduction factor (ERF_f)

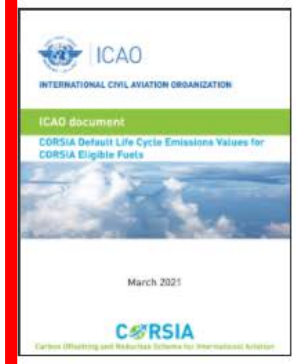
CEF Emissions Reductions

- **3. The operator includes information on CEF in its Emissions Report, including:**
  - CEF emissions reductions (ERy) claimed
  - Fuel type, mass, and life cycle emissions value (LS_f)
  - Evidence of compliance with CORSIA sustainability criteria
- **4. A verification body verifies information on CEF provided in the Emissions Report.**
  - (More information on verification is available throughout this chapter.)
- **5. The State collects and aggregates verified information on CEF from all aeroplane operators attributed to it,**
  - and reports aggregated information to ICAO through the CORSIA Central Registry (CCR).

The Life Cycle Emission (LS_f)

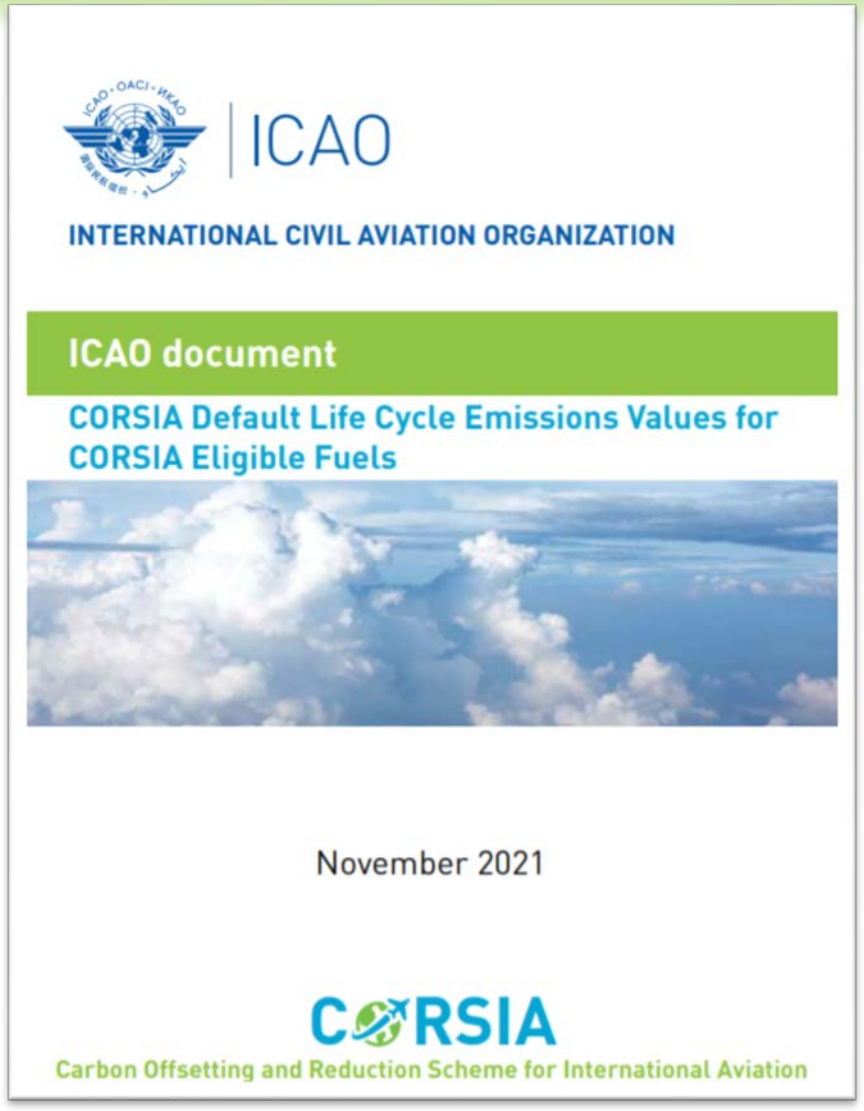
- The use of CEF can reduce aviation CO_2 emissions on a life cycle basis
  - i.e., from production to combustion.
- The reduction of CO_2 emissions from CEF depends on a variety of factors, e.g:
  - the feedstock used, how the feedstock was produced, the fuel conversion process used, etc.
- **These factors combine to provide a fuel's life cycle emissions value (LS_f)**

