ICAO
ENVIRONMENT

Council — 234th Session

Subject No. 50: Questions relating to the environment

Interim Assessments in Support of the 2025 CORSIA Periodic Review

Presented by CAEP

Referenced in C-WP/15676

ICAO ENVIRONMENT

Executive Summary

Review of the CORSIA's Pilot Phase (2021-2023)

- **Due to the decline in CO_2 emissions during the COVID-19 global pandemic coupled with a CORSIA baseline based on 2019 emissions, there were no offsetting required during the Pilot Phase.**
- **Despite the absence of offsetting requirements, markets started to develop and prepare to meet future expected demand for emissions reductions from CEF and CORSIA emissions units.**
- **Identified the need to develop possible approaches to access data on unit price for CORSIA eligible units** (for future analysis).

Updated Forward-looking CORSIA Analyses

Assessments through 2035 with a focus on First Phase (2024-2026)

- **Given amended CO_2 emissions forecasts and 85% of 2019 CORSIA baseline, offsetting requirements are expected to start in 2024 under all CAEP/13 traffic scenarios.**
- **Cumulative offsetting requirements could range from 980 to 1500 $MtCO_2$ from 2024 to 2035 and 100 to 150 $MtCO_2$ during the First Phase (2024-2026).**
- **Updated scenario-based analysis suggests that emissions reduction from CEF may address up to ≈6% to ≈10% of offsetting requirements during the First Phase of CORSIA.**
- **Costs associated with addressing offsetting requirements from 2024 to 2026 could range from ≈ $1.3 billion** using Emissions Units (only) **to ≈ $8.4 billion*** using a mix of Emissions Units and ER from CEF given a scenario that accounts for the CAAF/3 vision.
- **The costs of addressing offsetting requirements could represent ≈ 0.07% to 0.46% of international aviation revenue from 2024 to 2026.**

** Composed of ≈ $1.2 billion for CEEUs and ≈ $7.2 billion for ER from CEF.*

Contents

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 CAEP/13 CO_2 emissions forecasts.

Ongoing
Interim analyses towards the 234th session of the Council.

At its 231st session**, the Council…

New question from 231st session of the Council.

…13.f) noted that in order to support the Council in undertaking the 2025 CORSIA periodic review, **the CAEP would provide the Council with further updated CORSIA analyses**, as well as the schedule of subsequent updates, during the 232nd Session, including **updated information on the price of emissions units and CORSIA eligible fuels**.

Ongoing
Interim analyses towards the 234th session of the Council.

** Reference: C-DEC 228/7.* *** Reference: C-DEC 231/2.*

Council Requests & Status of CORSIA Analyses (cont.)

At its 232nd session*, the Council…

Questions from the 232nd session of the Council.

[…]

c) requested CAEP to **provide subsequent updates of the CORSIA analyses to support the Council in undertaking the 2025 CORSIA periodic review, as per the schedule outlined by the CAEP in this regard, as presented to the CEC during the current Session and as contained in the reference document to C-WP/15587;**

d) **emphasized the need for further information to be provided on the supply, regional distribution and price of CORSIA Eligible Emissions Units and CORSIA Eligible Fuels, as a key input to the 2025 CORSIA periodic review and to any recommendations that would form part of the report by the Council to the 42nd Session of the Assembly**; and

e) requested CAEP to **develop guidance for States and aeroplane operators on matters related to the claiming of sustainable aviation fuels in other regulatory and voluntary greenhouse gas (GHG) schemes, and the potential impact on the availability of CORSIA Eligible Fuels**.

Status

Ongoing
Interim analyses towards the 234th session of the Council.

Ongoing
Interim analyses towards the 234th session of the Council.

Started
Initial analyses towards the 234th session of the Council.

** Reference: C-DEC 232/6.*

Council Requests & Status of CORSIA Analyses (cont.)

At its 233rd session*, the Council…

New questions from 233rd session of the Council.

[…]

c) requested CAEP to **provide further updates on the CORSIA analyses to support the Council in undertaking the 2025 CORSIA periodic review during the 234th Session, as per the schedule outlined in Appendix C to C-WP/15630, with a particular emphasis on matters related to the overall supply, demand and price of CORSIA Eligible Fuels and CORSIA Eligible Emissions Units, as well as the related impacts on the implementation of the scheme;**

[…]

Status

Ongoing
Initial analyses presented at the 232nd and 233rd sessions of the Council.

** Reference: C-DEC 233/3.*

Contents

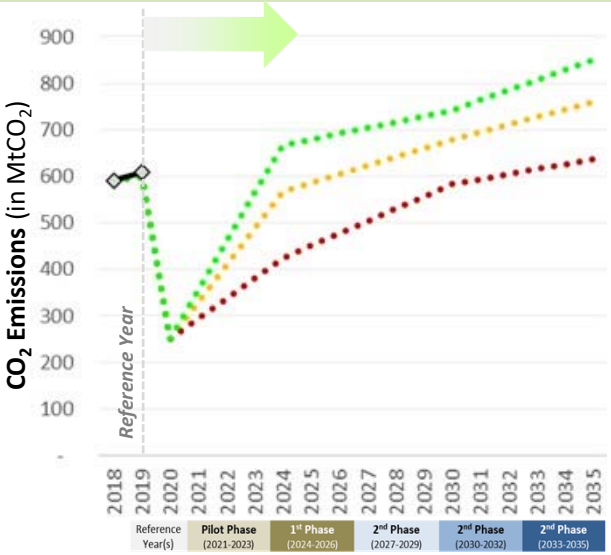
- **Background**
- **Assessment Approach in Support of the 2025 CORSIA Periodic Review**
- **Updates on 2025 CORSIA Periodic Review:** Review of CORSIA's Pilot Phase (2021-2023)
- **Updates on 2025 CORSIA Periodic Review:** Updated Forward Looking CORSIA Analyses
- **Next Steps**

CORSIA Periodic Review: High Level Approach

- **The 2025 CORSIA Periodic Review comprises (1) a backward-looking review of how CORSIA worked during the Pilot Phase in context of projections anticipated during the 2022 Review, and (2) an update of the forward-looking assessments based on the latest historical data.**

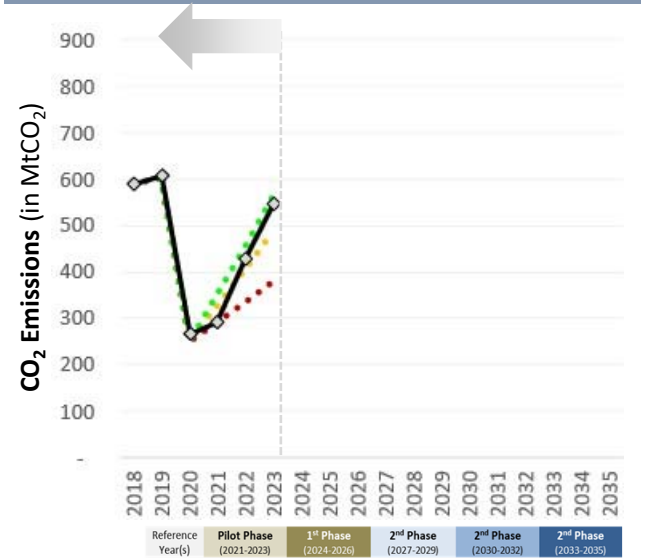
2022 CORSIA Periodic Review

Forward Looking Assessment

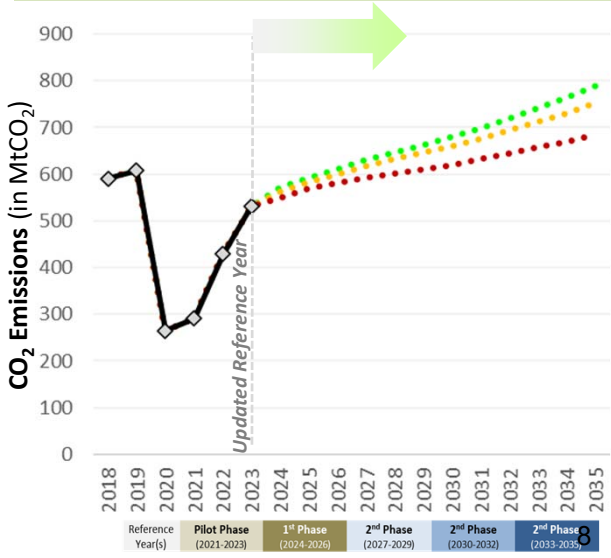


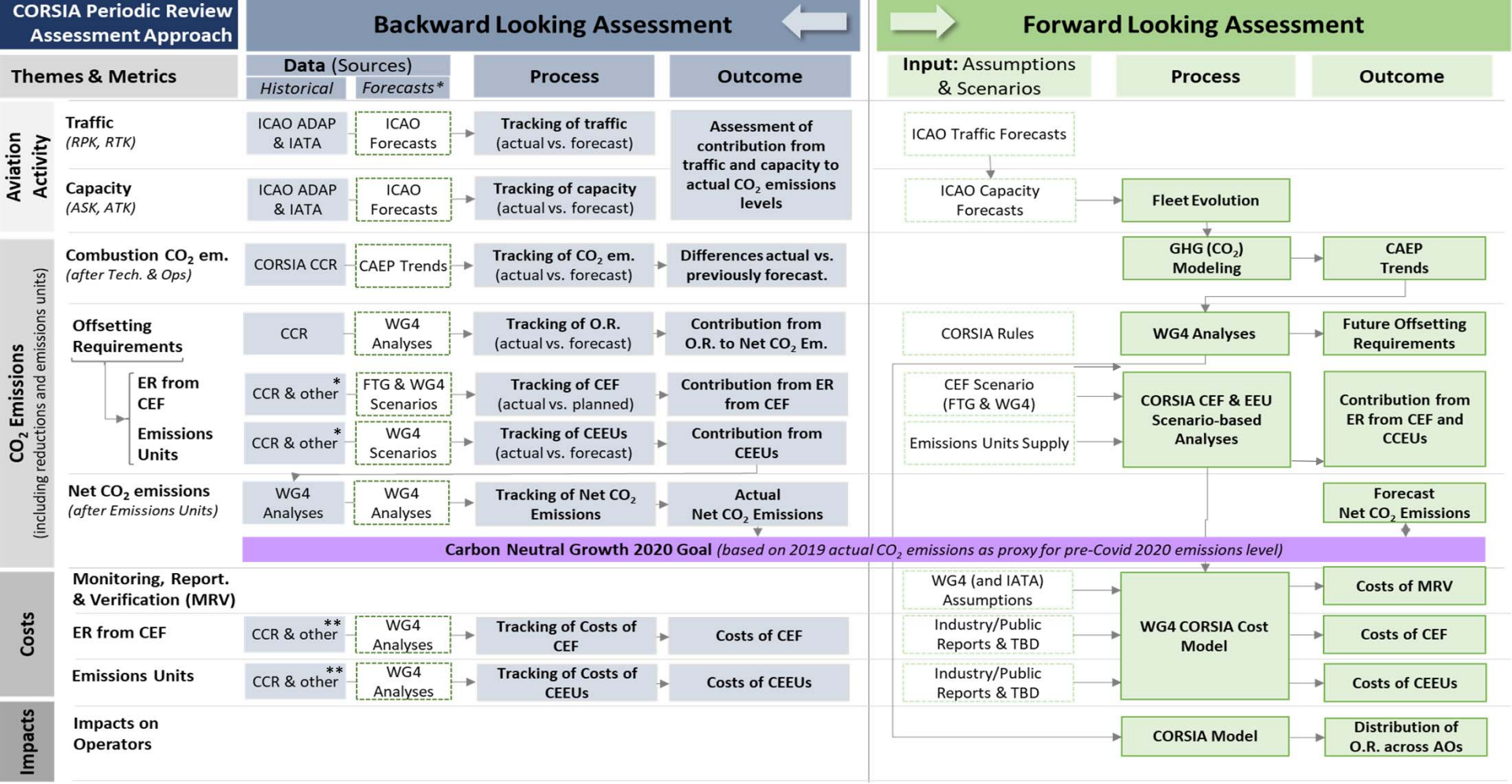
2025 CORSIA Periodic Review

Backward Looking Assessment



Updated Forward Looking Assessment





* Claimed Emissions Reductions from CEF and Cancelled Emissions Units available from the CCR (when available).

** Other sources of relevant information e.g., on price of CORSIA Eligible Fuels, price of emissions units. Note: Actual data not needed for the review of CORSIA's Pilot Phase (2021-2023) as part of the 2025 CORSIA Periodic Review given the expected lack of offsetting requirements during the Pilot Phase.

Contents

- **Background**
- **Assessment Approach in Support of the 2025 CORSIA Periodic Review**
- **Updates on 2025 CORSIA Periodic Review:** Review of CORSIA's Pilot Phase (2021-2023)
- **Updates on 2025 CORSIA Periodic Review:** Updated Forward Looking CORSIA Analyses
- **Next Steps**

Questions Addressed in this Section

Q1 How did actual CO_2 emissions from international aviation compare to what was anticipated during the 2022 CORSIA Periodic Review?

Q2 Given CO_2 emissions trends, how much offsetting was required under CORSIA's Pilot Phase?

Q3 How much (potential) supply of (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units was available?

Q4 Did international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

Questions Addressed in this Section

Q1 **How did actual CO_2 emissions from international aviation compare to what was anticipated during the 2022 CORSIA Periodic Review?**

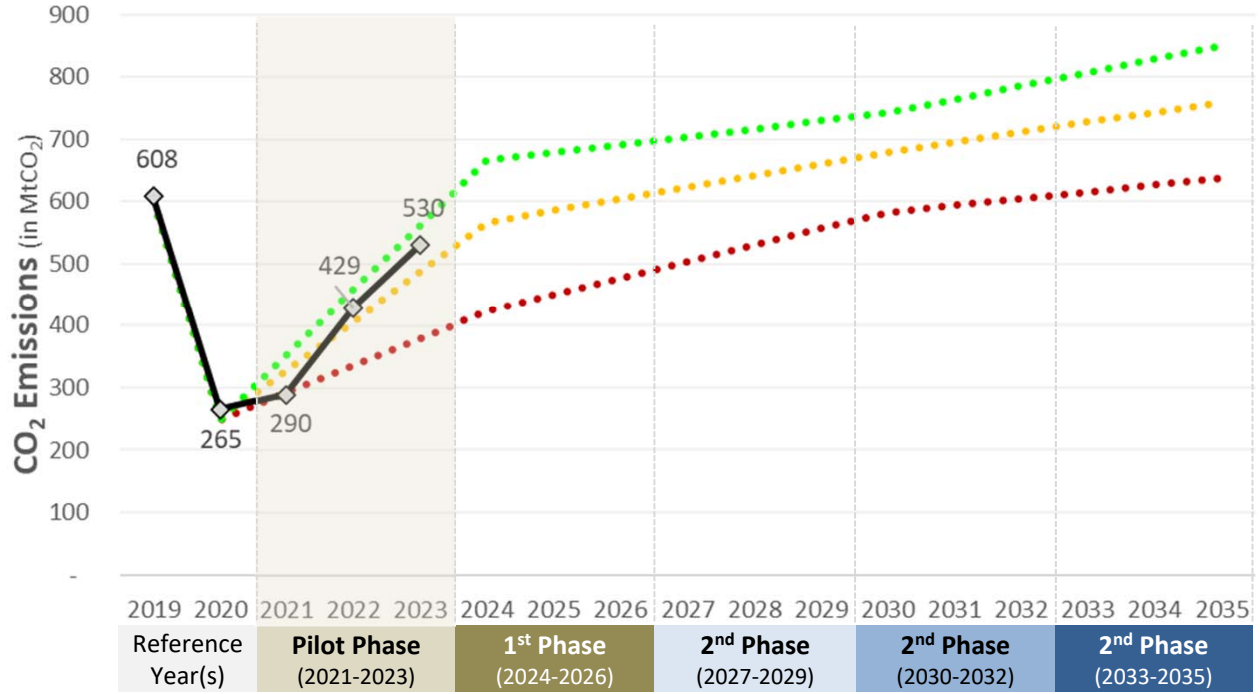
Q2 Given CO_2 emissions trends, how much offsetting was required under CORSIA's Pilot Phase?

