



ICAO

ENVIRONMENT

Council — 231st Session

Subject No. 50: Questions relating to the environment

Status Update on CORSIA Analyses

Presented by CAEP



Background on Council Requests & Status of CORSIA Analyses

At its 228th session*, the Council...

New question from 228th session of the Council

...f) requested CAEP to **provide regular updates on its report on the supply, demand and pricing analysis of CORSIA eligible emissions units and to immediately inform the Council of any significant increases in demand or pricing; [...]**

Question builds on the 2022 CORSIA Periodic Review

h) requested CAEP to:

ii. initiate its technical work on the consideration of methodologies for monitoring LTAG, as outlined in paragraphs 4.5 and 4.6 of C-WP/15471; **undertake work in order to support the Council on the 2025 CORSIA periodic review building upon the 2022 CORSIA review process (C-DEC 222/12, paragraph 10 refers), with a focus on the assessment of supply, demand, price and cost impact of the CORSIA offsetting requirements; and perform technical analyses to facilitate the development of a methodology for the periodic review;**

Status



Ongoing

Started with updates based on initial CAEP/13 forecasts.



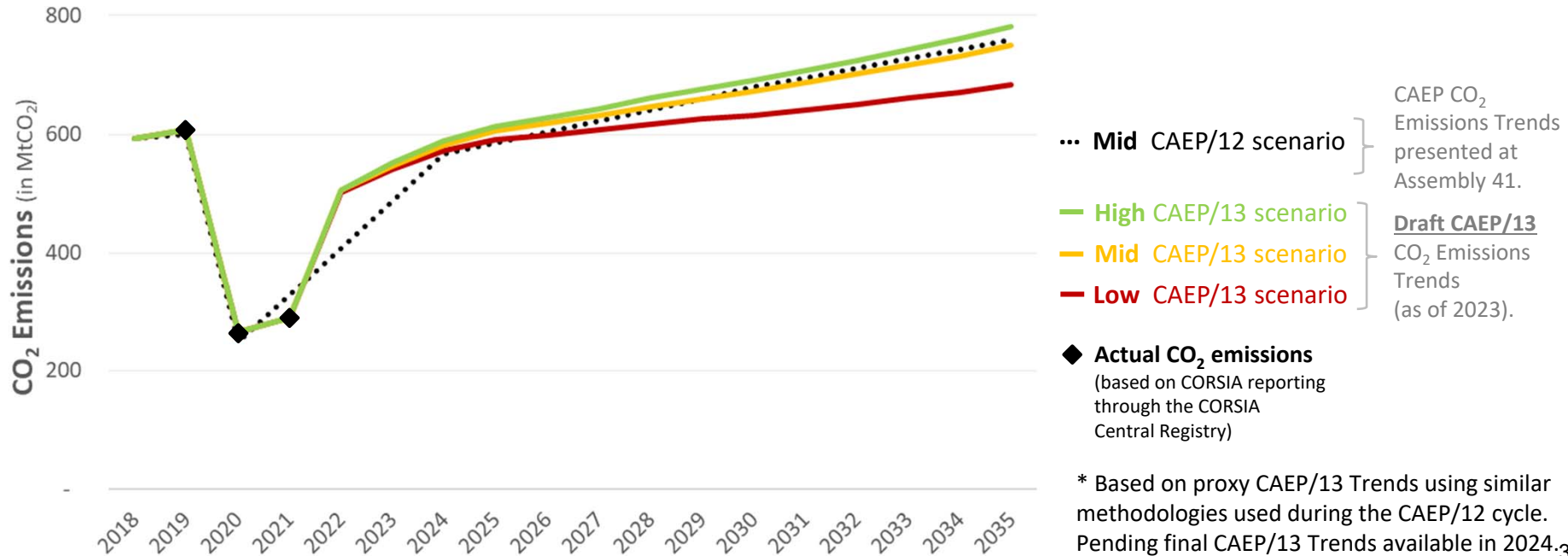
Started

Initial analyses towards the 230th session of the Council, with updates through Assembly 42.

* Reference: C-DEC 228/7.



- Stronger recovery in CO₂ emissions than previously anticipated (at the time of Assembly 41).
- CO₂ emissions expected to return to 2019 level by 2025 under the Mid and High CAEP/13 scenarios (2027 under the Low CAEP/13 scenario).

