



ICAO

ENVIRONMENT

The ICAO's Long-Term Aspirational Goal (LTAG) and the role of Sustainable Aviation Fuels (SAF)



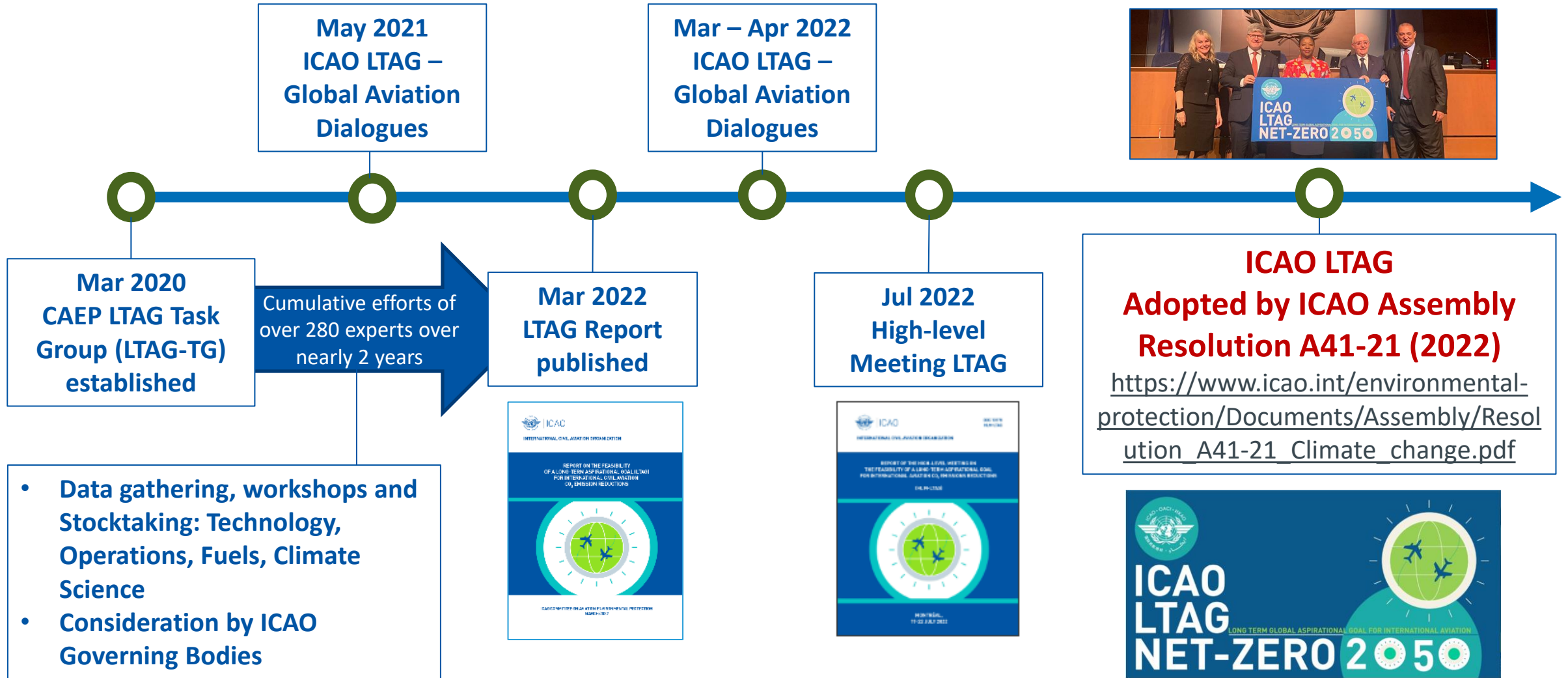
NACC/DCA/11

Varadero, Cuba, 27 June 2023



- **Milestones toward the ICAO 41st Assembly and its outcomes**
- **How fuels contribute to the LTAG**
- **ICAO's work on SAF and cleaner energies (including definitions)**
- **Opportunities for States to benefit along the SAF supply chain, and associated challenges**
- **Supporting policies for the aviation energy transition**
- **Assistance, Capacity Building, and Training for cleaner energy (including the ACT-SAF programme)**
- **Financing cleaner energy**
- **Looking forward to the CAAF/3**

Milestones toward LTAG outcome





The Assembly agreed to a collective long-term global aspirational goal (LTAG) of **net-zero carbon emissions from international aviation by 2050** (Resolution A41-21 Para 7)

- In support of Paris Agreement's temperature goal (A41-21 Para 7)
- Collective global aspirational goal, and does not attribute specific obligations or commitments in the form of emissions reduction goals to individual States (A41-21 Para 8)



Key outcomes from 41st Session of ICAO Assembly (Oct 2022)

- The Assembly recognized that **means of implementation** commensurate to the level of ambition, including financing, will promote the achievement of the LTAG. (Resolution A41-21 Para 17 & 18)
- The Assembly requested the Council to **regularly monitor progress** on the implementation of all elements of the basket of measures towards achievement of the LTAG...
- ... consider necessary methodologies for the **monitoring of progress**, and report to a future Session of the ICAO Assembly (Resolution A41-21 Para 9)