Q3 How much (potential) supply of (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units was available?

Q4 Did international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

CO_2 Emissions: Actual/Historical vs. Previously Anticipated during the last (2022) CORSIA Periodic Review

- **Actual CO_2 emissions followed a "Low" forecast in 2021, but the international aviation sector exhibited a stronger recovery with CO_2 emissions between the "Mid" and "High" in 2022 and 2023.**



Legend:

- High scenario
- Mid scenario
- Low scenario

2022 CORSIA Periodic Review based on CAEP/12 CO_2 Emissions Trends to A41.

Actual/Historical CO_2 emissions (based on CORSIA reporting through the CORSIA Central Registry)

Questions Addressed in this Section

Q1 How did actual CO_2 emissions from international aviation compare to what was anticipated during the 2022 CORSIA Periodic Review?

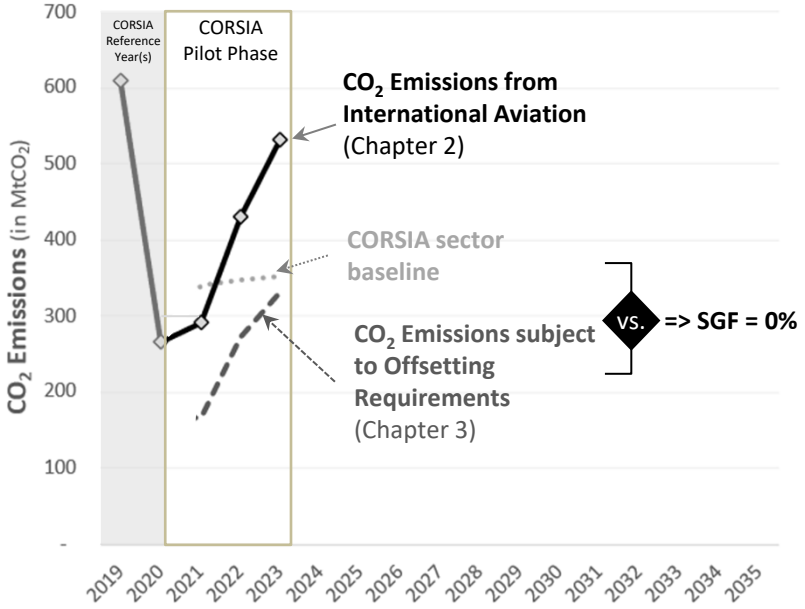
Q2 Given CO_2 emissions trends, how much offsetting was required under CORSIA's Pilot Phase?

Q3 How much (potential) supply of (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units was available?

Q4 Did international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

Q2 Offsetting Requirements during the Pilot Phase

- **Given the effects of the COVID-19 Global Pandemic on international aviation and despite the recovery since 2020, CO_2 emissions from international aviation subject to offsetting requirements remained below the 2019 CORSIA sector baseline in 2021, 2022 and 2023.**
- **As a result, the Sector Growth Factors (SGFs) were 0% for all three years of the CORSIA Pilot Phase.**
- **No offsetting was required during the Pilot Phase and there was no demand (triggered by CORSIA) for emissions reductions from CORSIA Eligible Fuels and/or CORSIA Eligible Emissions Units.**



Questions Addressed in this Section

Q1 How did actual CO_2 emissions from international aviation compare to what was anticipated during the 2022 CORSIA Periodic Review?

Q2 Given CO_2 emissions trends, how much offsetting was required under CORSIA?

Q3 How much (potential) supply of (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units was available?

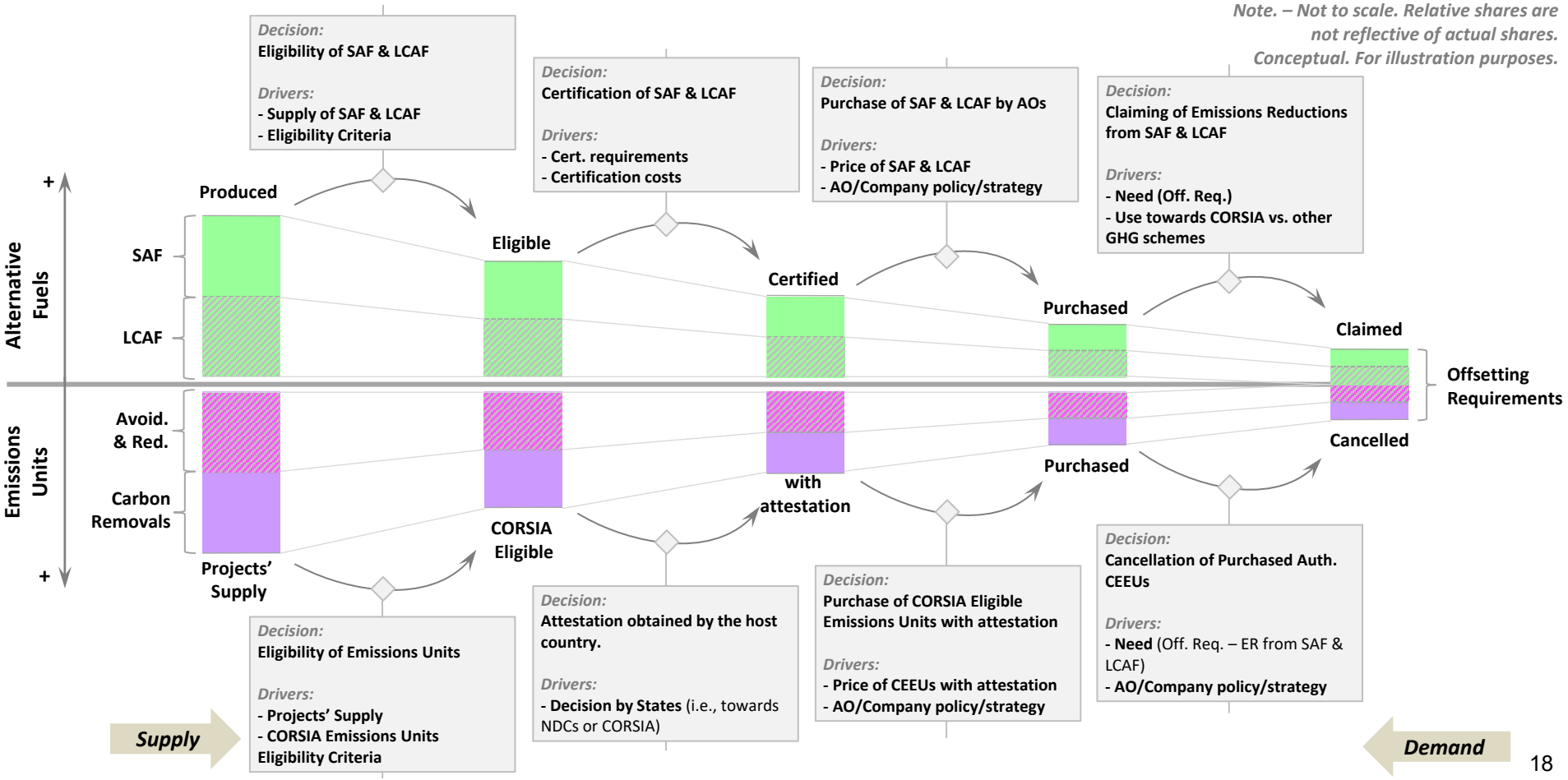
Q4 Did international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

Review of the Supply of Emissions Reductions from CEF and CORSIA Eligible Emissions Units

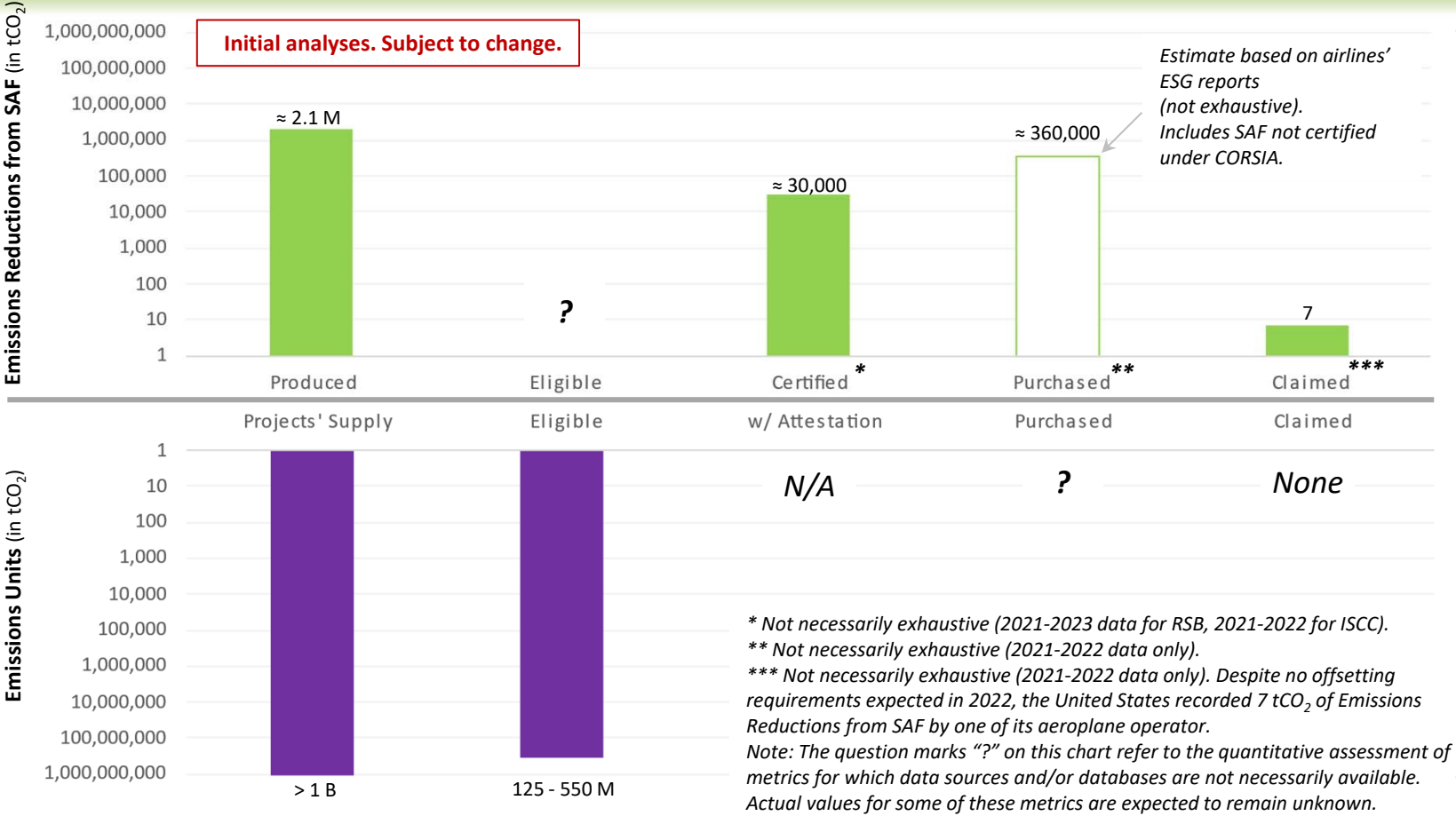
- The absence of demand for emissions reductions from CEF and/or emissions units does not mean that there was no supply, and that the markets did not prepare to meet potential and future demand.

- The WG4 developed a framework towards the assessment of the role of Emissions Reductions from CEF and CORSIA eligible emissions units.

Framework towards the assessment of the role of Emissions Reductions from CEF and CORSIA Eligible Emissions Units



Assessment of the role of Emissions Reductions from CEF and CORSIA Eligible Emissions Units