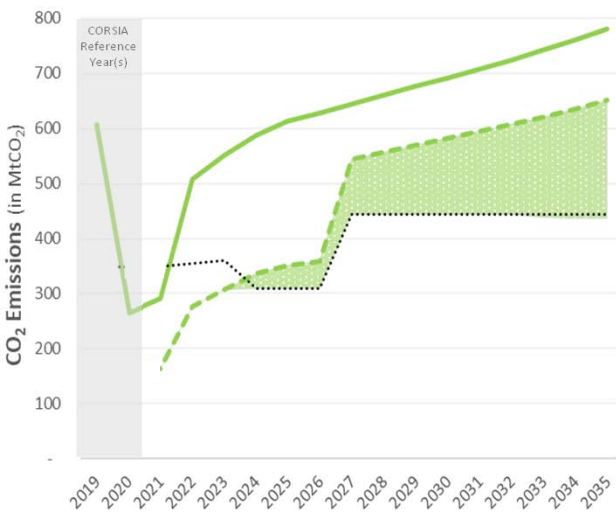




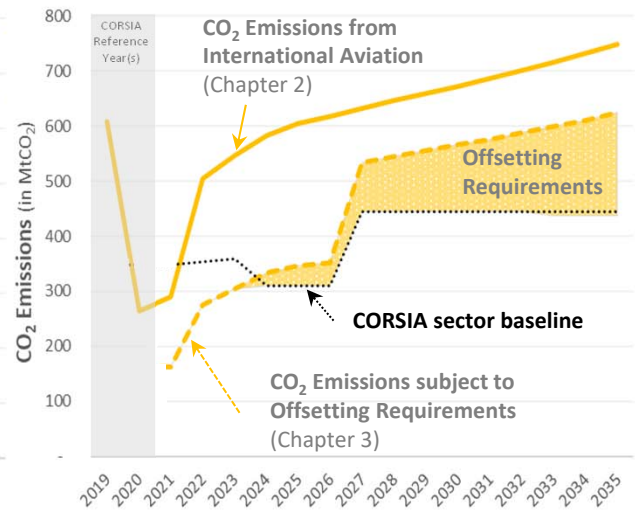
Estimation of Offsetting Requirements

- Total offsetting requirements across international aviation sector are influenced by the impact of Covid19 and, the rate of recovery in out years.
- Unlike with CAEP/12 forecasts, offsetting requirements are expected to start in 2024 under all CAEP/13 scenarios.

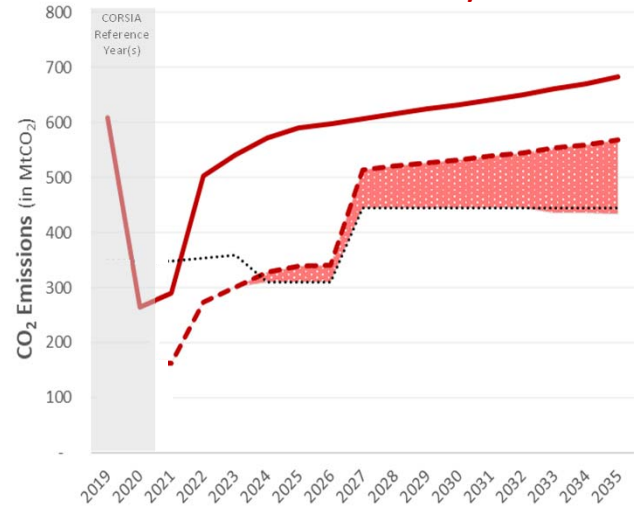
High Covid19 recovery



Mid Covid19 recovery



Low Covid19 recovery

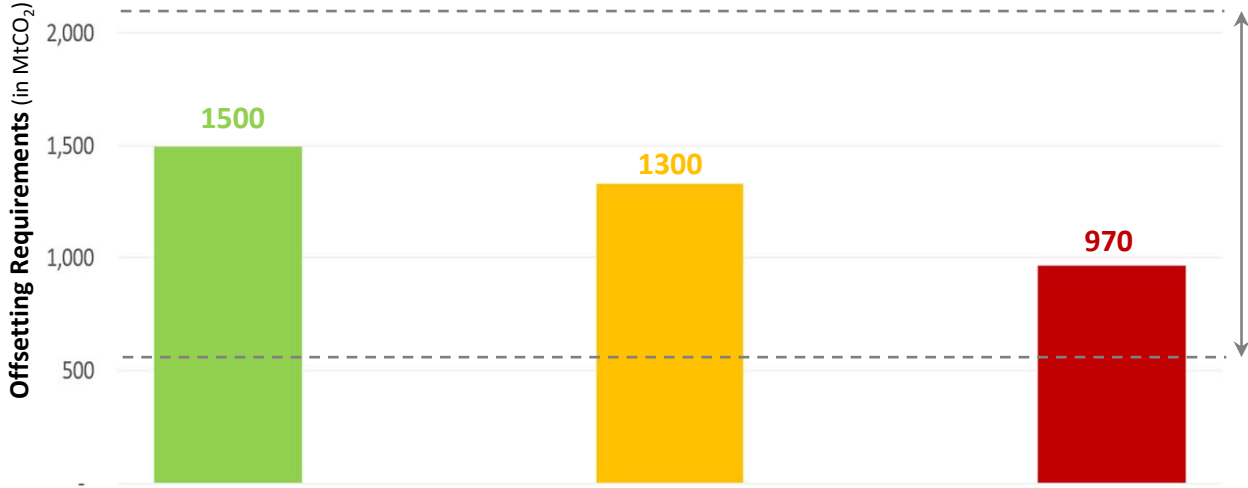




Estimation of Offsetting Requirements (cont.)

- Given the initial ICAO-CAEP/13 forecasts and decisions at Assembly 41, cumulative offsetting requirements (OR) from 2024 to 2035 could range from 970 to 1500 MtCO₂.

All Phases
(2021-2035)



Range of estimates from June 2022 analyses*.
 i.e., “Under an 85% of 2019 baseline for 2024-2035, OR could range from 600 to 2100 MtCO₂”.