ICAO

ENVIRONMENT

How fuels contribute to the LTAG



The ICAO Committee on Aviation Environmental Protection (CAEP) developed a robust analysis on feasibility of an LTAG



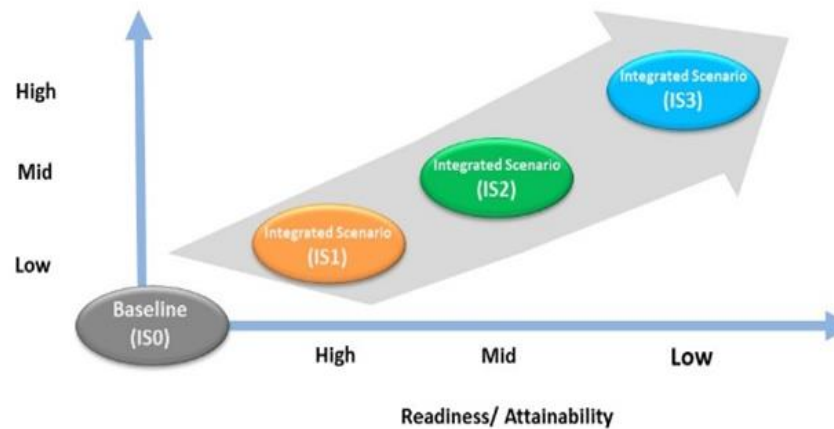
It developed integrated scenarios representing level of aspiration needed, with the degree of readiness and attainability



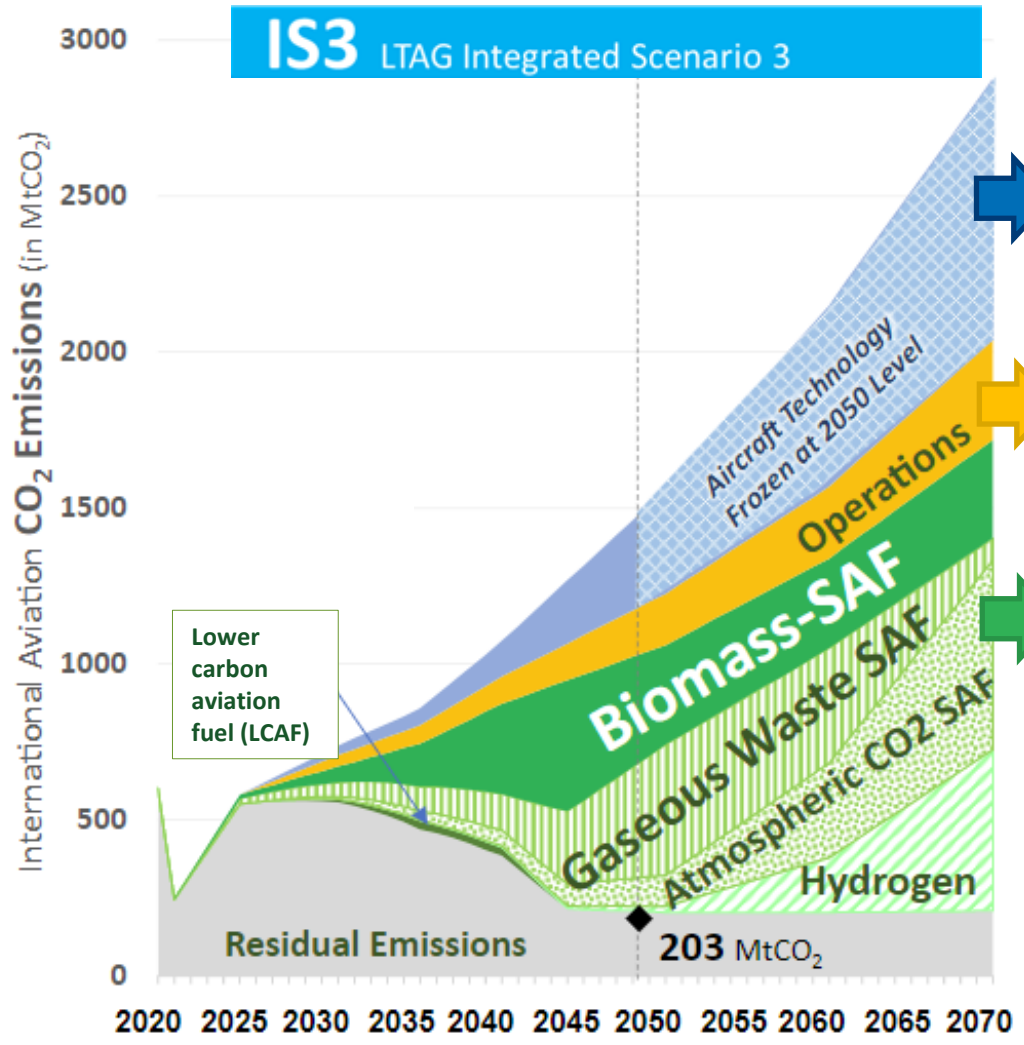
The LTAG Report, published in March 2022, underpinned the LTAG decision at Assembly in October 2022