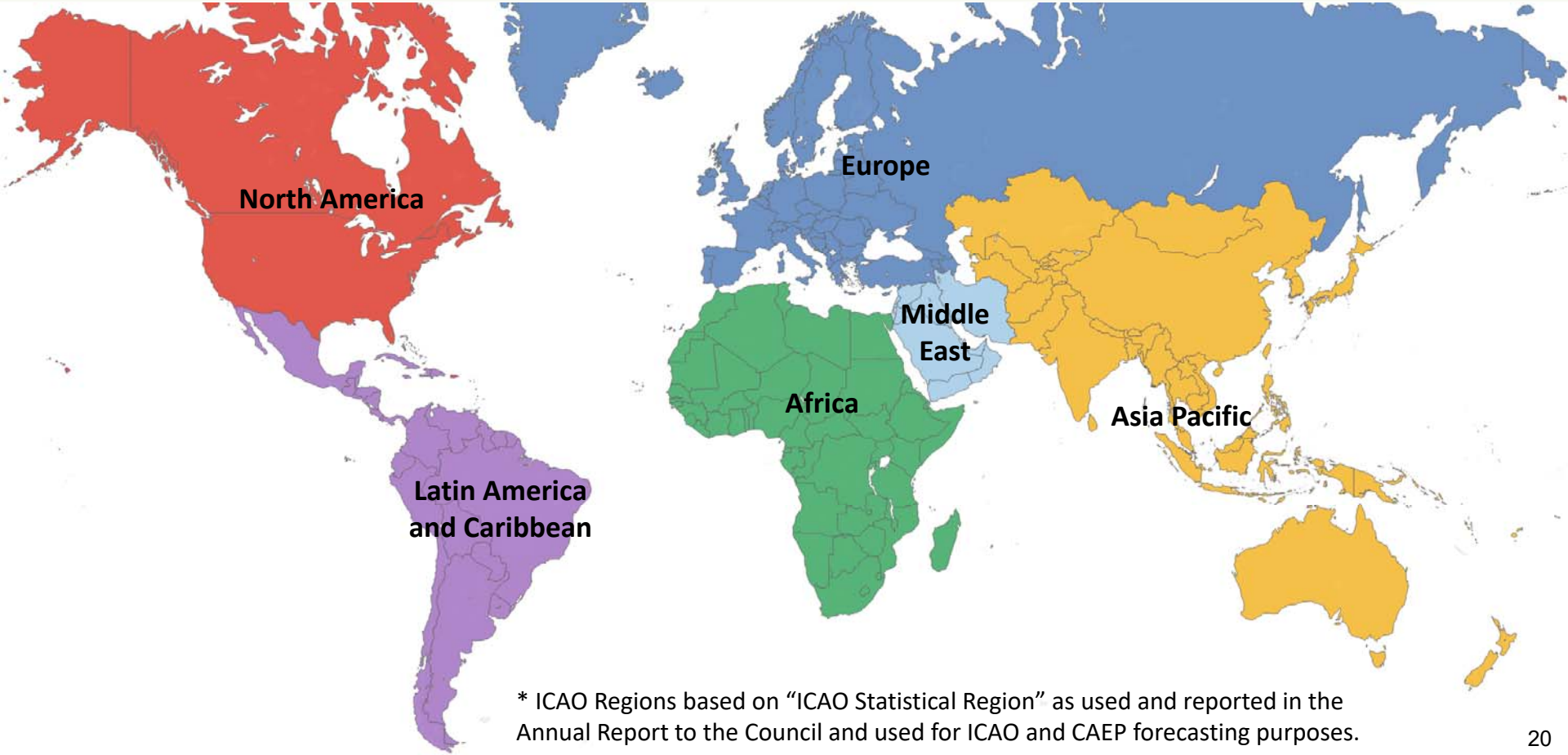


Offsetting Requirements

0 tCO_2 during CORSIA Pilot Phase

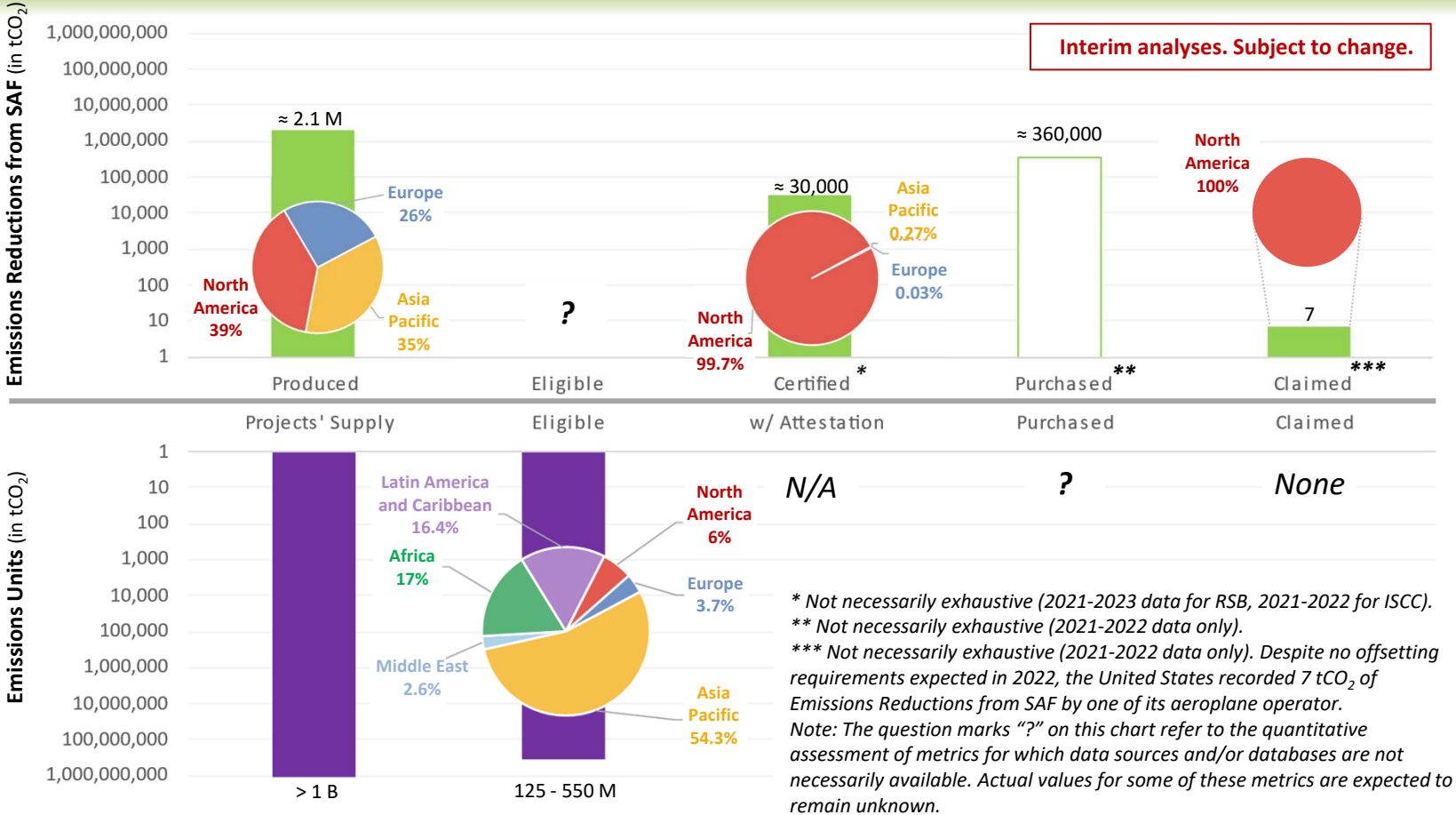
** Not necessarily exhaustive (2021-2023 data for RSB, 2021-2022 for ISCC).*
*** Not necessarily exhaustive (2021-2022 data only).*
**** Not necessarily exhaustive (2021-2022 data only). Despite no offsetting requirements expected in 2022, the United States recorded 7 tCO_2 of Emissions Reductions from SAF by one of its aeroplane operator.*
Note: The question marks "?" on this chart refer to the quantitative assessment of metrics for which data sources and/or databases are not necessarily available. Actual values for some of these metrics are expected to remain unknown.

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 the Emissions Reductions from CEF and CORSIA Eligible Emissions Units



Offsetting Requirements

0 tCO_2 during CORSIA Pilot Phase

** Not necessarily exhaustive (2021-2023 data for RSB, 2021-2022 for ISCC).*
*** Not necessarily exhaustive (2021-2022 data only).*
**** Not necessarily exhaustive (2021-2022 data only). Despite no offsetting requirements expected in 2022, the United States recorded 7 tCO_2 of Emissions Reductions from SAF by one of its aeroplane operator.*
Note: The question marks "?" on this chart refer to the quantitative assessment of metrics for which data sources and/or databases are not necessarily available. Actual values for some of these metrics are expected to remain unknown.

Questions Addressed in this Section

Q1 How did actual CO_2 emissions from international aviation compare to what was anticipated during the 2022 CORSIA Periodic Review?

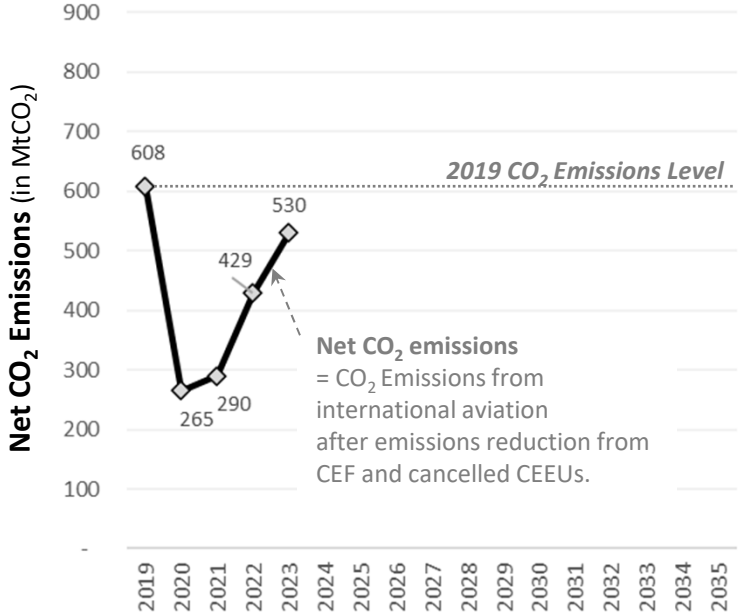
Q2 Given CO_2 emissions trends, how much offsetting was required under CORSIA?

Q3 How much (potential) supply of (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units was available?

Q4 **Did international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?**

Evolution of Net CO_2 Emissions in context of Carbon Neutral Growth goal from 2020 (CNG2020)

- **Given reported data through the CCR, net CO_2 emissions remained below their 2019 level*.**
- **The COVID-19 Global Pandemic was the primary driver of the decline in international aviation activity and resulting CO_2 emissions.**
- **International aviation sector met 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).



Summary of Observations

- **The CAEP continued its analyses in support of the 2025 CORSIA Periodic Review. Based on interim review and assessment of CORSIA's Pilot Phase (2021-2023), the CAEP:**
  - **a) observed that due to the decline in CO_2 emissions during the COVID-19 global pandemic coupled with a CORSIA baseline based on 2019 emissions, there were no offsetting required during the Pilot Phase.**
  - **b) noted that despite the lack of offsetting requirements, markets started to develop and prepare to meet potential and future demand for emissions reductions from CEF and CORSIA emissions units.**
  - **c) identified the need to develop possible approaches to access data on price information for CORSIA eligible units** (for future analysis).

Contents

Questions Addressed in this Section

Q1 How CO_2 emissions from international aviation may evolve from 2024 to 2035?

Q2 Given CO_2 emissions trends, how much offsetting may be required under CORSIA?

Q3 How offsetting requirements (demand) may be met using (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units*?

Q4 What are expected costs of compliance*?

Q5 What offsetting requirements could operators face?

Q6 Would international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

** Focus on the CORSIA First Phase (2024-2026).*

Questions Addressed in this Section

Q1 **How CO_2 emissions from international aviation may evolve from 2024 to 2035?**

Q2 Given CO_2 emissions trends, how much offsetting may be required under CORSIA?

Q3 How offsetting requirements (demand) may be met using (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units*?

Q4 What are expected costs of compliance*?

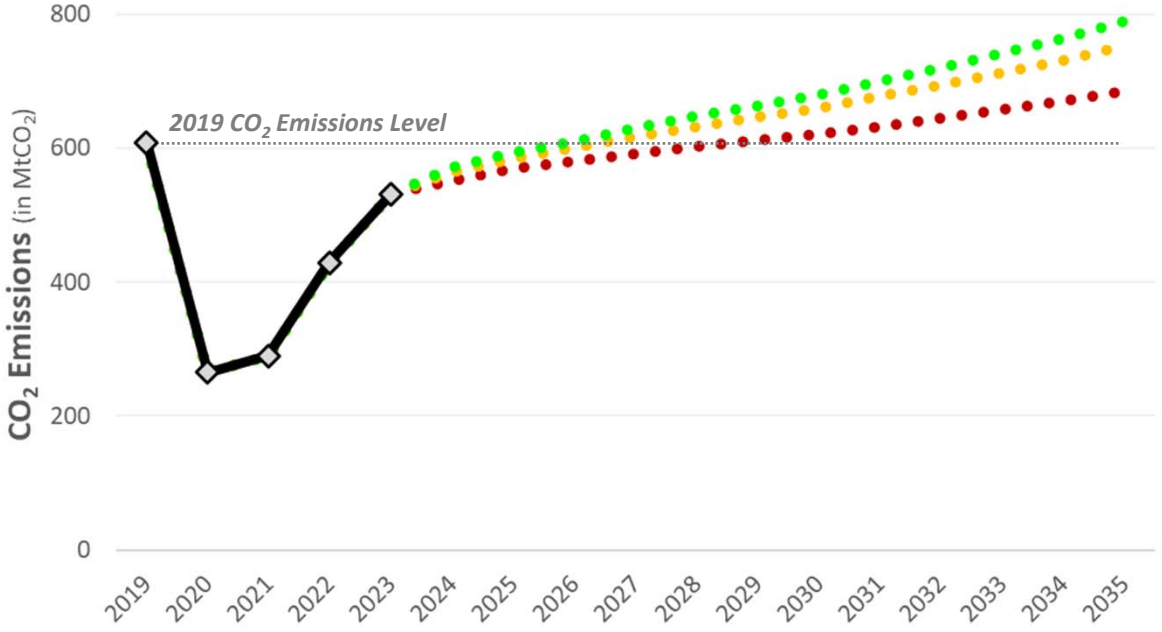
Q5 What offsetting requirements could operators face?

Q6 Would international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

** Focus on the CORSIA First Phase (2024-2026).*

Updated CO_2 Emissions Projections

- Updated forward looking assessment of CO_2 emissions.
- CO_2 emissions are expected to return to 2019 level by 2026 under the Mid and High CAEP/13 scenarios (2029 under the Low CAEP/13 scenario).



Legend:

- High scenario
- Mid scenario
- Low scenario

2025 CORSIA Periodic Review*

Actual/Historical CO_2 emissions
(based on CORSIA reporting through the CORSIA Central Registry)

* Based on CAEP/13 Trends scaled for purpose of CORSIA Analyses (to address consistent underestimation of CO_2 emissions compared to historical data from the CCR).

Questions Addressed in this Section

Q1 How CO_2 emissions from international aviation may evolve from 2024 to 2035?

Q2 **Given CO_2 emissions trends, how much offsetting may be required under CORSIA?**

Q3 How offsetting requirements (demand) may be met using (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units*?

Q4 What are expected costs of compliance*?

Q5 What offsetting requirements could operators face?

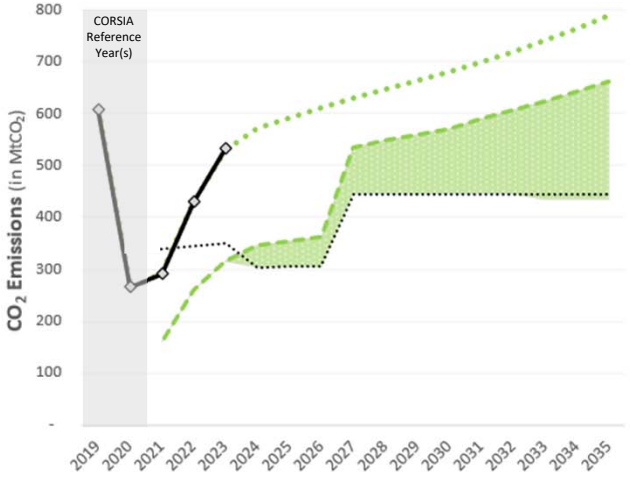
Q6 Would international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

** Focus on the CORSIA First Phase (2024-2026).*

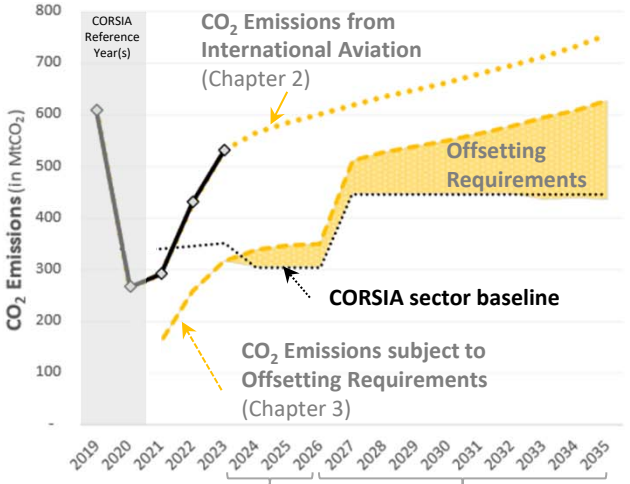
Estimation of Offsetting Requirements

- **Total offsetting requirements across international aviation sector are influenced by the impact of COVID-19, and the rate of recovery in out years.**
- **Offsetting requirements are expected to start in 2024 under all CAEP/13 traffic scenarios.**

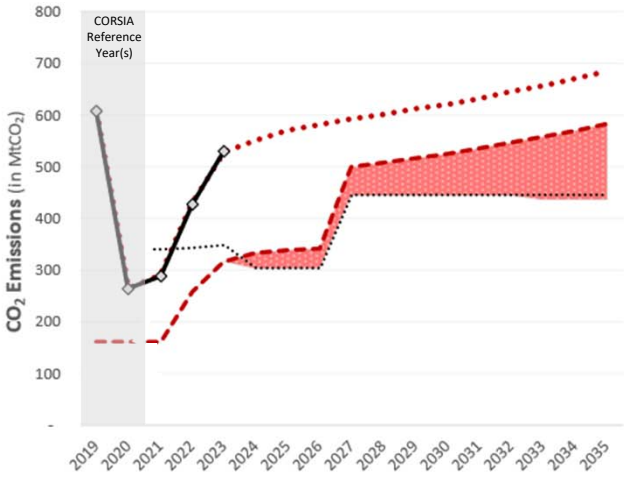
High traffic scenario



Mid traffic scenario



Low traffic scenario

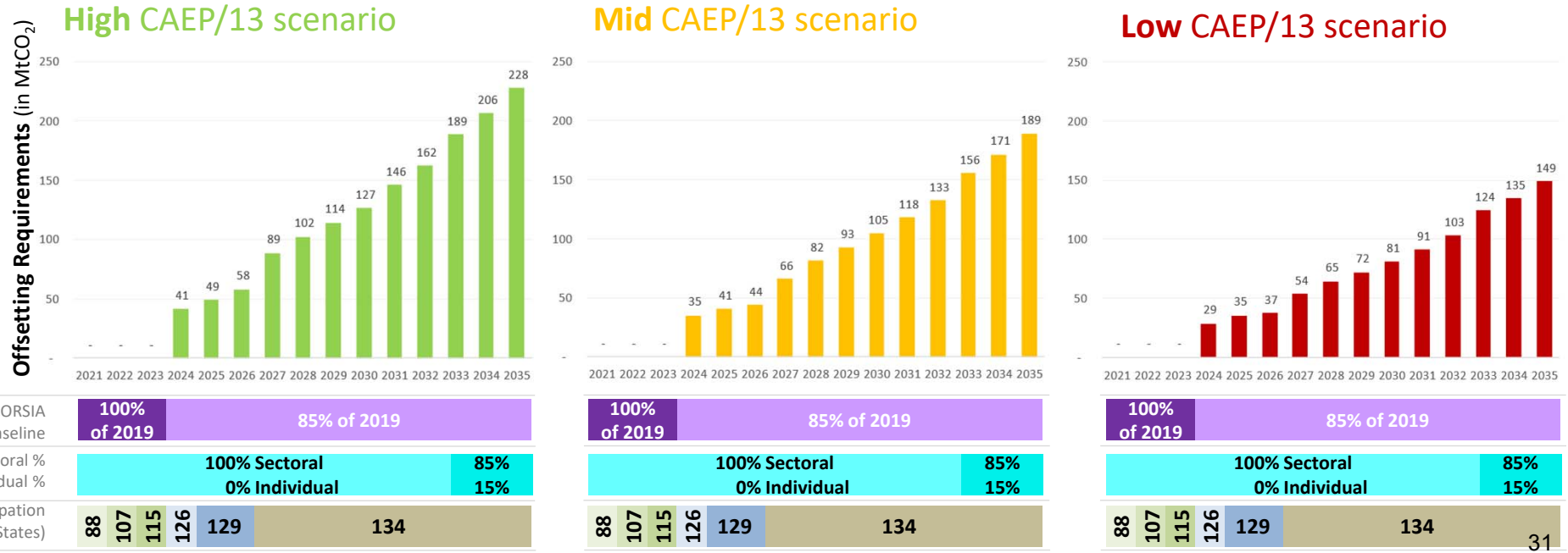


85% of international aviation emissions is subject to offsetting requirements (2027-2035).