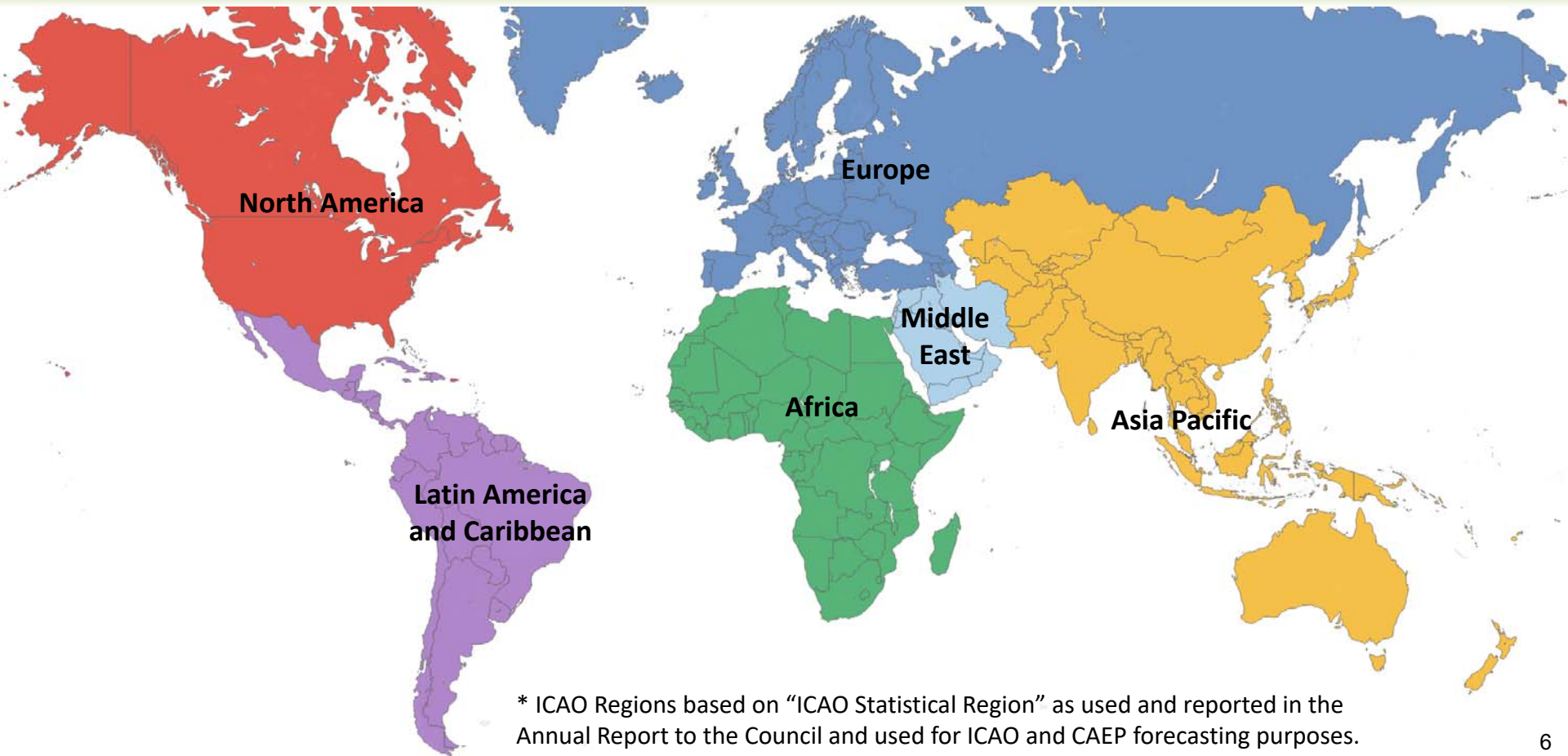
Note. – Average results from 100 runs of stochastic CORSIA model.

* Note: 85% baseline was evaluated in the June 2022 CORSIA analyses. However, these analyses did not include the changes to Sectoral/Individual shares agreed at Assembly 41, leading to minor differences in total O.R.

Scenario Assumptions	High	Mid	Low
	Covid19 Recovery Scenario	Covid19 Recovery Scenario	Covid19 Recovery Scenario
CO ₂ Emissions Trends			
CORSIA Baseline (2021-2023)	2019 (only)	2019 (only)	2019 (only)
CORSIA Baseline (2024-2035)	85% of 2019	85% of 2019	85% of 2019



Background on ICAO Regions*



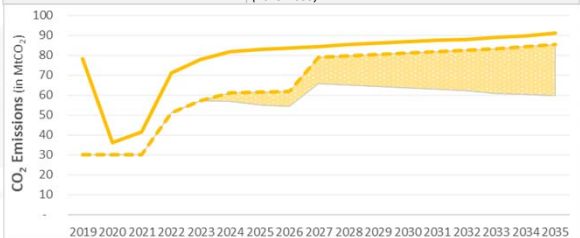
* ICAO Regions based on “ICAO Statistical Region” as used and reported in the Annual Report to the Council and used for ICAO and CAEP forecasting purposes.



Regional Breakdown of Offsetting Requirements by ICAO Regions

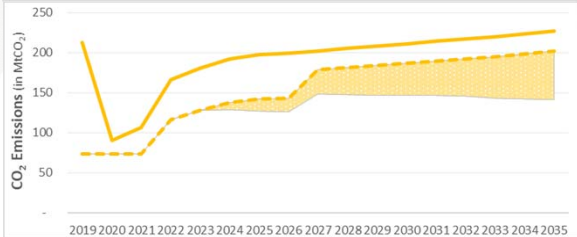
North America

Share of total CO₂ emissions (2021-2035)*: **13%**
Avg. annual growth rate CO₂ emissions (2019-2035)**: **0.9%**



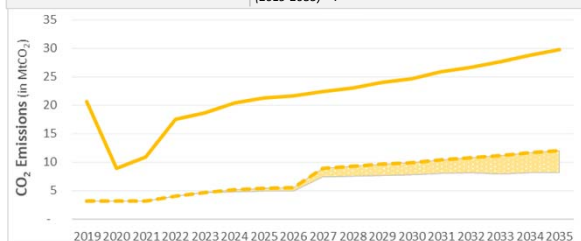
Europe

Share of total CO₂ emissions (2021-2035)*: **32%**
Avg. annual growth rate CO₂ emissions (2019-2035)**: **0.4%**



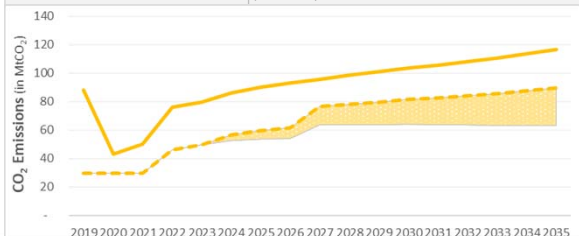
Latin America and Caribbean

Share of total CO₂ emissions (2021-2035)*: **4%**
Avg. annual growth rate CO₂ emissions (2019-2035)**: **2.3%**