ICAO WORK ON LONG-TERM ASPIRATIONAL GOAL ¹			
Operations	Technology	Fuel	
 Air operations Ground operations	 Alternative energy sources Airframe Propulsion Advanced Concepts	Fuels Drop-in fuels? Cryogenic fuels (Hydrogen and Methane) Electricity	Sources of energy Wind Solar Nuclear Biomass Solid & liquid wastes Fossil resources Industrial waste gases
Transport & Storage			
Identify combined in-sector scenarios of technology, fuels, and operations, and evaluate: Timing Readiness Attainability CO ₂ reduction			

Aspiration (Enabled by Policy/ Effort)



LTAG Report – Contributions from technology, operations, and fuels

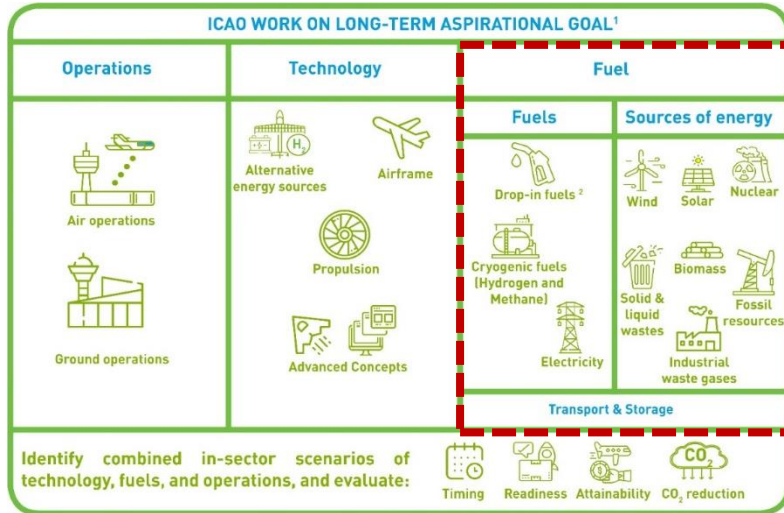


Advanced tube and wing, unconventional airframe/propulsion concept aircraft, non-drop-in fuels such as battery electric etc.

Improvements in the performance of flights across all phases

Sustainable aviation fuels (SAF) and other cleaner energy have the largest impact on residual CO₂ emissions, driving overall reductions by 2050

Contributions from hydrogen may increase in the 2050s and 2060s if technically feasible and commercially viable



Fuel Category	Fuel Name	Carbon sources in fuel feedstock
1. LTAG Sustainable Aviation Fuels (LTAG-SAF)	Biomass-based fuel	Primary biomass products and co-products
	Solid/liquid waste-based fuels	By-products, residues, and wastes
	Gaseous waste-based fuels	Waste CO/CO ₂
	Atmospheric CO ₂ -based fuels	Atmospheric CO ₂
2. LTAG Lower Carbon Aviation Fuels (LTAG-LCAF)	Lower carbon petroleum fuels	Petroleum
3. Non-drop-in fuels	Cryogenic hydrogen (LH ₂)	Natural gas, by-products, non-carbon sources
	Liquefied gas aviation fuels (ASKT)	Petroleum gas, 'fat' natural gas, flare gas, and propane-butane gases
	Electricity	Not applicable

Not part of LTAG fuels analyses – Electrification of aircraft, including hybrid + fully electric airframes considered under LTAG – Tech analysis. ASKT was analyzed as part of case study for applicability in remote areas with stranded hydrogen resources, excluded from subsequent analyses



LTAG Report - Financing costs and investments across stakeholders

Projected cumulative (2020-2050) costs and investments associated with highest-ambition LTAG scenario, across each stakeholder group

Stakeholders	Costs/investments
States	\$160b
Air Navigation Service Providers	\$20b
Aircraft manufacturers	\$350b
Fuel suppliers	\$3,200b
Airports	\$125b

Breakdown of fuel suppliers	Costs/investments
SAF biomass-based fuels	\$950b
SAF from gaseous waste	\$1,700b
SAF from atmospheric CO ₂	\$460b
LCAF	\$60b
Hydrogen	\$55b

Note: Some investments from upstream stakeholders are passed on downstream (e.g., operators) in the form of incremental price of products