60% of international aviation emissions is subject to offsetting requirements (2024-2026).

Estimation of Offsetting Requirements (cont.)

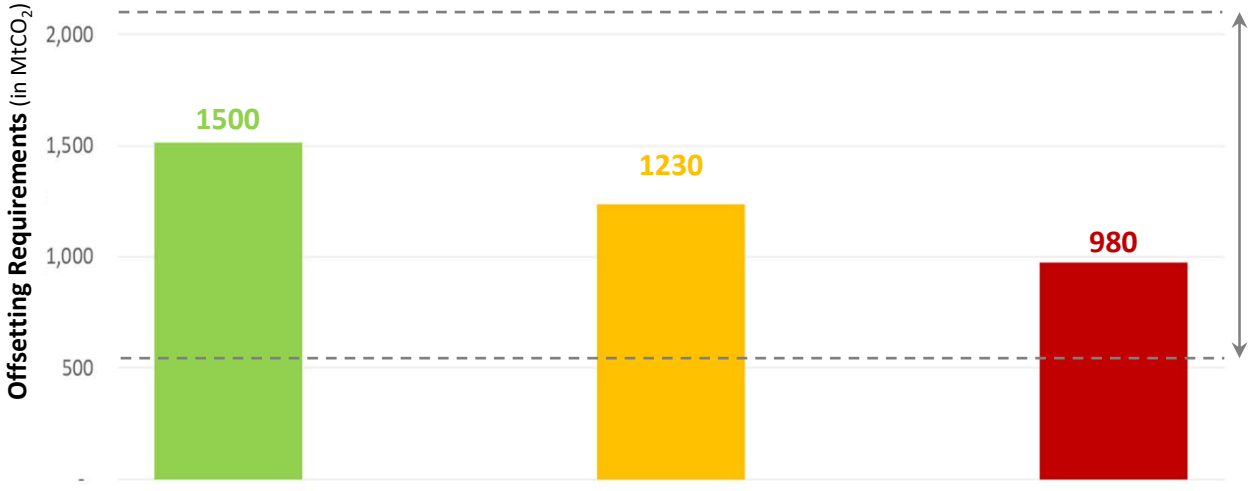
- **Total offsetting requirements across international aviation sector are influenced by the impact of the COVID-19 global pandemic, and the rate of recovery in out years.**
- **Offsetting requirements are expected to start in 2024 under all CAEP/13 scenarios.**



Estimation of Offsetting Requirements (cont.)

- **Given the initial ICAO-CAEP/13 traffic forecasts and decisions at Assembly 41, cumulative offsetting requirements (O.R.) from 2024 to 2035 could range from 980 to 1500 $MtCO_2$.**

All Phases
(2021-2035)



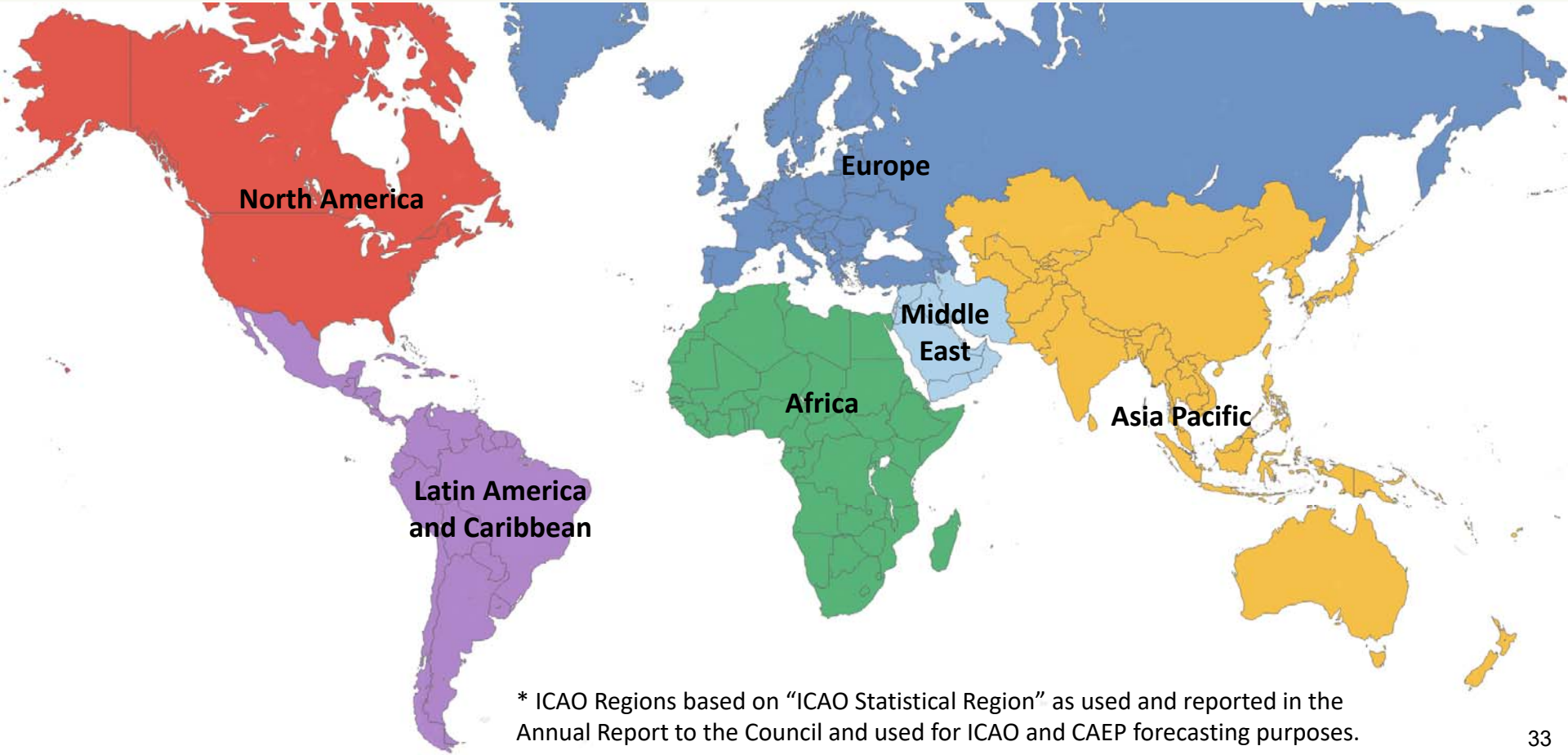
Note. – Average results from 100 runs of stochastic CORSIA model.

Scenario Assumptions			
CO_2 Emissions Trends	**High** ICAO-CAEP/13 Traffic	**Mid** ICAO-CAEP/13 Traffic	**Low** ICAO-CAEP/13 Traffic
CORSIA Baseline (2021-2023)	2019 (only)	2019 (only)	2019 (only)
CORSIA Baseline (2024-2035)	85% of 2019	85% of 2019	85% of 2019

Range of estimates from June 2022 analyses*.
i.e., "*Under an 85% of 2019 baseline for 2024-2035, O.R. could range from 600 to 2100 $MtCO_2$.*"

* 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.

Background on ICAO Regions*



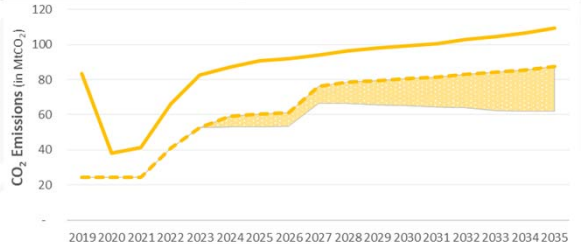
* ICAO Regions based on “ICAO Statistical Region” as used and reported in the Annual Report to the Council and used for ICAO and CAEP forecasting purposes.

Regional Breakdown of Offsetting Requirements

North America

Share of total CO_2 emissions (2021-2035)*: **15%**

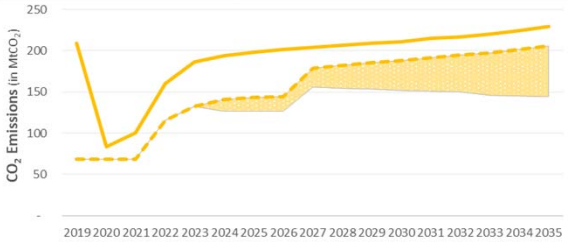
Avg. annual growth rate CO_2 emissions (2019-2035)**: **1.7%**



Europe

Share of total CO_2 emissions (2021-2035)*: **33%**

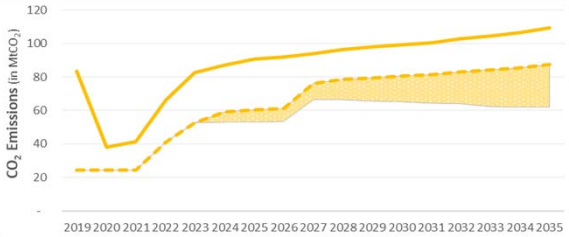
Avg. annual growth rate CO_2 emissions (2019-2035)**: **0.6%**



Middle East

Share of total CO_2 emissions (2021-2035)*: **15%**

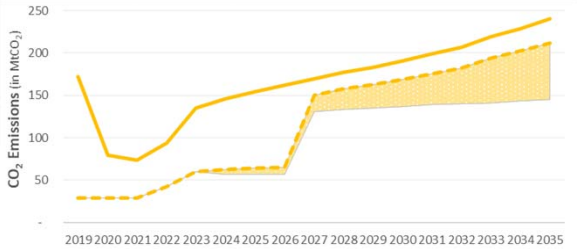
Avg. annual growth rate CO_2 emissions (2019-2035)**: **1.7%**



Asia Pacific

Share of total CO_2 emissions (2021-2035) **28.3%**

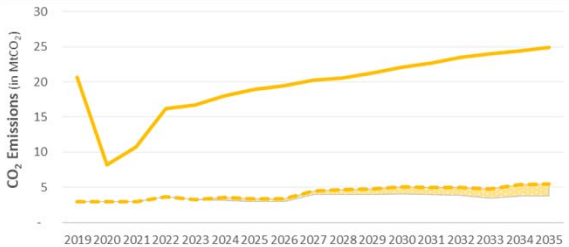
Avg. annual growth rate CO_2 emissions (2019-2035)**: **2.1%**



Latin America and Caribbean

Share of total CO_2 emissions (2021-2035)*: **3.3%**

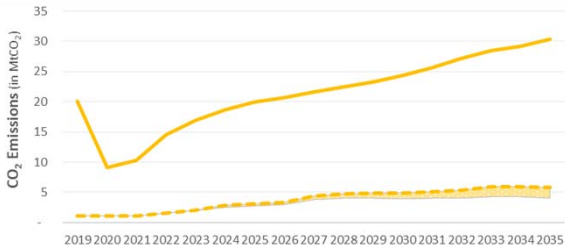
Avg. annual growth rate CO_2 emissions (2019-2035)**: **1.2%**



Africa

Share of total CO_2 emissions (2021-2035)*: **3.7%**

Avg. annual growth rate CO_2 emissions (2019-2035)**: **2.6%**



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 – 5 (Rev1)

Illustrative traffic scenario: Mid Covid19 recovery.

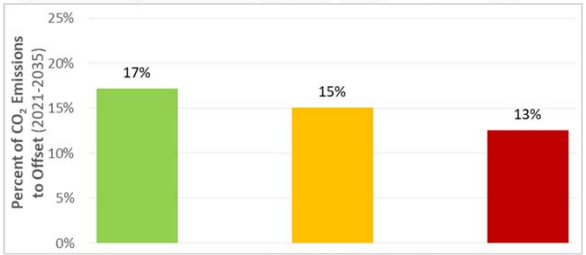
** Share of total international aviation CO_2 emissions (A16V4 Chapter 2) from 2021 to 2035. Shares very similar across Covid19 scenarios.*

*** Average annual growth of CO_2 emissions from international aviation (A16V4 Chapter 2) from 2019 to 2035.*

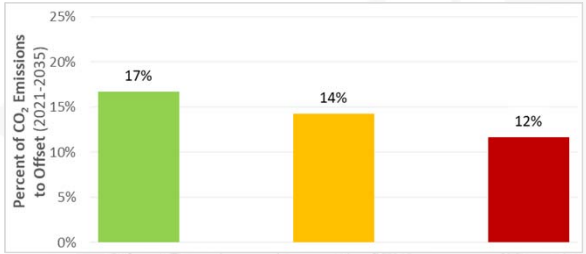
Percent CO_2 emissions to Offset by ICAO Regions

Percent CO_2 emissions to offset based on **total international aviation CO_2 emissions** (A16V4 Chapter 2).*

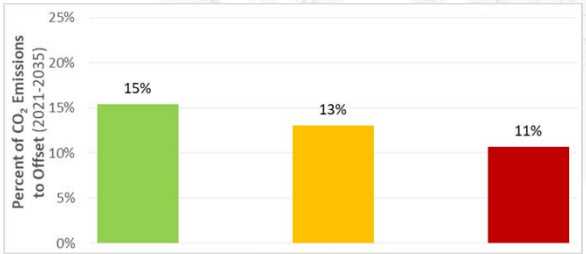
North America



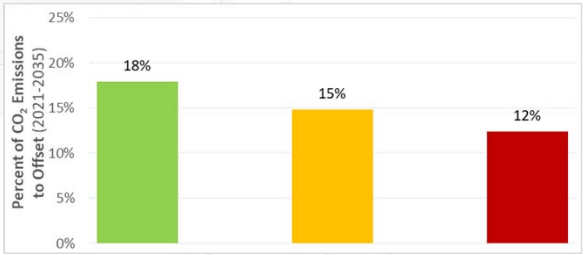
Europe



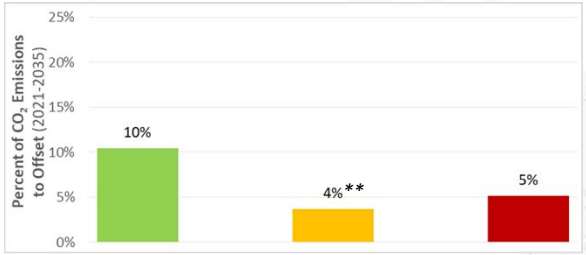
Middle East



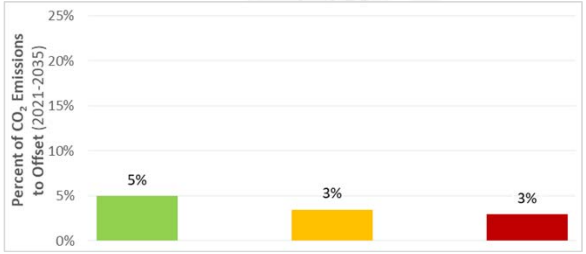
Asia Pacific



Latin America and Caribbean



Africa



** Percent CO_2 emissions to offset calculated as: total offsetting requirements (2021-2035) divided by total CO_2 emissions from international aviation (A16V4 Chapter 2) from 2021 to 2035.*