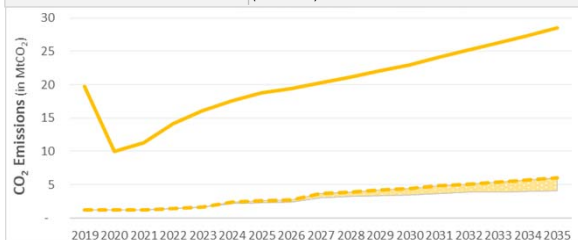
Middle East

Share of total CO₂ emissions (2021-2035)*: **15%**
Avg. annual growth rate CO₂ emissions (2019-2035)**: **1.8%**



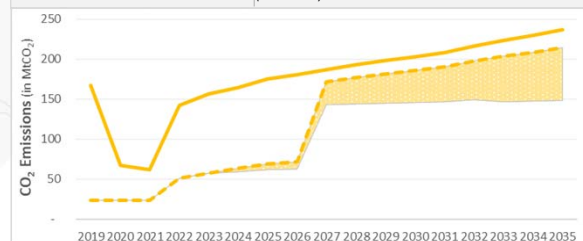
Africa

Share of total CO₂ emissions (2021-2035)*: **3%**
Avg. annual growth rate CO₂ emissions (2019-2035)**: **2.3%**



Asia Pacific

Share of total CO₂ emissions (2021-2035)*: **30%**
Avg. annual growth rate CO₂ emissions (2019-2035)**: **2.2%**



Summary of Assumptions:

CORSIA Baseline Ref. Year (Pilot):	2019
CORSIA Baseline Ref. Year (2024-2035):	85% of 2019
Sectoral/Individual:	100% in 2021-2032
Sectoral/Individual:	85% / 15% in 2033-2035
States for Chapter 3 State Pairs:	Editions 1-4

Illustrative traffic scenario: Mid Covid19 recovery.

* Share of total international aviation CO₂ emissions (A16V4 Chapter 2) from 2021 to 2035. Shares very similar across Covid19 scenarios.

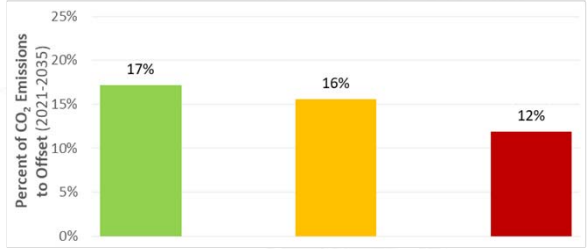
** Average annual growth of CO₂ emissions from international aviation (A16V4 Chapter 2) from 2019 to 2035.



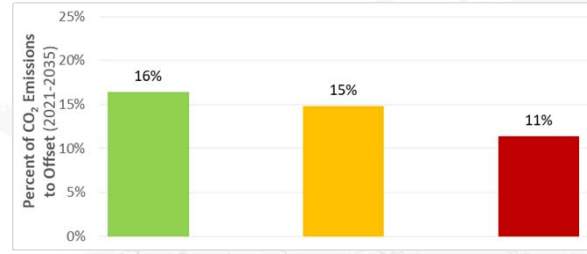
Percent CO₂ emissions to Offset by ICAO Regions

Percent CO₂ emissions to offset* based on total international aviation CO₂ emissions (A16V4 Chapter 2).

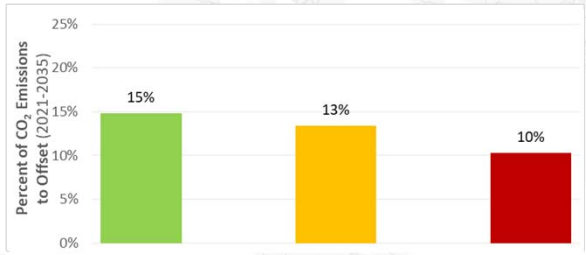
North America



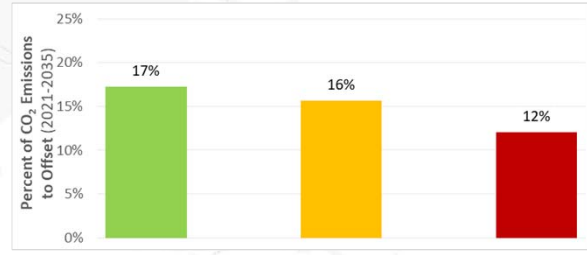
Europe



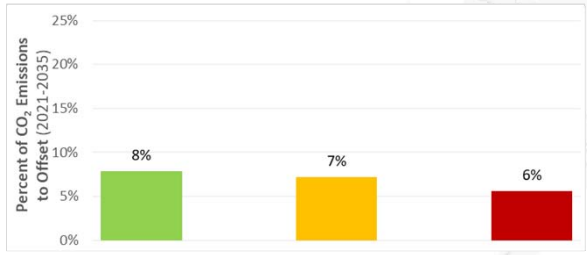
Middle East



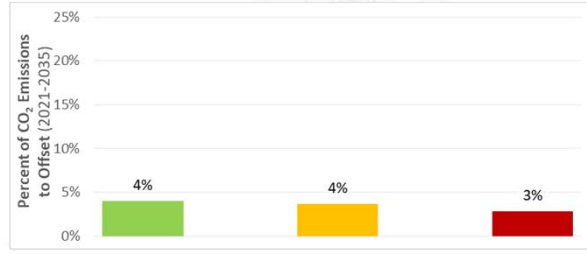
Asia Pacific



Latin America and Caribbean



Africa



Summary of Assumptions:
 CORSIA Baseline Ref. Year (Pilot): 2019
 CORSIA Baseline Ref. Year (2024-2035): 85% of 2019
 Sectoral/Individual: 100% in 2021-2032
 Sectoral/Individual: 85% / 15% in 2033-2035
 States for Chapter 3 State Pairs: Editions 1-4

* Percent CO₂ emissions to offset calculated as: total offsetting requirements (2021-2035) divided by total CO₂ emissions from international aviation (A16V4 Chapter 2) from 2021 to 2035.