Associated Documents

				
CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes First Edition, November 2019	**CORSIA Approved Sustainability Certification Schemes*** First Edition, November 2020	**CORSIA Sustainability Criteria for CORSIA Eligible Fuels**** Second Edition, November 2021	**CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels***** Third Edition, November 2021	**CORSIA Methodology for Calculating Actual Life Cycle Emissions Values** Second Edition, March 2021

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

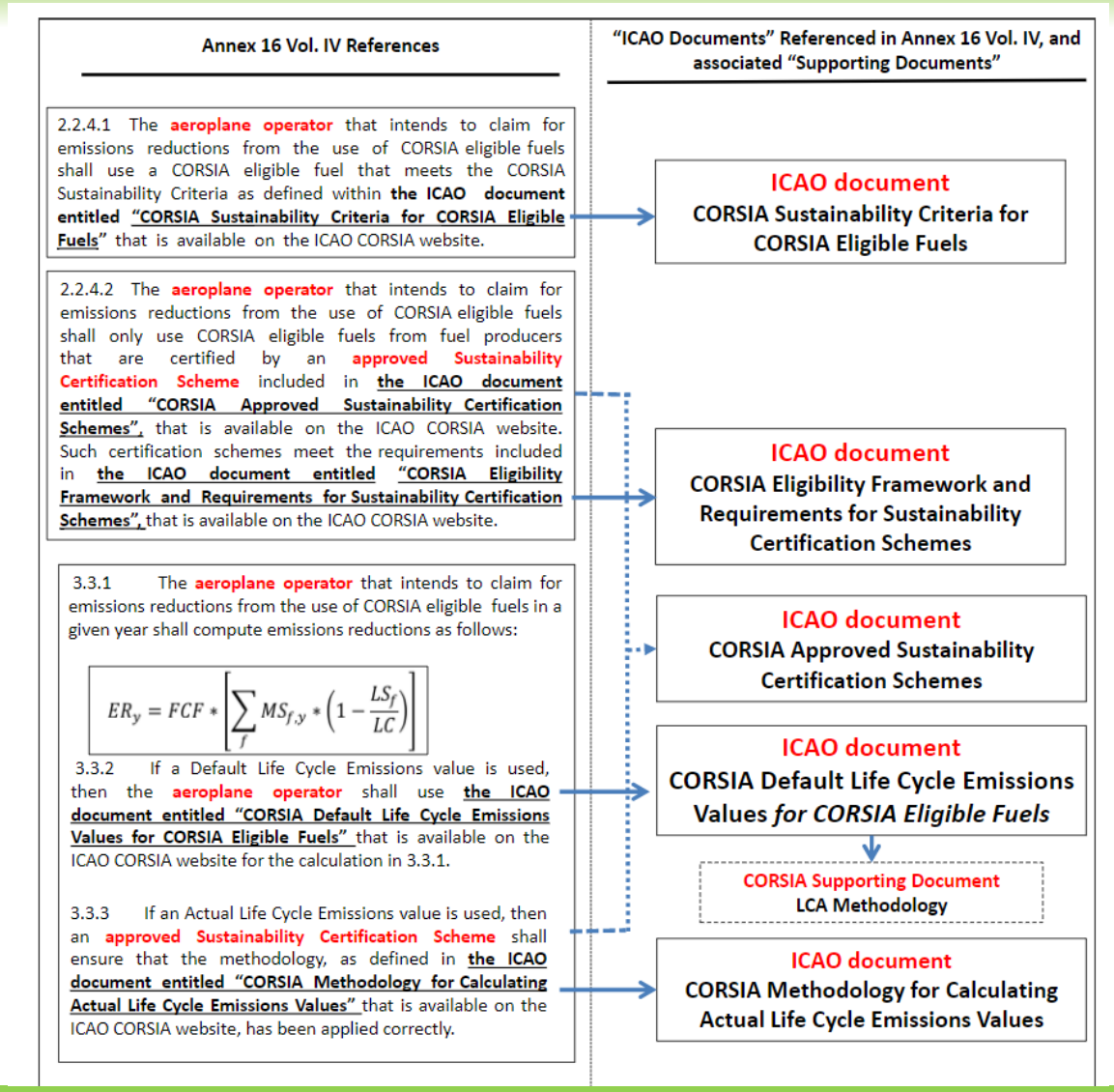
CORSIA Implementation Element for CEF (Docs for LS_f)