Incremental costs – per flight, per seat

Flight Distance		Incremental Cost* per Flight	
Illustrative Origin & Destination		(Incremental Cost* per Seat**)	
		in 2030	in 2050
Short Haul Flight 630 km <i>(=10th percentile of int. aviation flights)</i>	Zurich → Amsterdam Switzerland → Netherlands (LSZH) → (EHAM)	\$ 130 (\$0.8)	\$ 780 (\$4.4)
		\$ 520 (\$3.3)	\$ 1600 (\$9.2)
		\$ 660 (\$4.3)	\$ 2200 (\$13)
Average Haul Flight 2700 km <i>(average for international aviation)</i>	Montreal → Denver Canada → U.S. (CYUL) → (KDEN)	\$ 650 (\$3)	\$ 3500 (\$15)
		\$ 2600 (\$12)	\$ 7200 (\$31)
		\$ 3300 (\$15)	\$ 10,000 (\$43)
Long Haul Flight 5800 km <i>(=90th percentile of int. aviation flights)</i>	Singapore → Dubai Singapore → UAE (WSSS) → (OMDB)	\$ 1600 (\$5)	\$ 8000 (\$25)
		\$ 6600 (\$20)	\$ 17,000 (\$53)
		\$ 8300 (\$26)	\$ 23,000 (\$73)

* Costs in \$ 2020 (adjusted for inflation).
** Seat equivalent including available seats for passenger, equivalent seats for freighters and 13 seats (default) for business jets.

Under highest ambition scenario, incremental costs from Fuels may represent:

- Additional \$3,300 in 2030
- Additional \$10,000 in 2050

(Average haul flight – 2,700km)

This represents about \$15 - \$43 on a per seat basis



Break for questions and answers



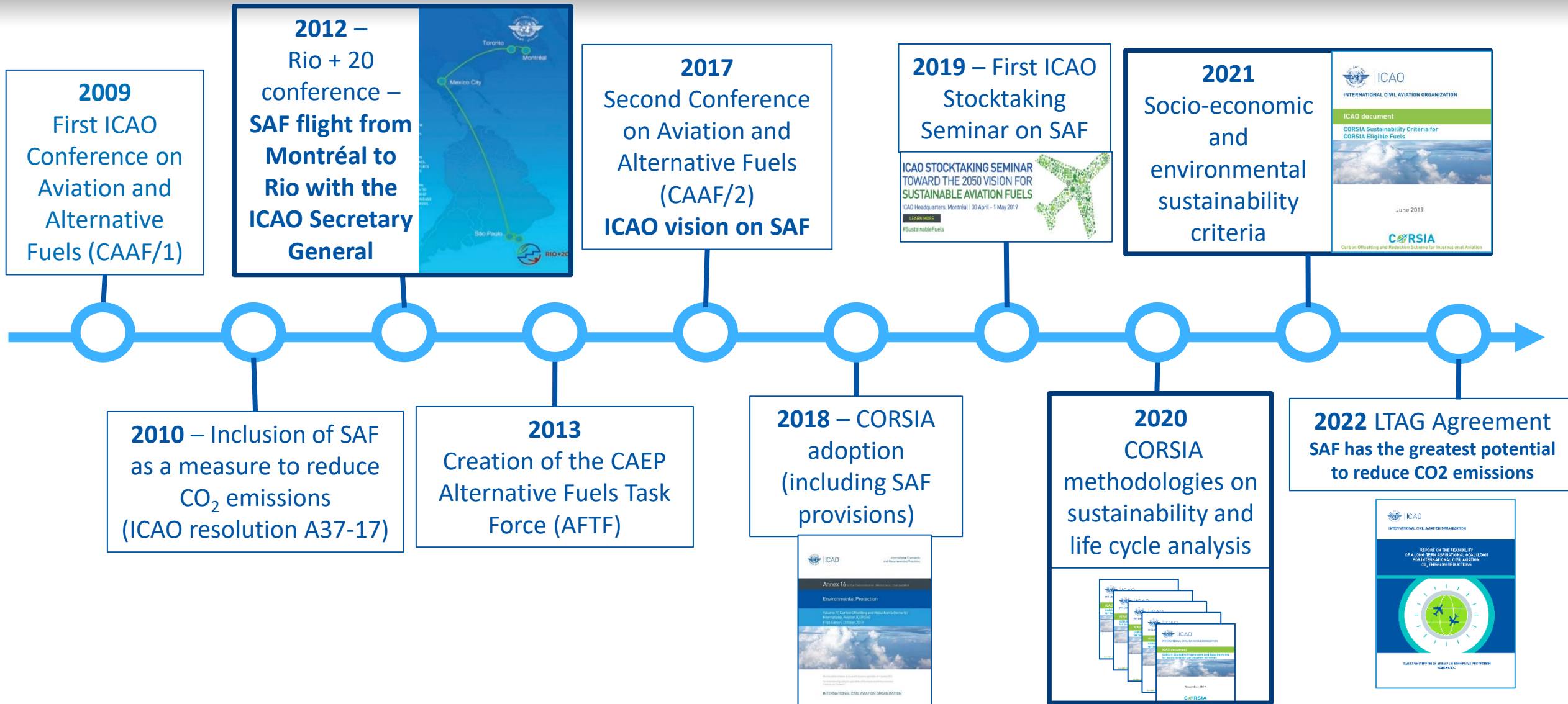
ICAO

ENVIRONMENT

ICAO's work on SAF and cleaner energies



ICAO action on Sustainable Aviation Fuels (SAF)