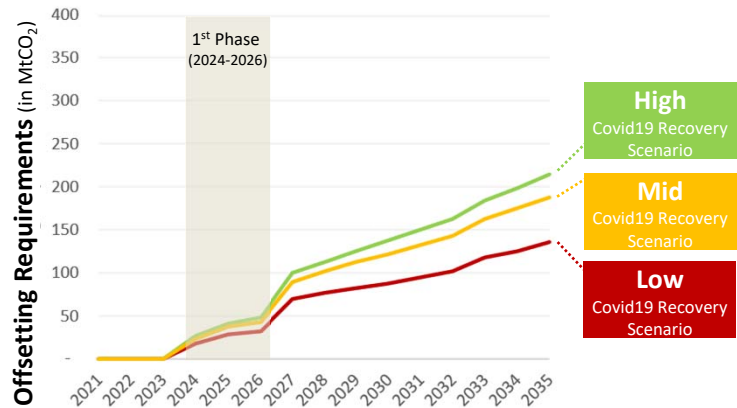
Scenarios underlying the Estimations of Demand for Emissions Units

- In accordance with Annex 16 Volume IV, final offsetting requirements (i.e., demand for emissions units) are calculated by subtracting emissions reductions from CEF from offsetting requirements.

Offsetting Requirements

Assumptions:

- CAEP/13 draft/proxy traffic forecasts.
- CORSIA Baseline and Individual/Sectoral Shares reflecting decisions at the 41st session of the ICAO Assembly.

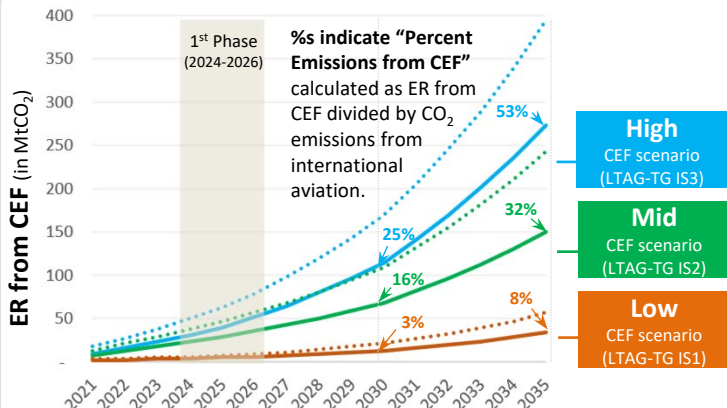


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Emissions Reductions from CEF

Assumptions:

- Scenarios for Emissions Reductions from CEF based on CAEP LTAG-TG Fuels scenarios and assumptions (used as proxy).
- Same scenarios considered in CORSIA Analyses to 226th Council.



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Final Offsetting Requirements

Proxy for Demand for Emissions Units

Offsetting Requirements (in MtCO ₂)	Cumulative Total Offsetting Requirements 2024-2035		Emissions Reductions from CEF Scenarios*			
	High (IS1)	Mid (IS2)	High (IS3)	Mid (IS2)	Low (IS1)	High (IS3)
ER from CEF	1500 (MtCO ₂)	1300 (MtCO ₂)	1300 (MtCO ₂)	1150 (MtCO ₂)	970 (MtCO ₂)	1300 (MtCO ₂)
ER from CORSIA	1500 (MtCO ₂)	1300 (MtCO ₂)	1300 (MtCO ₂)	1150 (MtCO ₂)	970 (MtCO ₂)	1300 (MtCO ₂)
Final Offsetting Requirements	0 (MtCO ₂)	0 (MtCO ₂)	0 (MtCO ₂)	0 (MtCO ₂)	0 (MtCO ₂)	0 (MtCO ₂)

See next slide for details

Note. Potential Global ER from CEF (for domestic and international aviation) in dotted lines. ER from CEF used on domestic aviation flights may be claimed towards CORSIA.



Estimates of Demand for Emissions Units

- Cumulative Final Offsetting Requirements (i.e., demand for emissions units) through 2035 as well as during the First Phase (2024-2026) would vary depending on traffic and emissions reductions from CEF scenarios.

Cumulative Final Offsetting Requirements 2021-2035 (2024-2026)		Emissions Reductions from CEF Scenarios*			
		No ER from CEF	Low CEF scenario (LTAG-TG IS1)	Mid CEF scenario (LTAG-TG IS2)	High CEF scenario (LTAG-TG IS3)
Offsetting Requirements (given Traffic Scenario)	High Covid19 Recovery Scenario	1500 MtCO ₂ (115)	1300 MtCO ₂ (100)	610 MtCO ₂ (25)	120 MtCO ₂ (0)
	Mid Covid19 Recovery Scenario	1300 MtCO ₂ (100)	1150 MtCO ₂ (90)	440 MtCO ₂ (15)	60 MtCO ₂ (0)
	Low Covid19 Recovery Scenario	970 MtCO ₂ (80)	790 MtCO ₂ (60)	110 MtCO ₂ (0)	0 MtCO ₂ (0)

*Likely scenario***

- Emissions Reductions from CEF +

+ Traffic (CO₂ Emissions)

* assuming Emissions Reductions from CEF i.e., Sustainable Aviation Fuels (SAF) and Lower Carbon Aviation Fuels (LCAF) corresponding to international aviation share of CEF use (i.e., excluding domestic aviation), consistent with LTAG-TG scenarios. Under the LTAG Integrated Scenarios 1-3, the use of LCAF starts in 2026 i.e., no use of LCAF in 2024 and 2025. These analyses assume that all Emissions Reductions from CEF associated with a CEF scenario are claimed under CORSIA. Note: Estimates of final O.R. reflect the constraint where ER from CEF can only be claimed within a given compliance cycle.