ICAO Doc: CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels

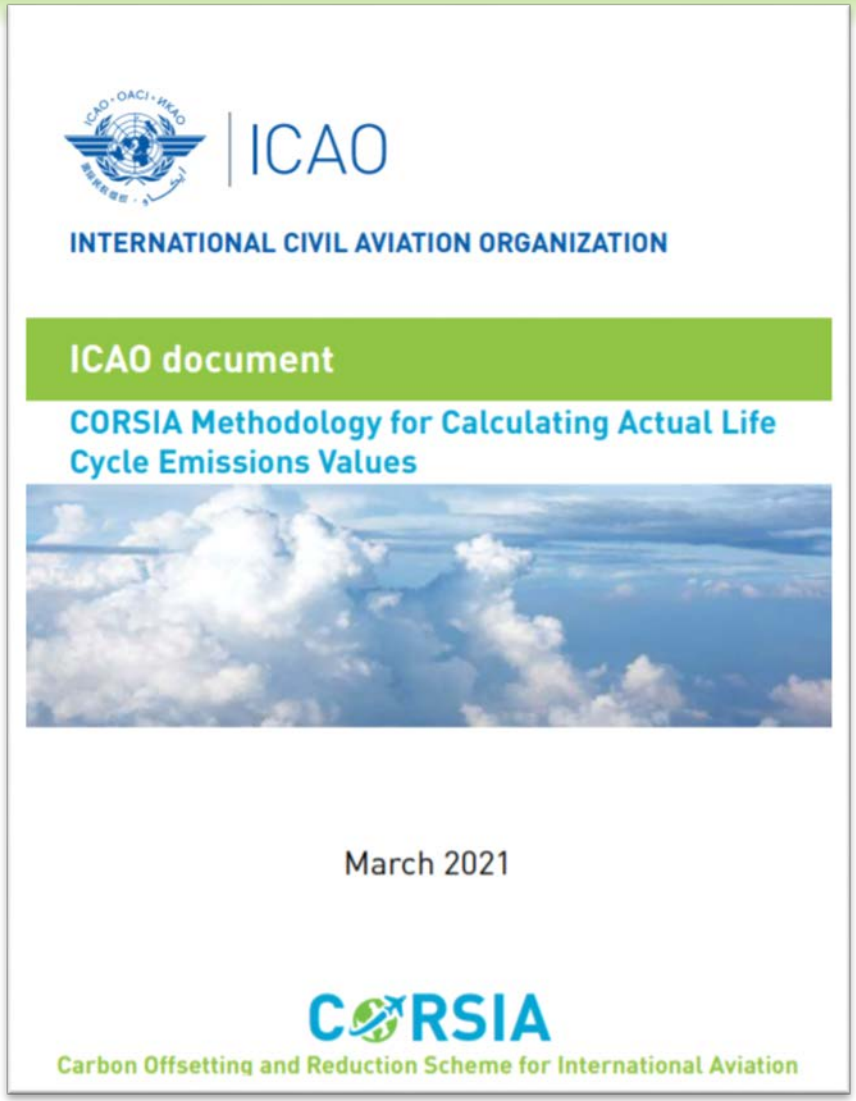
- This ICAO document provides a list of Default Life Cycle Emissions Values for CEFs, as a function of the feedstock, conversion process, and production region.
  - This is the simplest option available to determine the LS_f value of a given CEF.