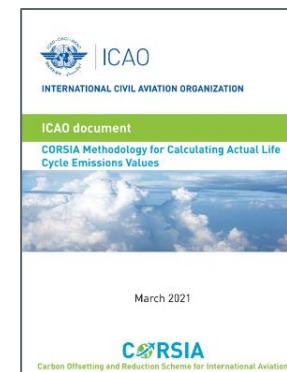
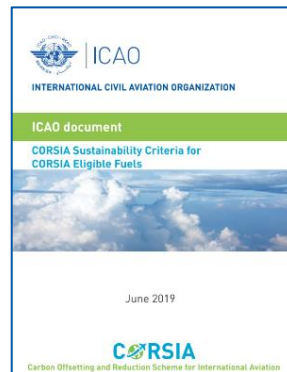
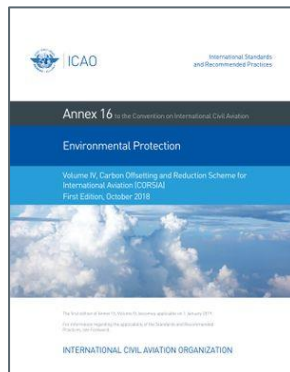


- The ASTM certification process guarantees the safety aspects of aviation fuels via ASTM D1655/D7566 compliance
- ICAO CORSIA Eligible Fuels Standards guarantee the sustainability aspects of aviation fuels
- The drop-in nature of SAF makes it interchangeable and compatible with conventional aviation fuels
 - SAFs can currently be blended at up to 50% with conventional jet fuel – it is handled in the same way as conventional aviation fuels
 - No changes in aircraft or its engines, nor in infrastructure, which would imply major logistical, safety, and cost issues

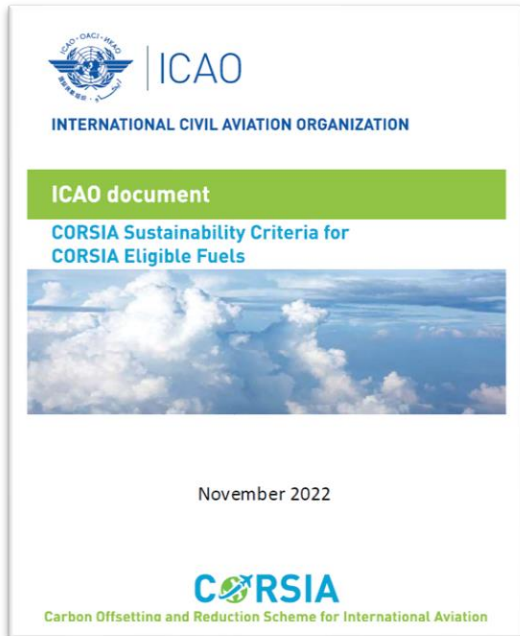
What are Sustainable Aviation Fuels (SAF)?

ICAO promotes technology and feedstock agnostic standards, CO₂ reduction focused

Definition	Which Sustainability Criteria?	What is a waste?
<p>SAF is defined as a <i>renewable or waste-derived aviation fuel</i> that meets sustainability criteria. <i>reference: Annex 16 Vol IV – CORSIA</i></p>	<p>Sustainability Criteria are defined in the ICAO document “<i>CORSIA Sustainability Criteria for CORSIA Eligible Fuels</i>”</p>	<p>Waste is a feedstock with inelastic supply and no economic value (e.g. municipal solid waste, used cooking oil, waste gases etc.) <i>reference: ICAO document “CORSIA Methodology For Calculating Actual Life Cycle Emissions Values”</i></p>



CORSIA sustainability criteria for CORSIA eligible fuels First global approach to sustainability for an industry sector



Sustainability Themes
1. Greenhouse Gases (GHG)
2. Carbon stock
3. GHG reduction permanence
4. Water
5. Soil
6. Air
7. Conservation
8. Waste and Chemicals
9. Seismic and Vibrational Impacts (only for LCAF)
10. Human and labour rights
11. Land use rights and land use
12. Water use rights
13. Local and social development
14. Food security

Carbon-reduction themes
(CORSIA pilot phase, 2021-
2023)

Environmental and socio-
economic Themes for CEF
(after CORSIA pilot phase,
from 2024)



Theme 1: Greenhouse gases

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

Theme 2: Carbon stock

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



For more details,
please refer to [CORSIA
Sustainability Criteria
for CORSIA Eligible
Fuels \(icao.int\)](#)



Theme 3: GHG emissions reductions permanence

- Emissions reductions attributed to CORSIA CEF should be permanent.