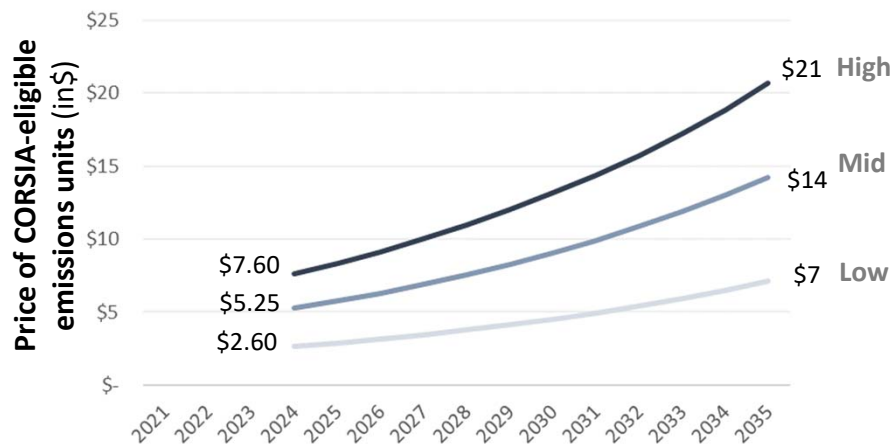
** Assessed as (more) likely scenario based on latest near- and mid-term trends (including FTG updates).



Summary of Estimates of Price of Emissions Units

- The CAEP-WG4 has updated its estimates of price of emissions units.
- Supply for emissions units from the TAB were considered.
- Updated demand estimates as presented in previous slides were also considered.
- For price, the CAEP-WG4:
 - compiled existing data on historical weighted average prices for carbon offsets similar to CORSIA-eligible emissions units, transacted voluntarily between 2015-2021.
 - updated the scenario-based price analysis to low, medium, and high price estimates for CORSIA eligible emissions units from 2024-2035.
 - assumed a 9.5% year-on-year increase in emissions units prices (per tonne), informed by historical data from the Ecosystem Marketplace reports for years 2015-2021 from programmes for which the emissions units' prices are driven by pre-compliance and/or compliance demand.

Initial CAEP/13 scenario-based price of CORSIA-eligible emissions units through 2035



Note: Caveats and limitations apply. Details available in CAEP-WG4 Information Paper.



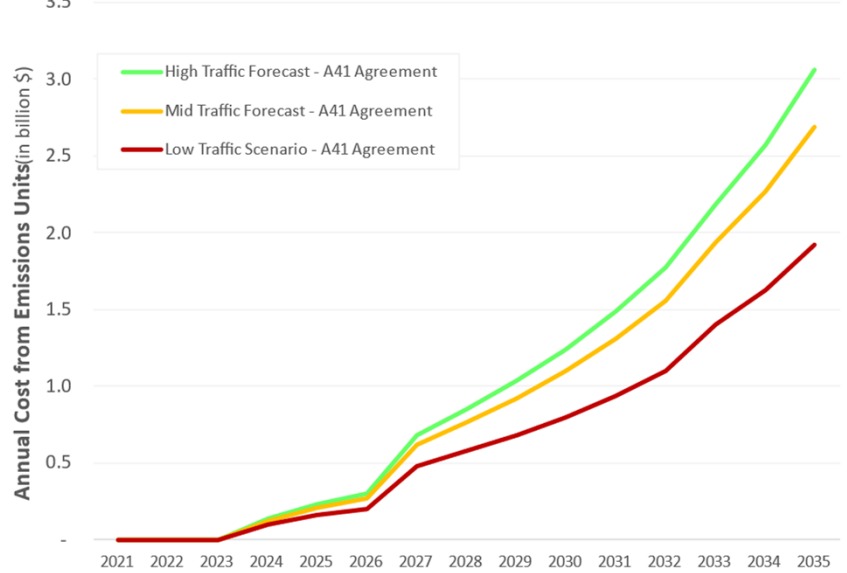
Estimations of Costs Associated with Offsetting Requirements through 2035

- Cumulative cost from emissions units from 2024 to 2035 could range from \$10 to 16 billion (depending on traffic forecast for mid-price scenario). For context and order of magnitude comparison, the global (domestic and international) aviation industry cumulative revenues** from 2015-2020 was ≈ \$3,700 billion.
- Total cost can vary due to price of emissions units and be reduced (by \$1.6 to 14 billion) if emissions reductions from CEFs are claimed.

Annual Cost of Emissions Units

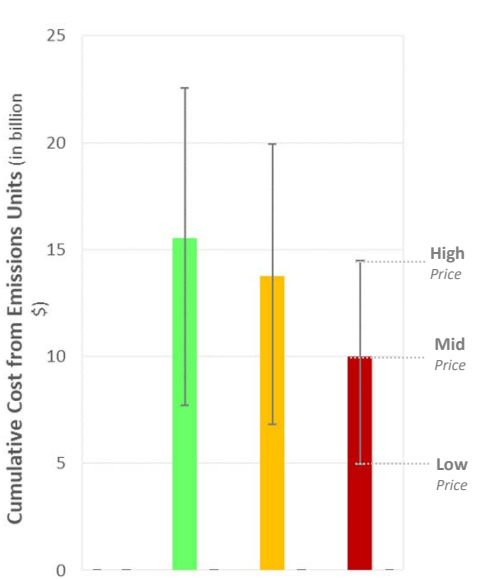
= Offsetting Requirements * Price CORSIA Eligible Emissions Units

(Mid Price Scenario) before potential Emissions Reductions from CEF are taken into account.