*** Lower estimate for Mid vs. Low scenarios due to a combination of factors, including; (1) the stochastic CORSIA model, (2) lower participation in CORSIA in this region, (3) an emerging issue due to input database based on 2018 COD. Emerging issue is minor as it affects approximately 1 per cent of the total offsetting requirements.*

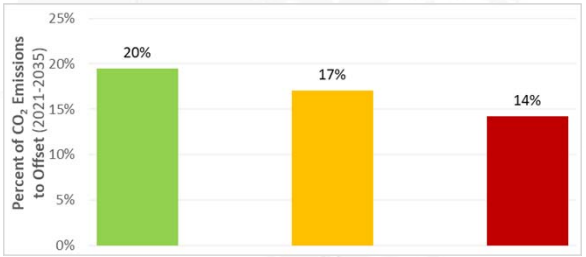
Summary of Assumptions:

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 – 5 (Rev1)

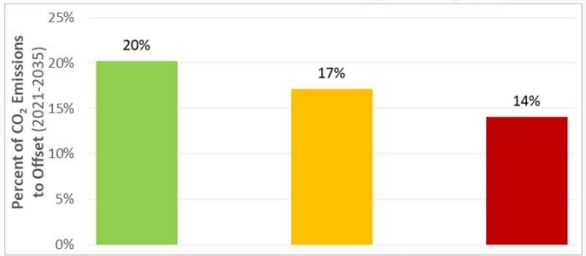
Percent CO_2 emissions to Offset by ICAO Regions

Percent Chapter 3 CO_2 emissions to offset based on* ***total international aviation CO_2 emissions subject to offsetting requirements*** *(A16V4 Chapter 3).*

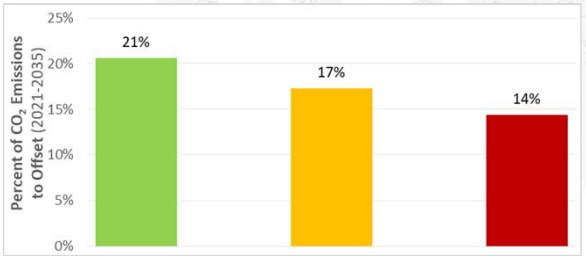
North America



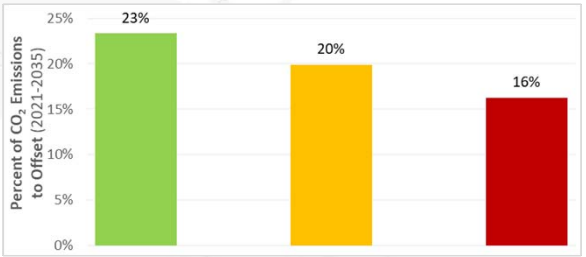
Europe



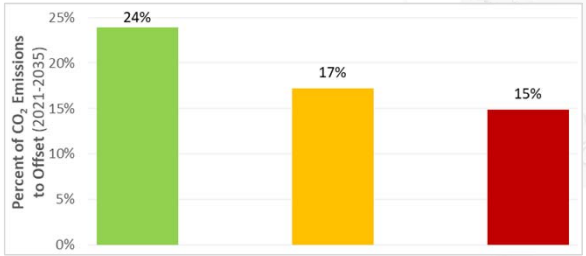
Middle East



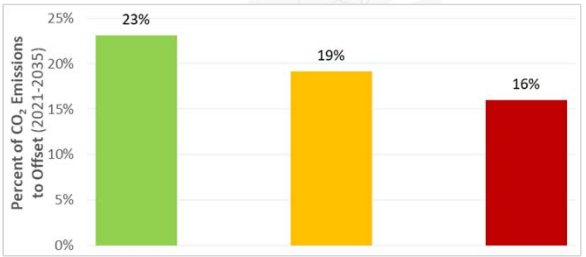
Asia Pacific



Latin America and Caribbean



Africa



** Percent Chapter 3 CO_2 emissions to offset calculated as: total offsetting requirements (2021-2035) divided by total international aviation CO_2 emissions subject to offsetting requirements (A16V4 Chapter 3) from 2021 to 2035.*

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 – 5 (Rev1)

Questions Addressed in this Section

Q1 How CO_2 emissions from international aviation may evolve from 2024 to 2035?

Q2 Given CO_2 emissions trends, how much offsetting may be required under CORSIA?

Q3 How offsetting requirements (demand) may be met using (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units*?

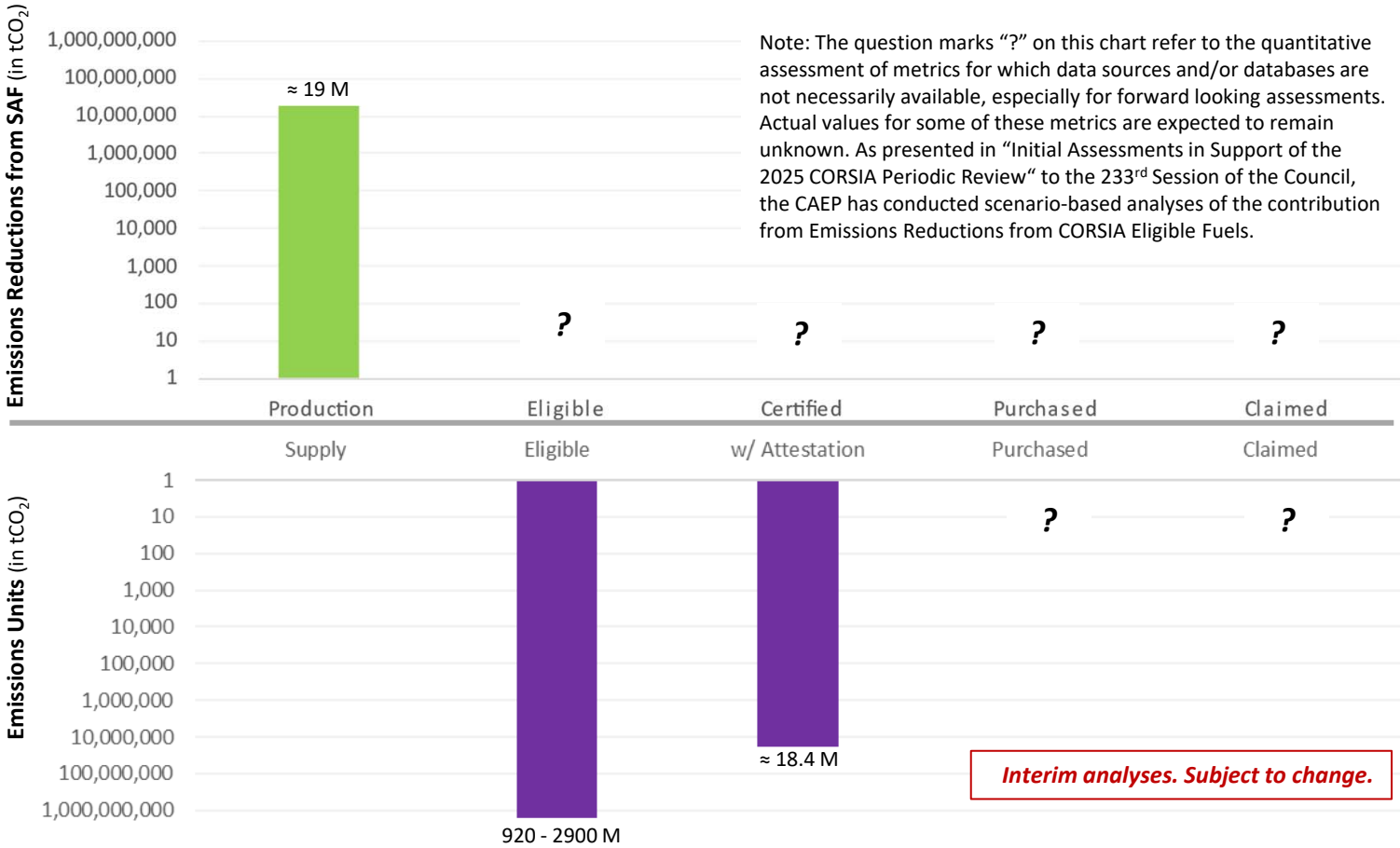
Q4 What are expected costs of compliance*?

Q5 What offsetting requirements could operators face?

Q6 Would international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

** Focus on the CORSIA First Phase (2024-2026).*

Assessment of the role of Emissions Reductions from CEF and CORSIA Eligible Emissions Units

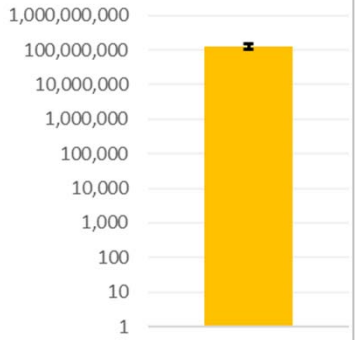


Note: The question marks "?" on this chart refer to the quantitative assessment of metrics for which data sources and/or databases are not necessarily available, especially for forward looking assessments. Actual values for some of these metrics are expected to remain unknown. As presented in "Initial Assessments in Support of the 2025 CORSIA Periodic Review" to the 233rd Session of the Council, the CAEP has conducted scenario-based analyses of the contribution from Emissions Reductions from CORSIA Eligible Fuels.

Offsetting Requirements

≈ 120 $MtCO_2$

during the First Phase of CORSIA

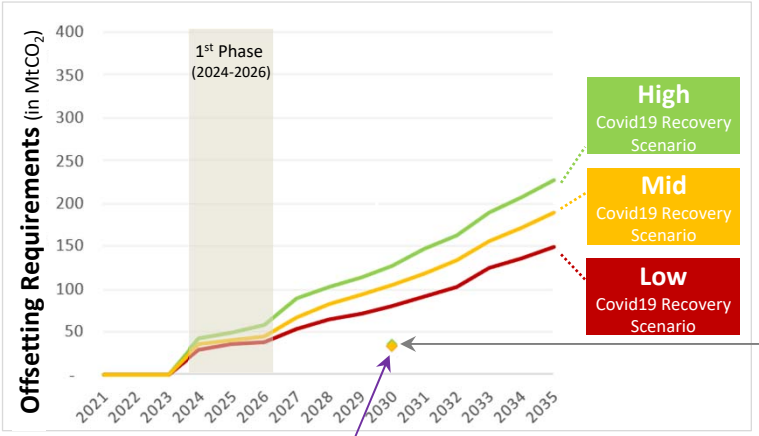


Outcome of CAAF/3 in Context of CORSIA Offsetting Requirements and SAF Scenarios

- **Following the CAAF/3 in Nov. 2024, CAEP used relevant technical outcome to place the SAF scenarios in context.**

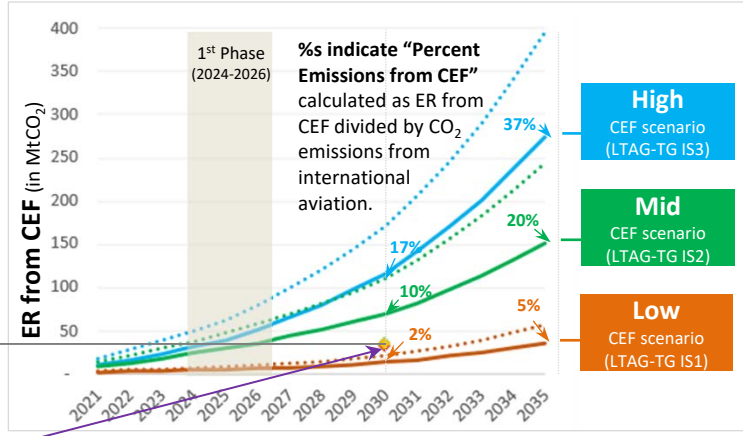
Offsetting Requirements

Assumptions:
- Amended CAEP/13 CO_2 emissions trends.
- CORSIA Baseline and Individual/Sectoral Shares reflecting decisions at the 41st session of the ICAO Assembly.



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.



ICAO's Collective global aspirational Vision (CAAF/3)

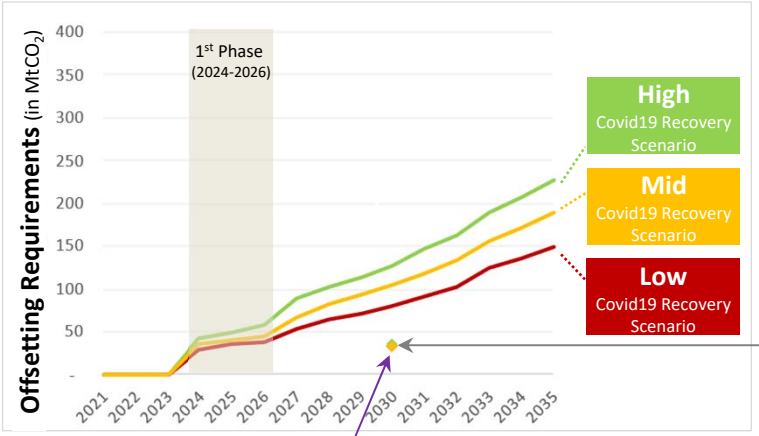
Note. Potential global emissions reductions from CEF (for domestic and international aviation) in dotted lines. Emissions reductions from CEF used on domestic aviation flights may be claimed towards CORSIA.

Outcome of CAAF/3 in Context of CORSIA Offsetting Requirements

- **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.**

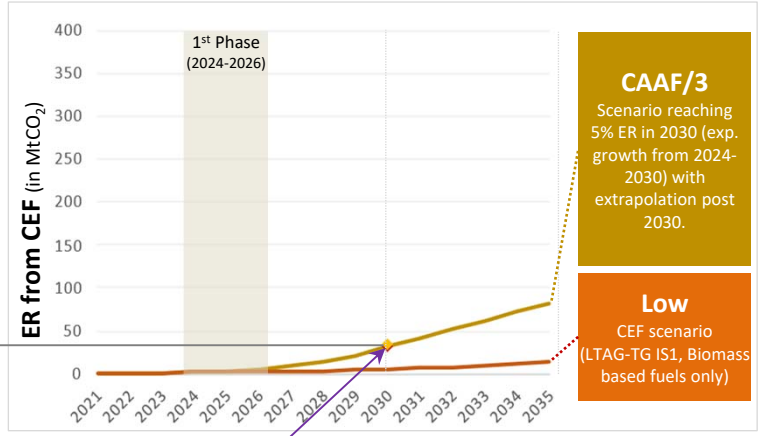
Offsetting Requirements

Assumptions:
- Adjusted CAEP/13 CO_2 emissions trends.
- CORSIA Baseline and Individual/Sectoral Shares reflecting decisions at the 41st session of the ICAO Assembly.



Emissions Reductions from CEF

Assumptions:
- Scenarios for Emissions Reductions from CEF based on adjusted CAEP LTAG-TG Fuels scenario (F1).
- Additional scenario reflecting technical outcome of CAAF/3.