Theme 4: Water

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

Theme 5: Soil

- Production of CORSIA CEF should maintain or enhance soil health

Theme 6: Air

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

Theme 7: Conservation

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

Theme 8: Waste and chemicals

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

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

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



Theme 10: Human and labour rights

- Production of CORSIA CEF should respect human and labour rights

Theme 11: Land use rights and land use

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

Theme 12: Water use rights

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

Theme 13: Local and social development

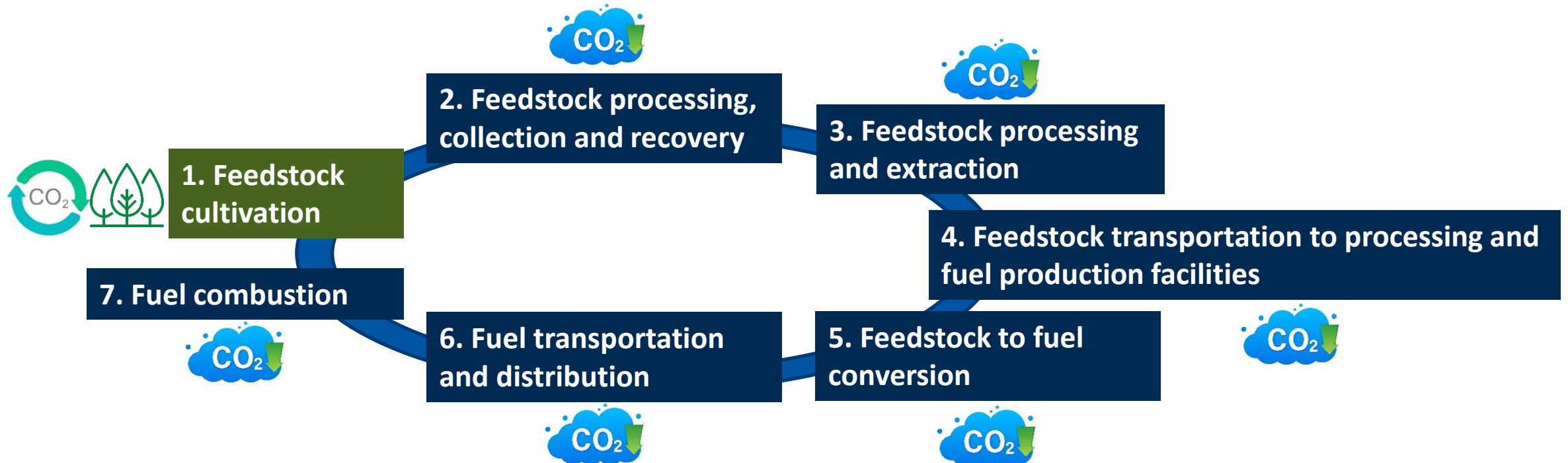
- Production of CORSIA CEF should contribute to social and economic development in regions of poverty

Theme 14: Food security

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

Core Life cycle assessment (core LCA value)

Emissions associated with all steps of SAF production and use



Life cycle assessment

CORSIA Sustainability Theme 1 requires lower carbon emissions on a life cycle basis.



CORSIA Sustainability Criterion 1.1 requires net greenhouse gas emissions reductions of at least 10% compared to a baseline.

These requirements are met based on a Life cycle assessment of the SAF:

SAF Life cycle emission value (LSf)
Unit – gCO₂e/MJ



**Core Life cycle assessment
(core LCA value)**
emissions associated with
all steps of SAF production
and use



**Induced Land use Change
(ILUC value)**
Emissions associated with
possible land use change
generated by SAF feedstock
production

Example: life cycle emissions of sugarcane ethanol ATJ in Brazil

Production step	Associated emissions (gCO ₂ e/MJ)
Feedstock growth	-74
Feedstock cultivation	16.9
Feedstock processing, collection and recovery	
Feedstock processing and extraction	
Feedstock transportation to processing and fuel production facilities	1.6
Feedstock to fuel conversion	5.2
Fuel transportation and distribution	0.4
fuel combustion on aircraft engine	74
total (core LCA value)	24.1
Induced Land use Change (ILUC value)	8.7
SAF Life cycle emission value (LSf) = core LCA + ILUC	32.8



63% emission reduction on a life cycle basis
 (Compared with Baseline emission value of 89 gCO₂e/MJ)



ICAO

ENVIRONMENT

Sustainability certification

ICAO-approved ‘Sustainability Certification Schemes (SCS)’ are responsible for:

- Ensuring compliance with the sustainability criteria for CORSIA eligible fuels (including CORSIA SAF)
- Ensuring that the life cycle emissions values of the fuel have been applied/calculated correctly

To date, the International Sustainability and Carbon Certification (ISCC) and Roundtable on Sustainable Biomaterials (RSB) are the two CORSIA-approved SCSs