Cumulative Cost of Emissions Units

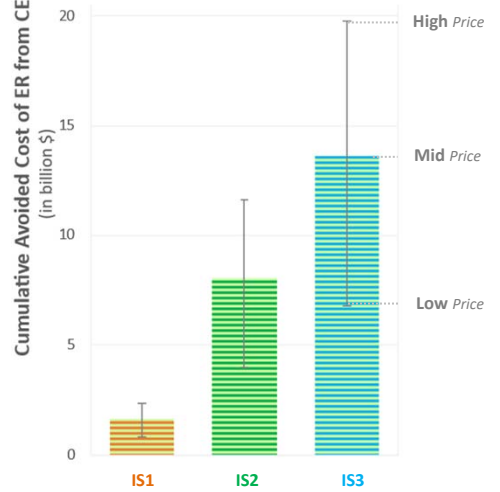
from 2021 to 2035



Cumulative Avoided Cost of Emissions Reductions from CEFs*

from 2021 to 2035

(Estimated costs associated with acquiring CORSIA Eligible Fuels ranging from \$255 to \$1100 billion under IS1 and IS3 scenarios respectively)



Assumptions

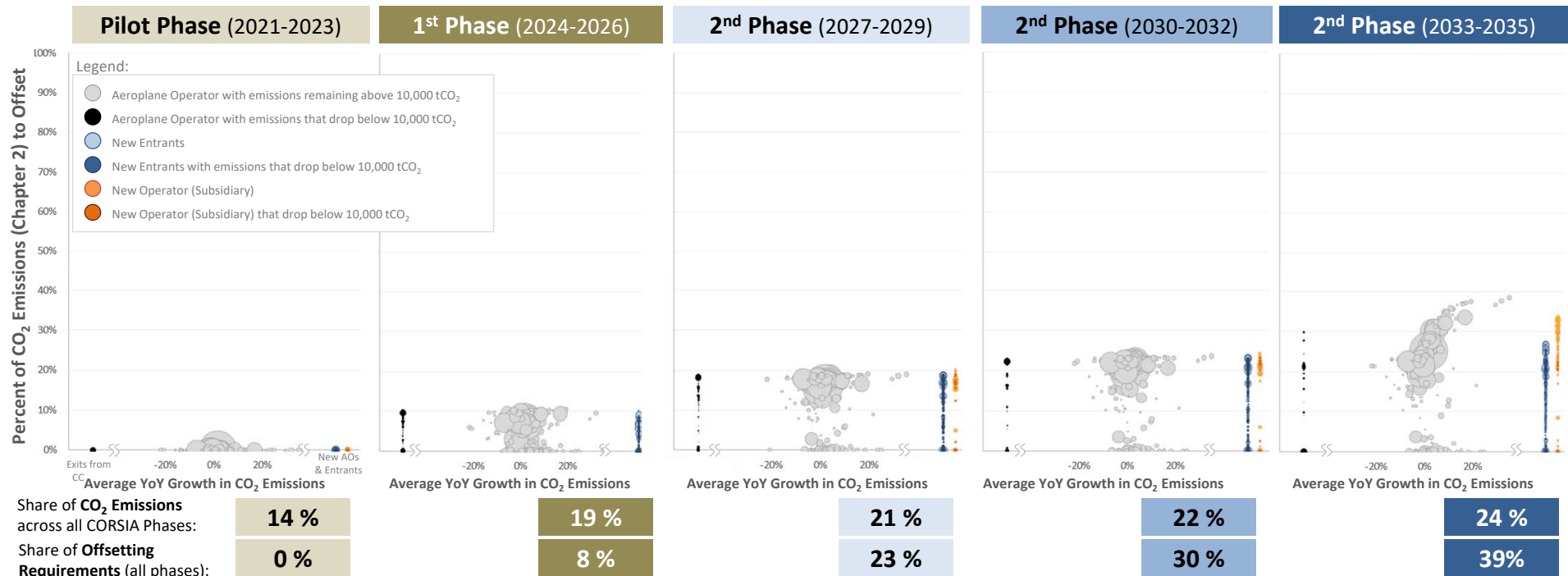
Mid Price \$5.25 \$6.90 \$9.05 \$11.89 \$14.25

* Cumulative avoided costs of emissions reductions from CEFs represent the costs avoided if Emissions Reductions from CEF were not claimed under CORSIA and Emissions Units were used to meet offsetting requirements.

**Reference: IATA, Industry Statistics, Fact Sheet, available at: www.iata.org/en/iata-repository/pressroom/fact-sheets/industry-statistics/



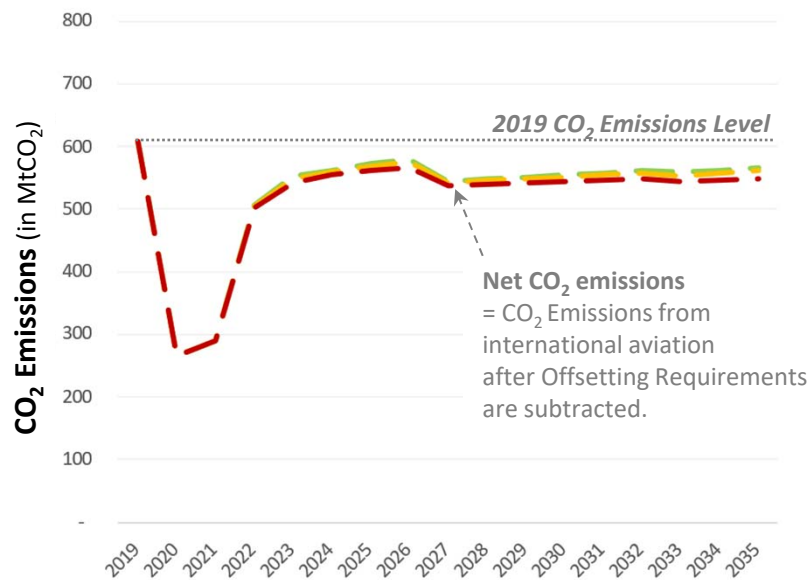
- Offsetting requirements (and differences across operators) evolve over time and are driven by (1) phased implementation of CORSIA (i.e., States' participation), (2) Sector Growth Factor (e.g., CORSIA baseline) and (3) transition to individual approach from 2033.