Final Offsetting Requirements

Proxy for Demand for Emissions Units

(see next slide for details)

ICAO's Collective global aspirational Vision (CAAF/3)

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.**

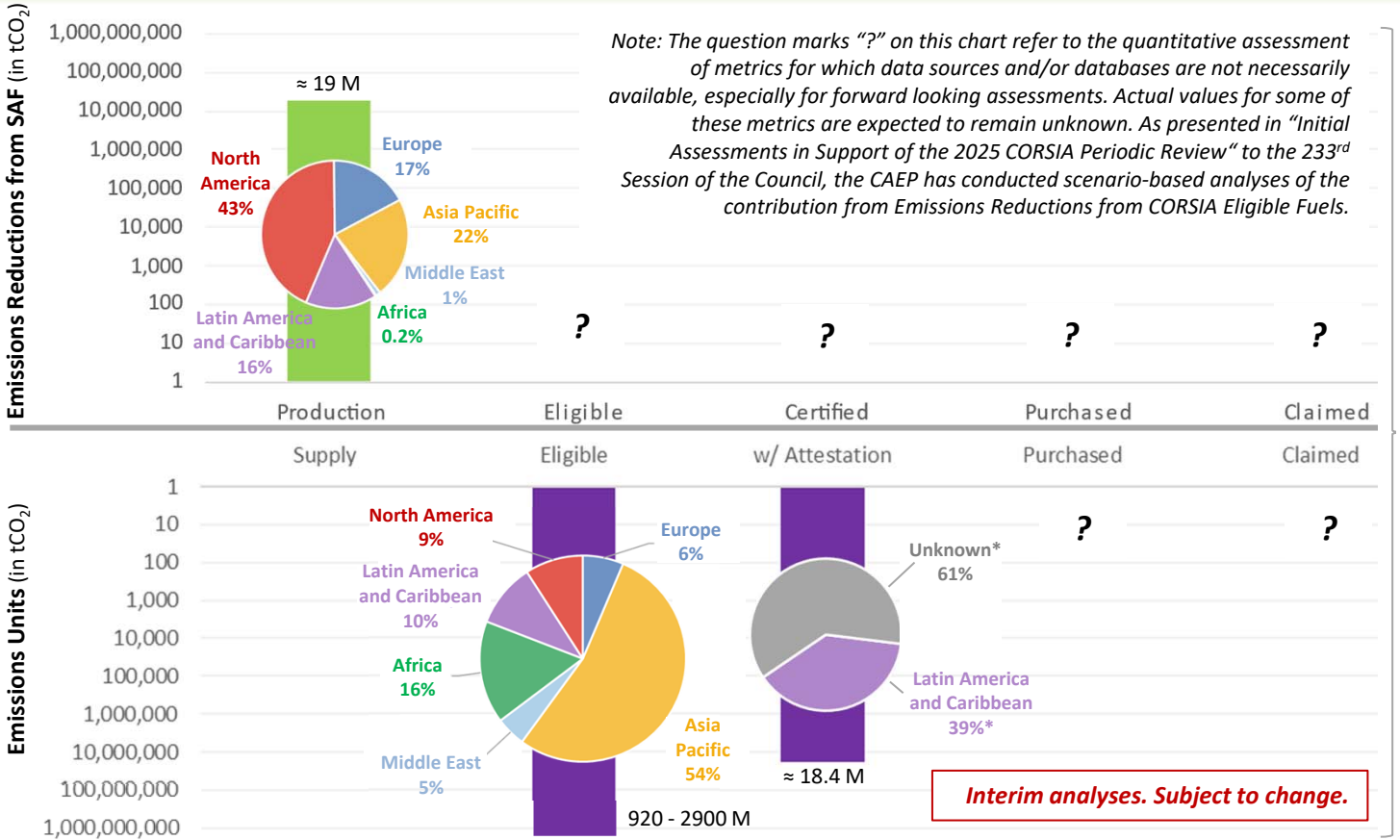
Cumulative Final Offsetting Requirements 2021-2035 (2024-2026)		No ER from CEF	Emissions Reductions from CEF Scenarios*	
			Low CEF scenario (LTAG-TG IS1)	**CAAF/3** scenario (Scaled LTAG-TG IS1)
Offsetting Requirements (given Traffic Scenario)	**High** Traffic Scenario *(CAEP/13)*	**1510** (148) $MtCO_2$	**1440** (142) $MtCO_2$	**1110** (137) $MtCO_2$
	Mid Traffic Scenario *(CAEP/13)*	**1230** (120) $MtCO_2$	**1160** (114) $MtCO_2$	**830** (109) $MtCO_2$
	Low Traffic Scenario *(CAEP/13)*	**980** (102) $MtCO_2$	**900** (95) $MtCO_2$	**575** (90) $MtCO_2$

– Traffic (CO_2 Emissions) +

– Emissions Reductions from CEF +

* 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.

Regional Breakdown of the Emissions Reductions from CEF and CORSIA Eligible Emissions Units

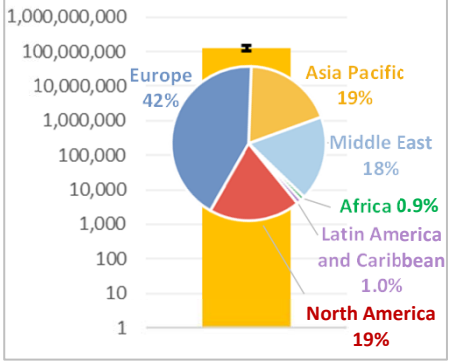


Note: The question marks "?" on this chart refer to the quantitative assessment of metrics for which data sources and/or databases are not necessarily available, especially for forward looking assessments. Actual values for some of these metrics are expected to remain unknown. As presented in "Initial Assessments in Support of the 2025 CORSIA Periodic Review" to the 233rd Session of the Council, the CAEP has conducted scenario-based analyses of the contribution from Emissions Reductions from CORSIA Eligible Fuels.

Offsetting Requirements

≈ 120 $MtCO_2$

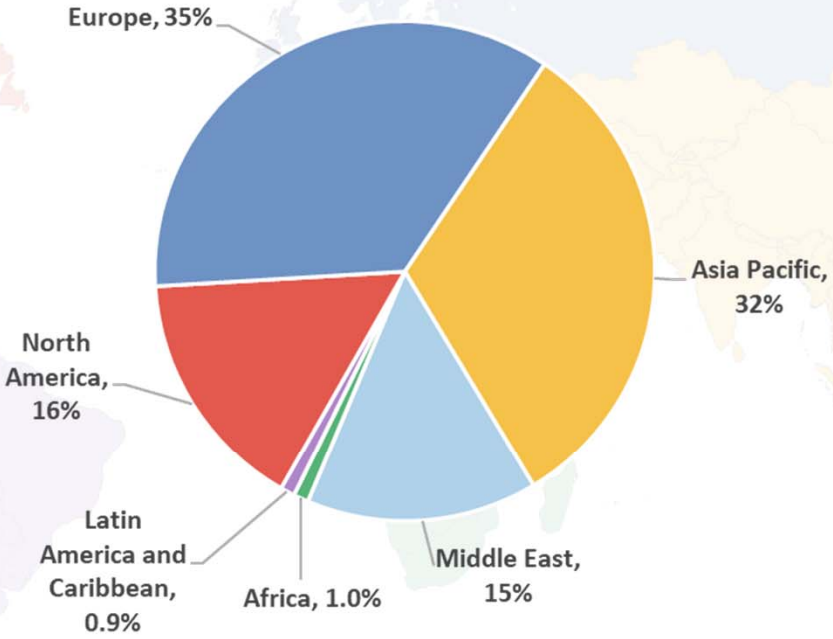
during the First Phase of CORSIA



* Comprehensive geographical distribution not available in the TAB report and surveys. Estimates based on regional distribution information available through program registries.

Regional Breakdown of Demand and Supply of Emissions Units across ICAO Regions – All Phases (2024-2035)

Demand: Regional Distribution of Offsetting Requirements (2024-2035)



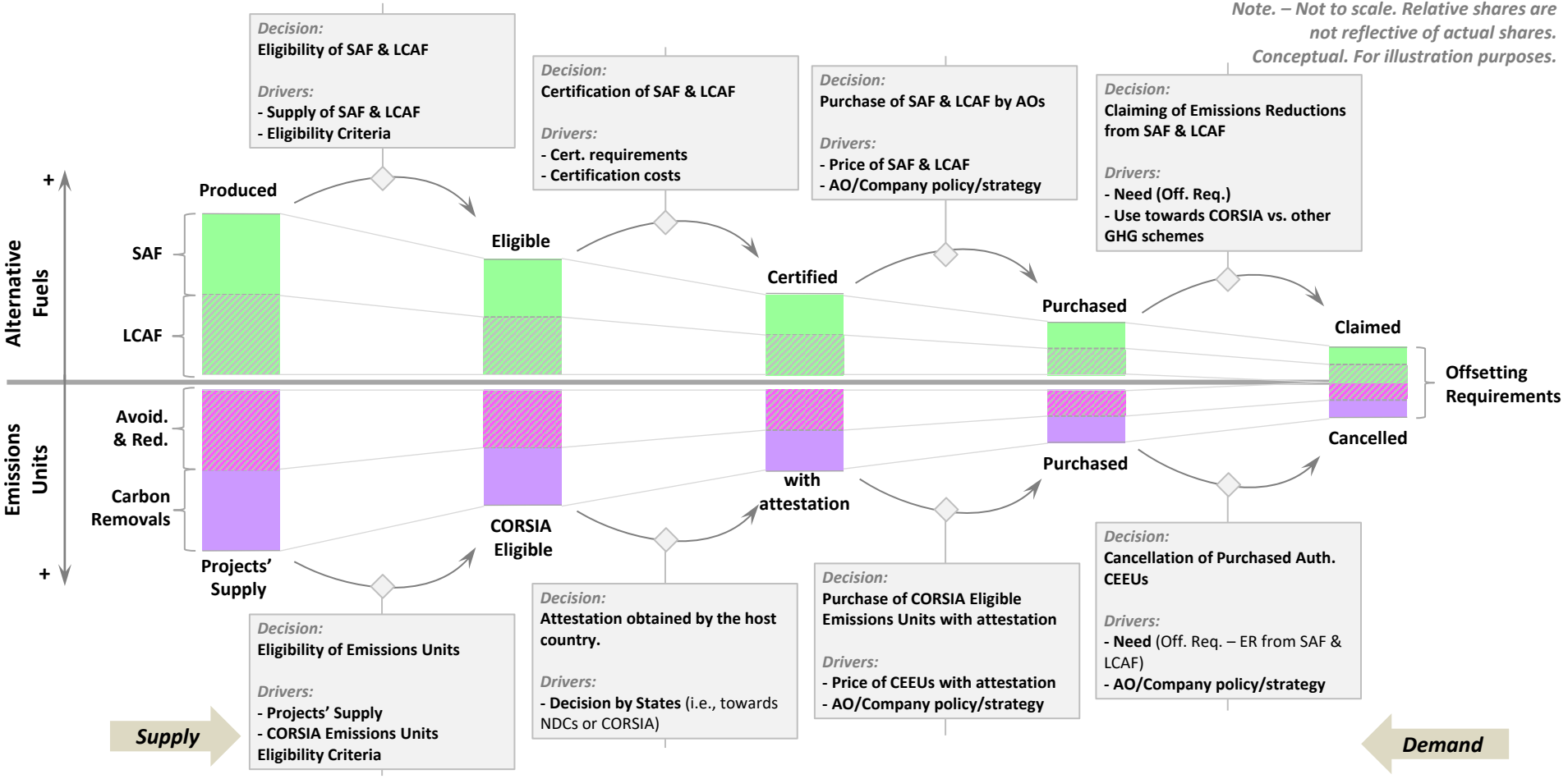
Total: ≈ 1230 $MtCO_2$

Range: 980-1500 $MtCO_2$

ICAO ENVIRONMENT

Updated Forward Looking CORSIA Analyses Q3

Framework towards the assessment of the role of Emissions Reductions from CEF and CORSIA Eligible Emissions Units

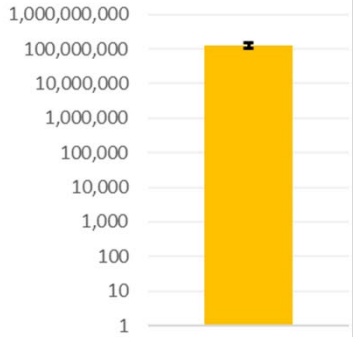


Assessment of the role of Emissions Reductions from CEF and CORSIA Eligible Emissions Units

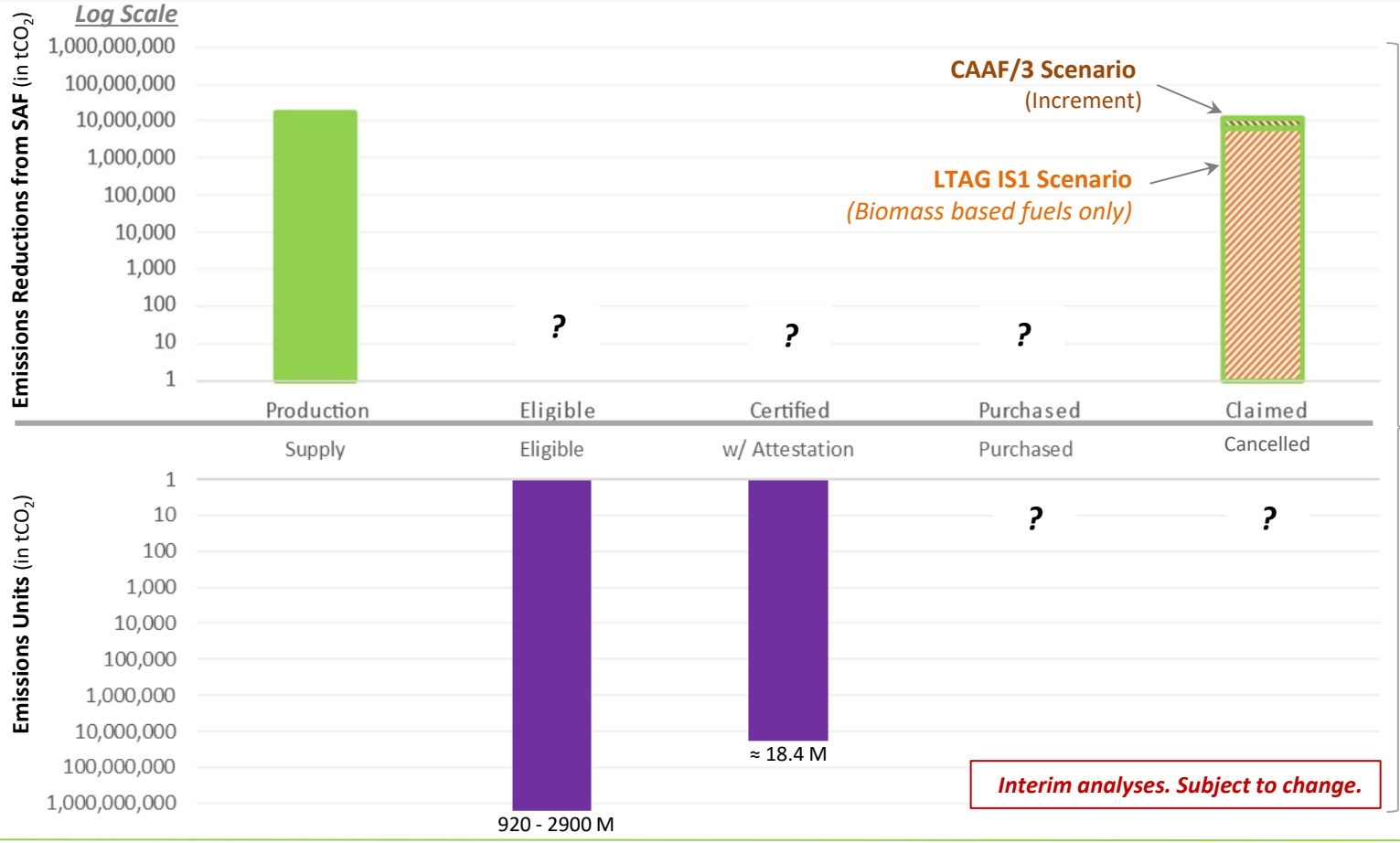
Offsetting Requirements

≈ 120 $MtCO_2$

during the First Phase of CORSIA



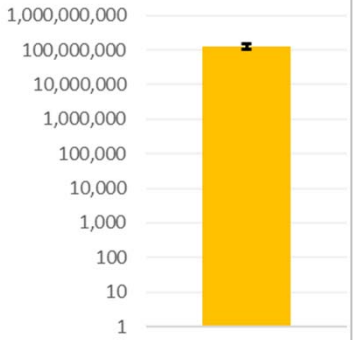
Scenario-based assessment of the role of Emissions Reductions from CEF and CORSIA Eligible Emissions Units



Offsetting Requirements

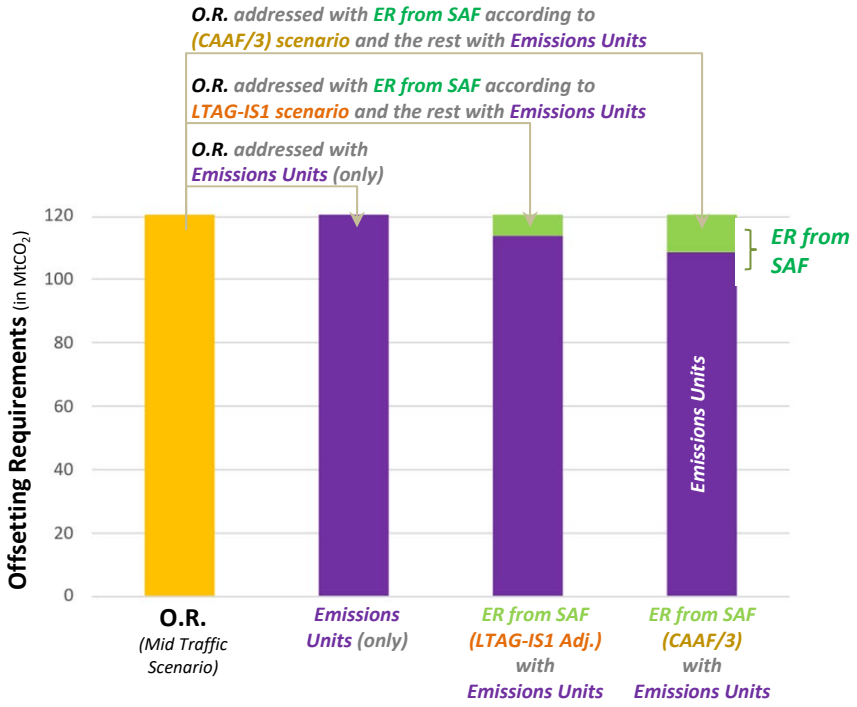
≈ **120** $MtCO_2$

during the First Phase of CORSIA



How Offsetting Requirements may be Addressed with SAF and/or Emissions Units?