CORSIA Implementation Element for CEF (Docs for LS_f Cont.)



- The CORSIA supporting document "CORSIA Eligible Fuels – Life Cycle Assessment Methodology" (available from the ICAO CORSIA webpage)
  - provides technical information and describe ICAO processes to manage and maintain this ICAO document.

CORSIA Implementation Element for CEF (Docs for LSf)



CORSIA Methodology for Calculating Actual Life Cycle Emissions Values

- provides methodologies that can be used by fuel producers to calculate Actual Life Cycle Emissions Values.
  - These methodologies allow fuel producers to claim Life Cycle Emissions Values lower than the default values in ICAO document **ICAO Doc: CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels**
    - in case they can support that with proper technical information.

Illustration: Calculating ERy

Example:

If, in 2021, an operator uses 10,000 tonnes of Jet-A fuel produced from Used Cooking Oil (*default LS_f =13.9 gCO2e/MJ**), what will be the **amount of emissions reductions**?

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

$$ER_{2021} = 3.16 \times \left[10\,000 \times \left(1 - \frac{13.9}{89}\right)\right] = 26,665\ tonnes\ of\ CO_2$$

Total final CO_2 offsetting requirements for a given compliance period using CEFs

The amount of CO_2 emissions required to be offset by the AO, after taking into account emission reductions from the use of CORSIA eligible fuels in a given compliance period **from 1 January 2021 to 31 December 2035**,

shall be calculated by the State as follows:

$$\boldsymbol{FOR_c = \left(OR_{1,c} + OR_{2,c} + OR_{3,C}\right) - \left(ER_{1,C} + ER_{2,C} + ER_{3,C}\right)}$$

Where:

- FOR_C= Aeroplane operator's total final offsetting requirements in the given compliance period *c*;
- $OR_{y,c}$= Aeroplane operator's offsetting requirements in the given year y (where *y* = 1, 2 or 3) of the compliance period *c*; and
- $ER_{y,c}$= Emissions reductions from the use of CORSIA eligible fuels in the given year *y* (where *y* = 1, 2 or 3) of the compliance period *c*.

Total final CO_2 offsetting requirements for a given compliance period using CEFs

- The aeroplane operator's total final offsetting requirements during a compliance period (i.e., FORc)
  - shall be rounded up to the nearest tonne of CO_2.
- The State after calculating the total final offsetting requirements for a given compliance period of each of the aeroplane operators attributed to it,
    - Shall inform the aeroplane operator of its total final offsetting requirements according to the CORSIA timeline in Annex 16.

Information on CORSIA Eligible Emissions Units, which can be used to meet CO_2 offsetting requirements- ***ICAO Doc* CORSIA Eligible Emissions Units.**

Negative FOR_C

- If the aeroplane operator's total final offsetting requirements during a compliance period **(i.e., FORc) is negative**,
  - then the aeroplane operator **has no offsetting requirements** for the **compliance period**.
- These negative offsetting requirements
  - **shall not** be carried forward to subsequent compliance periods.

FAQ: Can an aeroplane operator's CO_2 offsetting requirements be negative?

- If an aeroplane operator's total final offsetting requirements during a compliance period are negative (i.e., the verified emissions reductions claimed by an operator from the use of CORSIA eligible fuels are more than its offsetting requirements), the operator has no offsetting requirements for the compliance period.
  - Negative offsetting requirements will not be carried forward to a subsequent 3-year compliance period
  - If an operator's offsetting requirements in a given year inside of a compliance period are negative, the operator will reduce its total final offsetting requirement for that three-year compliance period.

CORSIA

QUESTIONS?

ICAO

North American Central American and Caribbean (NACC) Office
Mexico City

South American (SAM) Office
Lima

ICAO Headquarters
Montréal

Western and Central African (WACAF) Office
Dakar

European and North Atlantic (EUR/NAT) Office
Paris

Middle East (MID) Office
Cairo

Eastern and Southern African (ESAF) Office
Nairobi

Asia and Pacific (APAC) Sub-office
Beijing

Asia and Pacific (APAC) Office
Bangkok

THANK YOU