Assumptions: Traffic and Emissions Profile (CAEP/13 Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and 85% of 2019 for 2024-2035), Sectoral/Individual (100% / 0% in 2021-2032, 85% / 15% in 2033-2035), States for Chapter 3 State Pairs (Editions 1 through 4), New Entrant baseline option E.

Projections of Net CO₂ Emissions through 2035

- Under a draft proxy CAEP/13 Trends scenario, net CO₂ emissions may be ≈550 to 570 MtCO₂ in 2035 (≈ -7% to -10% below the 2019 level).
- International aviation sector would possibly meet its mid-term goal of “keeping net carbon emissions from 2020 at the same level” (assuming 2019 level as a proxy for pre-COVID 2020 expected emissions).
- **Note. Net CO₂ emissions would not stabilize at 85% of 2019 emissions level due to partial participation in CORSIA.**



CORSIA Baseline	100% of 2019	85% of 2019
Sectoral %	100%	85%
Individual %	0%	15%
Participation (Nb States)	88	129
	107	115
	124	



- Recovery from the global COVID19 pandemic is faster than anticipated in previous rounds of CORSIA Analyses presented to Council in 2022.
- The uncertainty in the timing of the return to 2019 CO₂ emissions level is reduced.
- In all traffic scenarios, offsetting requirements are expected to start in 2024.
- Given the draft ICAO-CAEP/13 forecasts and the decisions from the Assembly 41, cumulative offsetting requirements (OR) from 2024 to 2035 could range from 970 to 1500 MtCO₂.
- Cumulative cost from emissions units from 2024 to 2035 could range from \$10 to 16 billion (depending on traffic forecast for mid-price scenario).
- Net CO₂ emissions may be ≈550 to 570 MtCO₂ in 2035 (≈ -7% to -10% below the 2019 level) allowing for the international aviation sector to possibly meet its mid-term goal of *“keeping net carbon emissions from 2020 at the same level”* (assuming 2019 level as a proxy for pre-COVID 2020 expected emissions).



- **Continue to monitor the evolution and forecasts of CO₂ emissions and their influence on offsetting requirements and demand for emissions units.**
- **Further develop and refine the scenarios for Emissions Reductions from CORSIA Eligible Fuels.**
- **Continue to monitor and inform the Council on changes in supply, demand and price of emissions units.**



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ENVIRONMENT



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THANK YOU

PRELIMINARY SCHEDULE FOR CORSIA ANALYSES

Note — The proposed preliminary schedule for updates to the CORSIA analyses takes into account the estimated timeline for updates of key inputs to the CORSIA analyses. The proposed schedule is preliminary and subject to further work and elaboration by CAEP.

231st Session of the Council (March 2024):

- Key inputs to the CORSIA analyses expected to be updated:
 - a) TAB's analysis on the supply of CORSIA Eligible Emissions Units, based on TAB's recommendations from the 2023 assessment on the eligibility of programmes for CORSIA's first phase (2024-2026), submitted to the 230th Session of the Council (November 2023).
 - b) forecast prices for CORSIA Eligible Emissions Units.
 - c) relevant technical outcome of the third ICAO Conference on Aviation Alternative Fuels (CAAF/3), to be held from 20 to 24 November 2023 in Dubai, United Arab Emirates (UAE).
 - d) 2022 CO₂ emissions data reported through the CORSIA Central Registry (CCR).
- Update level: medium.
- Areas of CORSIA analyses subject to update:
 - a) estimates of price of emissions units.
 - b) scenarios for emissions reductions from CORSIA eligible fuels.
 - c) estimates of costs associated with offsetting requirements.

232nd Session of the Council (June 2024):

- Key inputs to the CORSIA analyses expected to be updated:
 - a) draft CAEP/13 CO₂ emissions (TBC).
 - b) CAEP/13 SAF scenarios.
- Update level: medium to high.
- Areas of CORSIA analyses subject to update:
 - a) estimates of volume of offsetting requirements.
 - b) regional distribution of offsetting requirements by ICAO region.
 - c) scenarios for emissions reductions from CORSIA eligible fuels.
 - d) costs associated with offsetting requirements.

233rd Session of the Council (November 2024):

- Key inputs to the CORSIA analyses expected to be updated:
 - a) CAEP/13 CO₂ emissions (if not available towards 232nd session).
 - b) CORSIA volunteer States in 2025.
- Update level: low to high.
- Areas of CORSIA analyses subject to update:
 - a) estimates of volume of offsetting requirements.
 - b) regional distribution of offsetting requirements by ICAO region.
 - c) costs associated with offsetting requirements.

234th Session of the Council (March 2025):

- Key inputs to the CORSIA analyses expected to be updated:
 - a) CAEP/13 emissions trends.
 - b) TAB's analysis on the supply of CORSIA Eligible Emissions Units, based on TAB's recommendations from the 2024 assessment on the eligibility of programmes for CORSIA's first phase (2024-2026), submitted to the 233rd Session of the Council (November 2024).
 - c) forecast prices for CORSIA Eligible Emissions Units.
 - d) 2023 CO₂ emissions data reported through the CORSIA Central Registry (CCR).
- Update level: high.
- Areas of CORSIA analyses subject to update:
 - a) estimates of volume of offsetting requirements.
 - b) regional distribution of offsetting requirements by ICAO region.
 - c) scenarios for emissions reductions from CORSIA eligible fuels.
 - d) costs associated with offsetting requirements.

— END —