How Offsetting Requirements may be Addressed with SAF and/or Emissions Units?
(Scenario-based analysis)



- **Given the uncertainty in how aeroplane operators may choose to address offsetting requirements** (i.e., mix of ER from CEF and/or Emissions Units)**, a scenario-based assessment was conducted.**

- **Three scenarios considered:**

  (1) Offsetting Requirements addressed with **Emissions Units (only).**

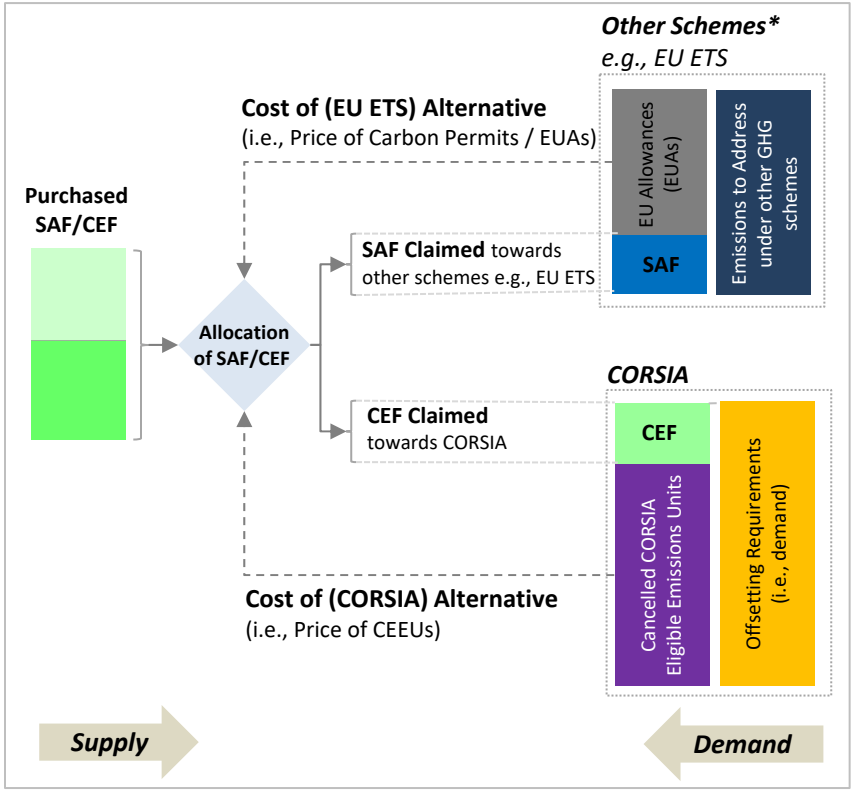
  (2) Offsetting Requirements addressed with **Emissions Units** and **ER from SAF** (according to **LTAG-IS1 scenario, biomass-based fuels only**).

  (3) Offsetting Requirements addressed with **Emissions Units** and **ER from SAF** (according to **CAAF/3 scenario**).

Assessment of the Potential Allocation of SAF/CEF to CORSIA vs. other GHG Schemes*

- **Demand from CORSIA and other schemes is likely to exceed the supply of SAF/CEF, making it a supply constrained market.**
- **The use/allocation of limited emissions reductions from SAF/CEF (towards a least overall cost outcome) will likely be driven by the costs of alternatives** e.g., emissions units under CORSIA and carbon permits (allowances) under EU ETS*.
- **Approach for assessments towards the 235th session:**
  - Identification and review of other GHG schemes,
  - Assessment of the use of SAF/CEF by aeroplane operators,
  - Quantification of the likelihood of claiming SAF/CEF towards CORSIA vs. other schemes.

Initial Framework for Assessing the Potential Claiming of CEF towards CORSIA vs. other Schemes



* **"CORSIA is the only global market-based measure applying to CO_2 emissions from international aviation"** (ICAO Resolution A41-22 par. 18). Note: Through C-DEC 232/6 action e), the Council requested CAEP to consider "other […] GHG schemes", which requires considering specific country and/or regional schemes for purpose of technical analyses.

Questions Addressed in this Section

Q1 How CO_2 emissions from international aviation may evolve from 2024 to 2035?

Q2 Given CO_2 emissions trends, how much offsetting may be required under CORSIA?

Q3 How offsetting requirements (demand) may be met using (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units*?

Q4 What are expected costs of compliance*?

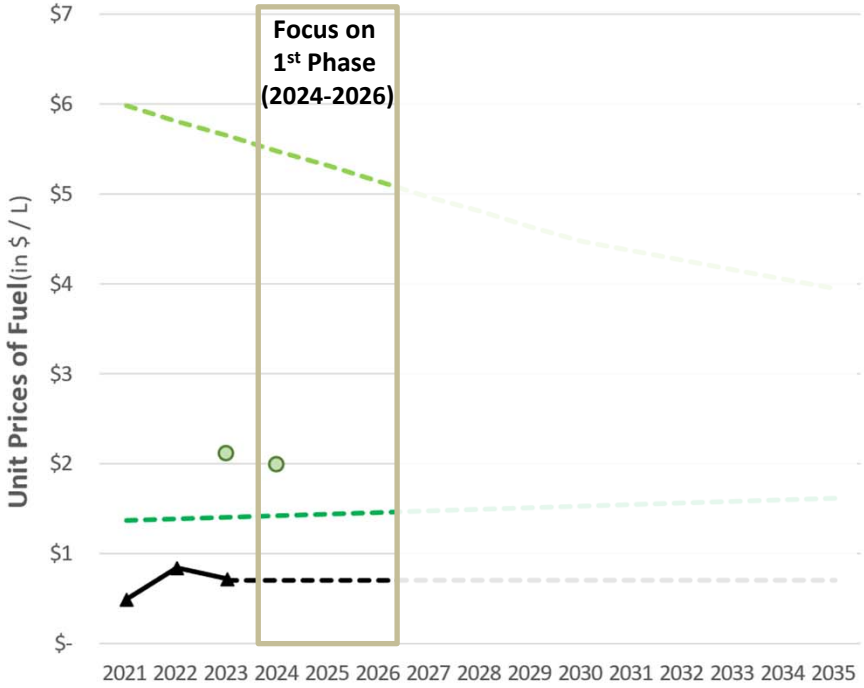
Q5 What offsetting requirements could operators face?

Q6 Would international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

** Focus on the CORSIA First Phase (2024-2026).*

Summary of Estimates of Price of SAF

- **Conventional jet fuel price is estimated at ≈ $0.7 per Liter for 2024*.**
- **The unit price of SAF is ≈ $2.0 per Liter** (≈ 2.8x the price of conventional jet fuel).



Legend:

- IS1: LTAG-SAF Gaseous waste based fuels
- IS1: LTAG-SAF Biomass based fuel

Scenarios from LTAG Report (for context)

- SAF Unit Price: Historical & Est.
- Conventional Jet Fuel Unit Price
- Historical Jet Kerosene Price

* IATA, Industry Statistics, Industry Statistics, Fact Sheet, December 2023, www.iata.org/en/iata-repository/pressroom/fact-sheets/industry-statistics,

** Sources: IATA, Quantum Commodity Intelligence, Argus.

Summary of Estimates of Price of Emissions Units

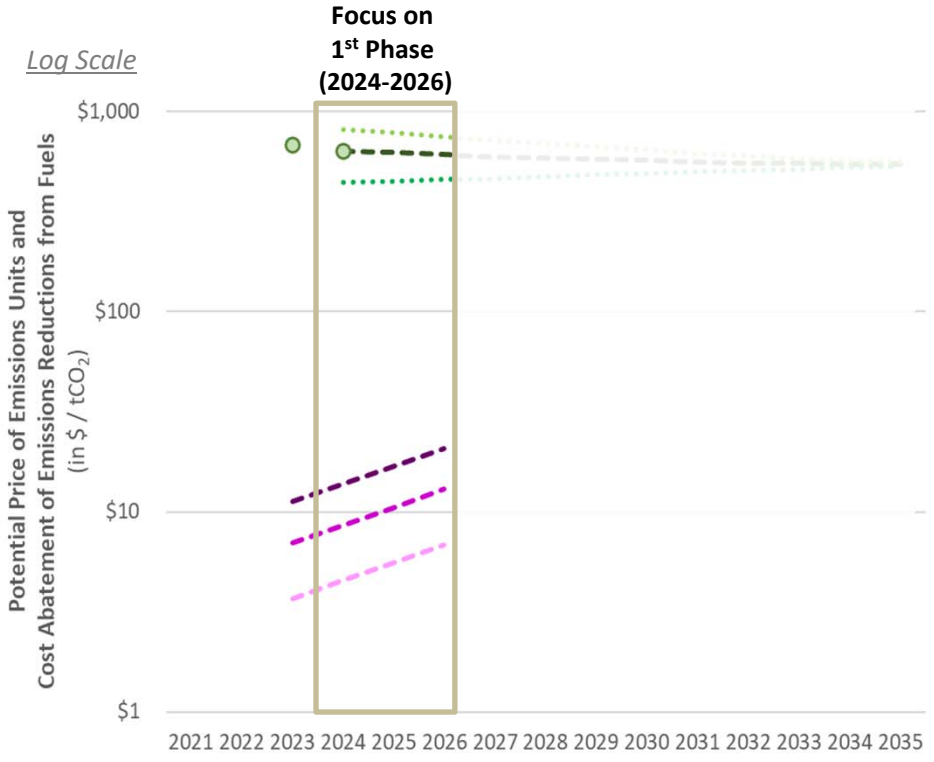
- The CAEP has updated its estimates of price of emissions units.
- Supply for emissions units from the TAB were considered.
- Updated demand estimates as presented in previous slides were also considered.
- For price, the CAEP noted that:
  - The market for CORSIA-eligible units remains at a nascent stage.
  - In recent years, most, if not all, carbon offset transactions are undertaken through bilateral contracts (over-the-counter or "OTC" transactions), making price information largely opaque.
  - Price forecasting, and assumptions applied, should be underpinned by robust data.
  - Additional sources of demand for carbon offsets are expected in the years to come, including from Parties to the Paris Agreement that may use carbon markets to help achieve their NDCs, as well as from private companies.

Initial CAEP/13 scenario-based price of CORSIA-eligible emissions units through 2026

Note: Caveats and limitations apply. Details available from CAEP.

Summary of Unit Prices

- **Cost abatement (i.e., SAF Premium / tCO_2 abated) from the Emissions Reductions from SAF ranges from ≈ $600-800 per tCO_2. Average prices of emissions units may range from $5.70 to $17.20 per tCO_2 during the First Phase of CORSIA.**



Legend:

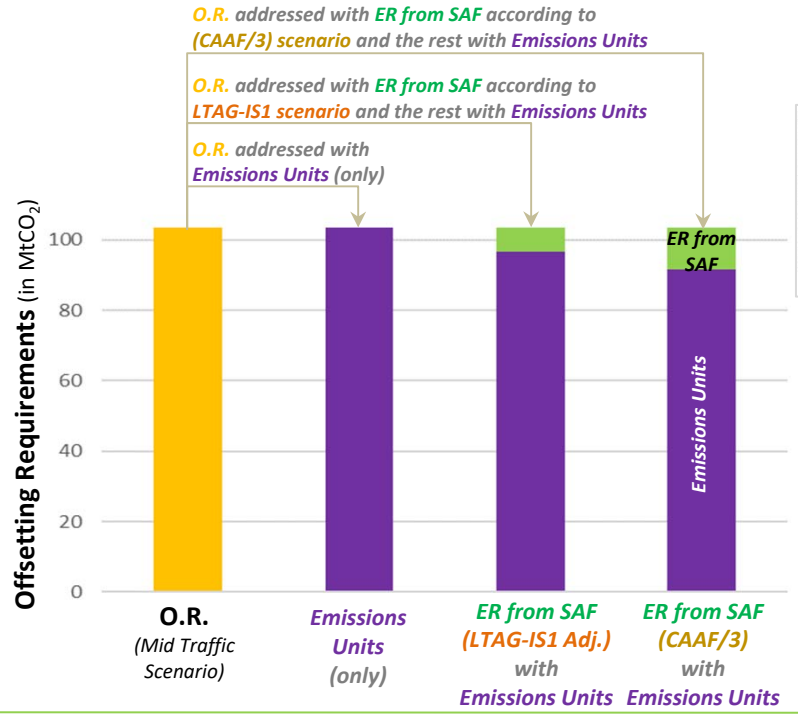
- Price ER from CEF (Mid) based on historical data and trend btw High and Low
- Price ER from CEF (High) Weighted LTAG-IS1 (F1) Scenario
- Price ER from CEF (Low) LTAG-IS1 (F1) Biomass based fuel only (High Price)
- Historical (SAF)
- CORSIA EEUs (High)
- CORSIA EEUs (Mid)
- CORSIA EEUs (Low)

Note: LTAG-TG Cost Abatements based on updated 0.7 $/L for Conventional Jet Fuel.

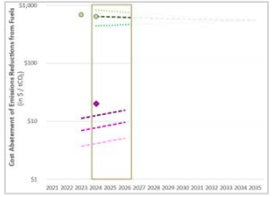
Addressing Offsetting Requirements during the First Phase of CORSIA with Cost Implications

How Offsetting Requirements may be Addressed with SAF and/or Emissions Units?