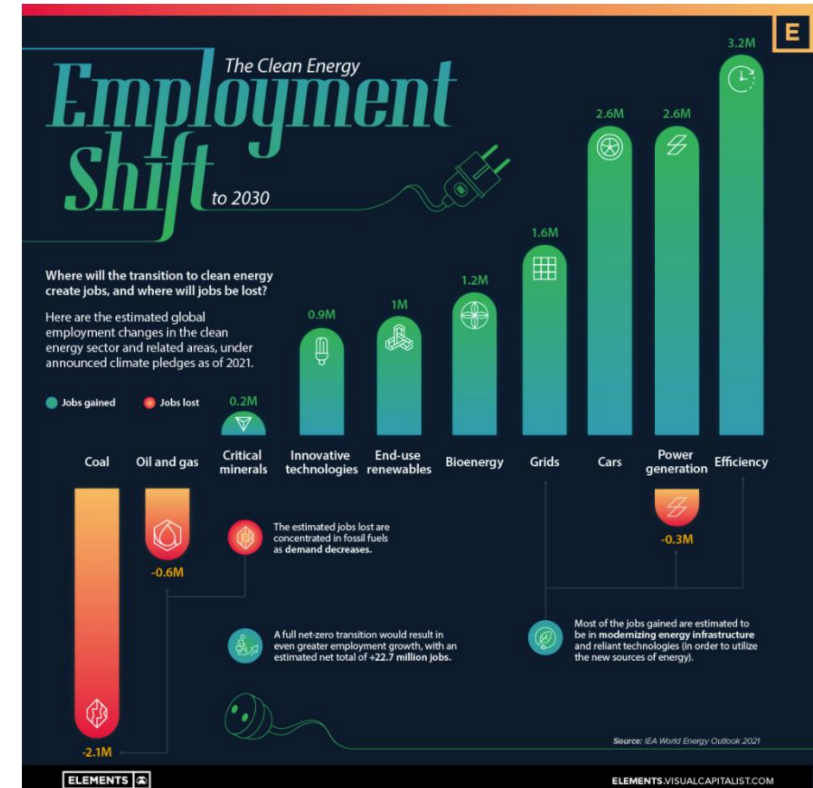
Opportunities for States to benefit along the SAF supply chain, and associated challenges





- **Energy Security and Diversification of Energy Mix:** reduces dependence on imported oil and enhances energy security.
- **Renewable and Sustainable Energy:** SAF can be derived from organic matter, such as crops, agricultural residues, and waste materials.
- **Economic Growth and Job Creation:** The sector requires investments in research, development, and infrastructure, leading to the emergence of new businesses and industries.
- **Environmental Benefits:** Compared to fossil fuels, SAF emits fewer greenhouse gases on a life-cycle basis.
- **Rural Development:** Biomass for SAF production is often linked to agriculture and forestry, providing an additional market for farmers' crops and residues.
- **Technological Innovation and Research:** Developing a SAF industry necessitates advancements in technology and research. This can drive innovation in areas such as biomass conversion, fuel processing, and crop improvement techniques.

- **Significant employment shifts towards the green energy sector expected in the future**
 - IEA World Energy Outlook estimated global employment shifts (job loss in coal, oil and gas, gains in **end-use renewables**, bioenergy, efficiency)
 - Manufacturers committed to delivering commercial aircraft certified to operate on **100% SAF by 2030** to realize maximum potential of drop-in fuel use
- **Expansion of research and development**
 - Non-CO₂ benefits from SAF use (e.g., improved air quality)
 - New feedstock and conversion pathways
 - Non-drop-in fuels

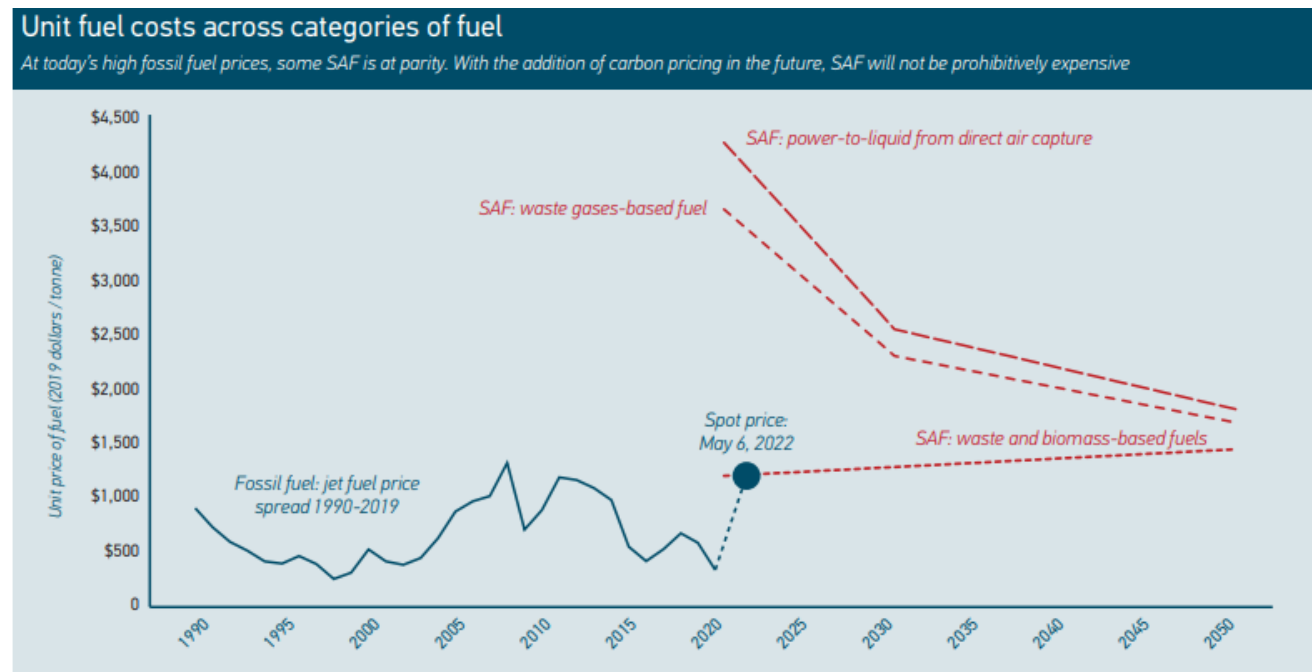


Source: <https://elements.visualcapitalist.com/the-clean-energy-employment-shift-by-2030/>