(Scenario-based analysis)



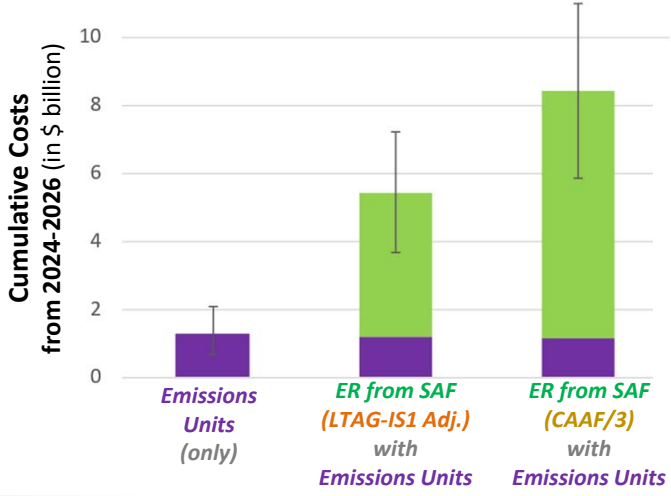
Prices of ER from SAF and Emissions Units:
Data & Assumptions



How much would it cost to address Offsetting Requirements during the First Phase ?

(Scenario-based analysis)

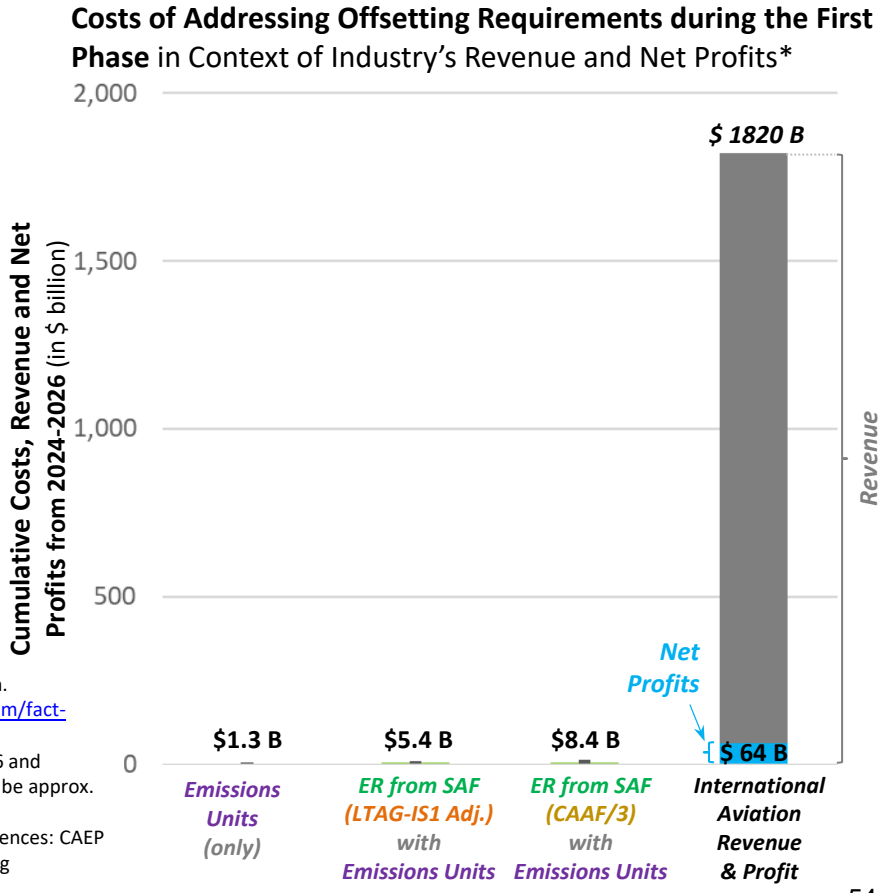
Initial analyses. Subject to change.



Note: Actual cost of ER from SAF expected to be lower due to States' support e.g., tax credits, subsidies.

Costs of Addressing Offsetting Requirements during the First Phase in Context of Industry's Revenue

- **Costs associated with addressing offsetting requirements from 2024 to 2026 could range from ≈ $1.3 billion** using Emissions Units (only) **to ≈ $8.4 billion*** using a mix of Emissions Units and ER from CEF given the scenario based on the CAAF/3 vision. **These costs are lower than those anticipated in 2016 before CORSIA was agreed**.**
- **These total costs associated with addressing offsetting requirements could represent ≈ 0.07% to 0.46% of international aviation revenue from 2024 to 2026*.**
- These costs could represent ≈2% to 13% of net profits from 2024 to 2026*.



* IATA estimated global aviation industry revenues of $ 965 billion with projected revenues for 2025 at $1007 billion. References: IATA, Industry Statistics, December 2024, Fact Sheet, https://www.iata.org/en/iata-repository/pressroom/fact-sheets/industry-statistics/ and Global Outlook for Air Transport https://www.iata.org/en/iata-repository/publications/economic-reports/global-outlook-for-air-transport-december-2024/. Extrapolating for 2026 and assuming a 60% ratio for international aviation, cumulative revenues from international aviation were estimated to be approx. $ 1800 billion.

**In 2016, the CAEP estimated the costs from a global MBM to range from $2.2 to $6.2 billion (in 2025 alone). References: CAEP analysis presented at EAG/15 (January 2016); and IATA, "Comments on the Cost Impact of a Global Carbon Offsetting Mechanism", https://www.icao.int/Meetings/a39/Documents/WP/wp_153_rev1_en.pdf

Questions Addressed in this Section

Q1 How CO_2 emissions from international aviation may evolve from 2024 to 2035?

Q2 Given CO_2 emissions trends, how much offsetting may be required under CORSIA?

Q3 How offsetting requirements (demand) may be met using (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units*?

Q4 What are expected costs of compliance*?

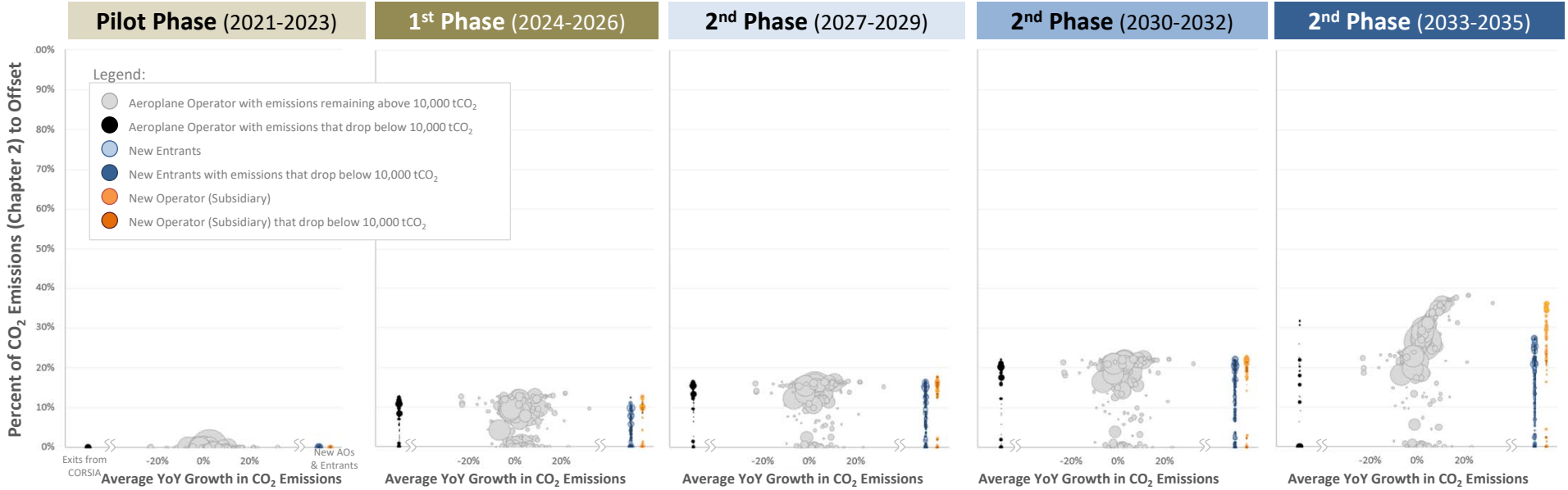
Q5 What offsetting requirements could operators face?

Q6 Would international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

** Focus on the CORSIA First Phase (2024-2026).*

Assessment of CORSIA's impact on Aeroplane Operators

- **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.**

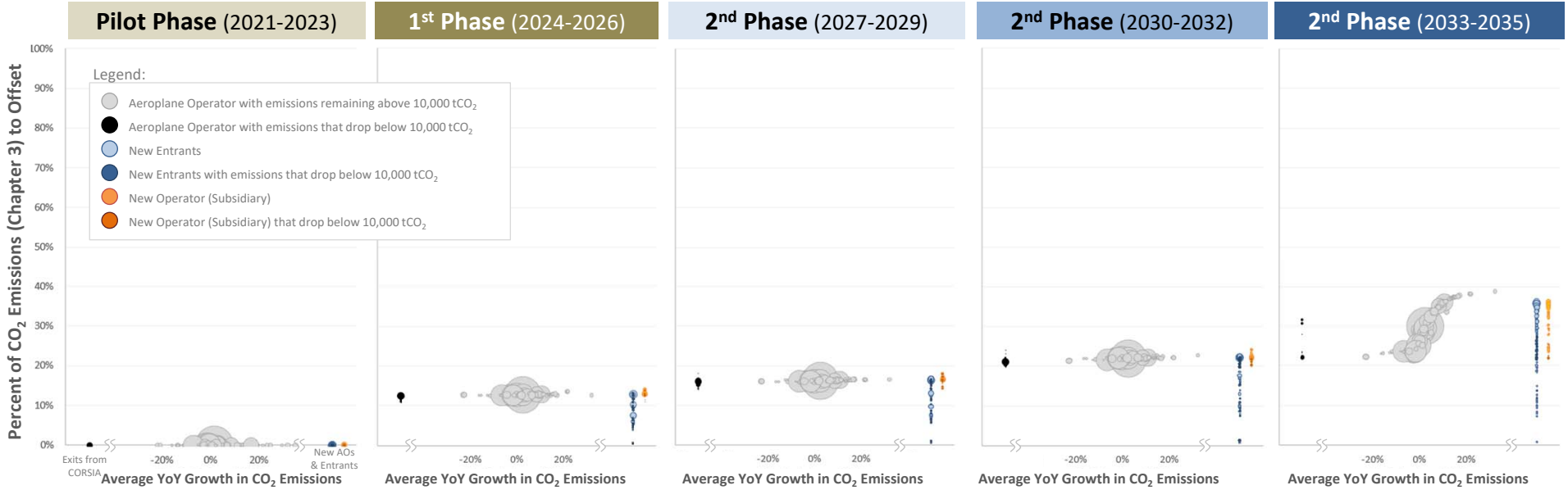


	Pilot Phase (2021-2023)	1st Phase (2024-2026)	2nd Phase (2027-2029)	2nd Phase (2030-2032)	2nd Phase (2033-2035)
Share of **CO_2 Emissions** across all CORSIA Phases:	**14 %**	**19 %**	**21 %**	**22 %**	**24 %**
Share of **Offsetting Requirements** (all phases):	**0 %**	**8 %**	**23 %**	**30 %**	**39%**

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 5/Rev1), New Entrant baseline option E.

Assessment of CORSIA's impact on Aeroplane Operators

- **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.**



	Pilot Phase (2021-2023)	1st Phase (2024-2026)	2nd Phase (2027-2029)	2nd Phase (2030-2032)	2nd Phase (2033-2035)
Share of **CO_2 Emissions** across all CORSIA Phases:	14 %	19 %	21 %	22 %	24 %
Share of **Offsetting Requirements** (all phases):	0 %	8 %	23 %	30 %	39%

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/Rev1), New Entrant baseline option E.

Questions Addressed in this Section

Q1 How CO_2 emissions from international aviation may evolve from 2024 to 2035?

Q2 Given CO_2 emissions trends, how much offsetting may be required under CORSIA?

Q3 How offsetting requirements (demand) may be met using (1) Emissions Reductions from CEF and/or (2) CORSIA Eligible Emissions Units*?

Q4 What are expected costs of compliance*?

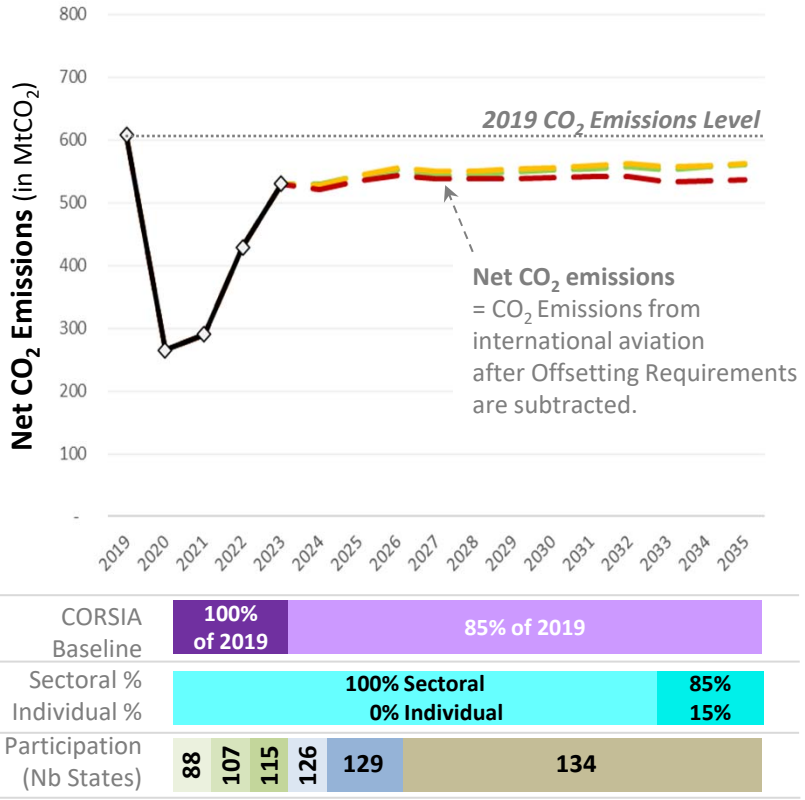
Q5 What offsetting requirements could operator face?

Q6 Would international aviation meet its Carbon Neutral Growth goal from 2020 (CNG2020)?

** Focus on the CORSIA First Phase (2024-2026).*

Projections of Net CO_2 Emissions through 2035

- **Net CO_2 emissions may be ≈540 to 560 $MtCO_2$ in 2035** (≈ -7.4% to -12% 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 CO_2 emissions would not stabilize at 85% of 2019 emissions level due to partial participation in CORSIA.***



Summary of Observations

- **Based on its updated forward-looking assessments through 2035 with focus on First Phase (2024-2026), the CAEP noted that:**
  - **a) Given amended CO_2 emissions forecasts and 85% of 2019 CORSIA baseline, offsetting requirements are expected to start in 2024 under all traffic scenarios.**
  - **b) Cumulative offsetting requirements could range from 980 to 1500 $MtCO_2$ from 2024 to 2035 and 100 to 150 $MtCO_2$ during the First Phase.**
  - **c) Relevant technical information from CAAF/3 was considered to update scenarios for potential Emissions Reductions from CEF.**
  - **d) Updated scenario-based analysis suggests that emissions reduction from CEF may address up to ≈ 6 to 10 % of offsetting requirements during the First Phase of CORSIA.**
  - **e) Costs associated with addressing offsetting requirements from 2024-2026 could range from:**
    - **≈ $1.3 billion ($0.7B to $2.1B) using Emissions Units only** to
    - **≈ $8.4 billion ($5.8B to $11B) using a mix of Emissions Units and ER from SAF given a scenario that takes into account the CAAF/3 vision.**

Contents

Next Steps

- **CORSIA Periodic Review: Review of CORSIA's Pilot Phase:**
  - **further develop potential approaches to access data on price for CORSIA Eligible Emissions Units (for future analysis).**

- **CORSIA Periodic Review: Updated Forward Looking CORSIA Analyses:**
  - **update the scenarios of the potential role of emissions reductions from CEF by integrating the CAEP short-term production projections** (expected in April/May 2025),
  - **Further assess the potential demand and drivers of allocation of SAF/CEF towards CORSIA vs. other schemes.**
  - **Assess the potential magnitude of demand and supply from operators (potentially) faced with an allocation decision** (i.e., choice of where to allocate limited SAF/CEF during the CORSIA First Phase).
  - **continue to monitor and inform the Council on changes in supply, demand and price of emissions units.**

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