- **Sustainability criteria for SAF (e.g., ICAO CORSIA)**
 - Planning, appropriate regulations, and sustainable practices are essential to ensure that the SAF industry maximizes its benefits while minimizing potential drawbacks.
- **Competition for feedstock**
 - Land transport alternative fuels (e.g., biodiesel) also take up huge volumes of feedstock
- **Financing**
 - **Access to capital**, in particular for SAF technology providers may be very limited, impacting opportunities for any scaling up of production
 - Insufficient funding to enable technologies to attain sufficient competitiveness to compete in the market

- **Existing price gap**

- With the right levels of investment and increased SAF volumes, current price differences between SAF and conventional jet fuel are expected to converge in the future



Source: Waypoint 2050 Factsheet #15 / Jun 2022. Based on ICAO/CAEP data



Break for questions and answers



ICAO

ENVIRONMENT

Assistance, capacity-building, and training for cleaner energy, including the ICAO ACT-SAF programme





- **Assembly request on means of implementation**
- **Updates on the ACT-SAF Programme**
 - Objectives of the programme
 - Status of partner States and Organizations
 - ACT-SAF Series of Training
 - Feasibility Studies and template
 - Support to certification
 - Support to policy implementation and facilitating financing



“Means of implementation commensurate to the level of ambition, including financing, will promote the achievement of the LTAG” (A41-21, para. 17)



Relevant provisions from A41-21 on assistance, capacity building, and other means of implementation

Para. 12: ... share information ...

Para. 13: ... dissemination of economic and technical studies ...

Para. 17: ... means of implementation ...

Para. 18.a: ... facilitate... access to private investment capacities...

Para. 18.b: ... climate finance initiative or funding mechanism under ICAO ...

Para. 18.c: ... assistance and cooperation programme dedicated to LTAG ... ACT-SAF

Para. 18.d: promote the voluntary transfer of technology...

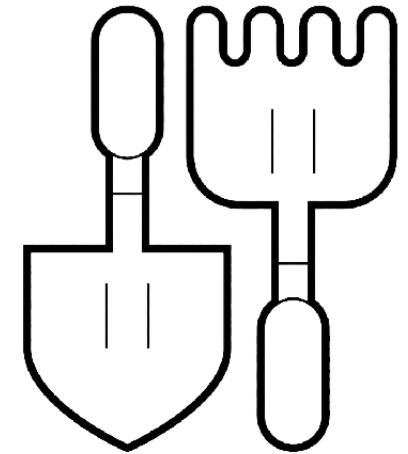
Para. 18.e: ... regular and substantial contributions to the ICAO Environment Fund...

Para. 20.d: ... assist Member States with studies, evaluations and development of procedures ...

Para. 21: ... to work together with relevant organizations ... recognizing ... largest ... CO2 emissions reduction will come from fuel-related measures

Para. 27.b: ... consider the use of incentives to ... cleaner and renewable energy sources ...

Para. 28: ... facilitate the establishment of partnerships and the definition of policies ...



Click on the paragraphs to see the full text

What is the ICAO ACT-SAF?

- Launched on June 1st 2022, ACT-SAF is an ICAO initiative to facilitate the development and deployment of SAF
- Tailored support for States
- Facilitate cooperation under ICAO coordination
- A Platform to facilitate knowledge sharing and progress monitoring

Why ICAO ACT-SAF programme?

- Builds on existing ICAO “ACT” experience, through partnerships and cooperation among States
- ICAO LTAG report foresees largest CO₂ reductions coming from fuels and cleaner energy sources
- Need for immediate action to fully realize SAF potentials
- ACT-SAF was welcomed by the 41st ICAO Assembly (A41-21, para. 18)





ICAO

ENVIRONMENT

ACT>>SAF

The ACT-SAF Partners



<https://www.icao.int/environmental-protection/Pages/act-saf.aspx>



International Organizations

Acceptance T&C ● (Blank) ● Pending ● Yes



ACT-SAF website provides details on ACT-SAF participation and initiatives

Latest news on ACT-SAF

Date	Latest news	Link
29/03/2023	IBAC joins ACT-SAF	Link
17/03/2023	Airbus Signs the ACT-SAF Terms and Conditions	Link
16/02/2023	ACI joins ACT-SAF	
12/01/2023	Cote d'Ivoire offers financial resources to ACT-SAF	
22/12/2022	Netherlands offers financial resources to ACT-SAF	
20/12/2022	France offers financial resources to ACT-SAF	

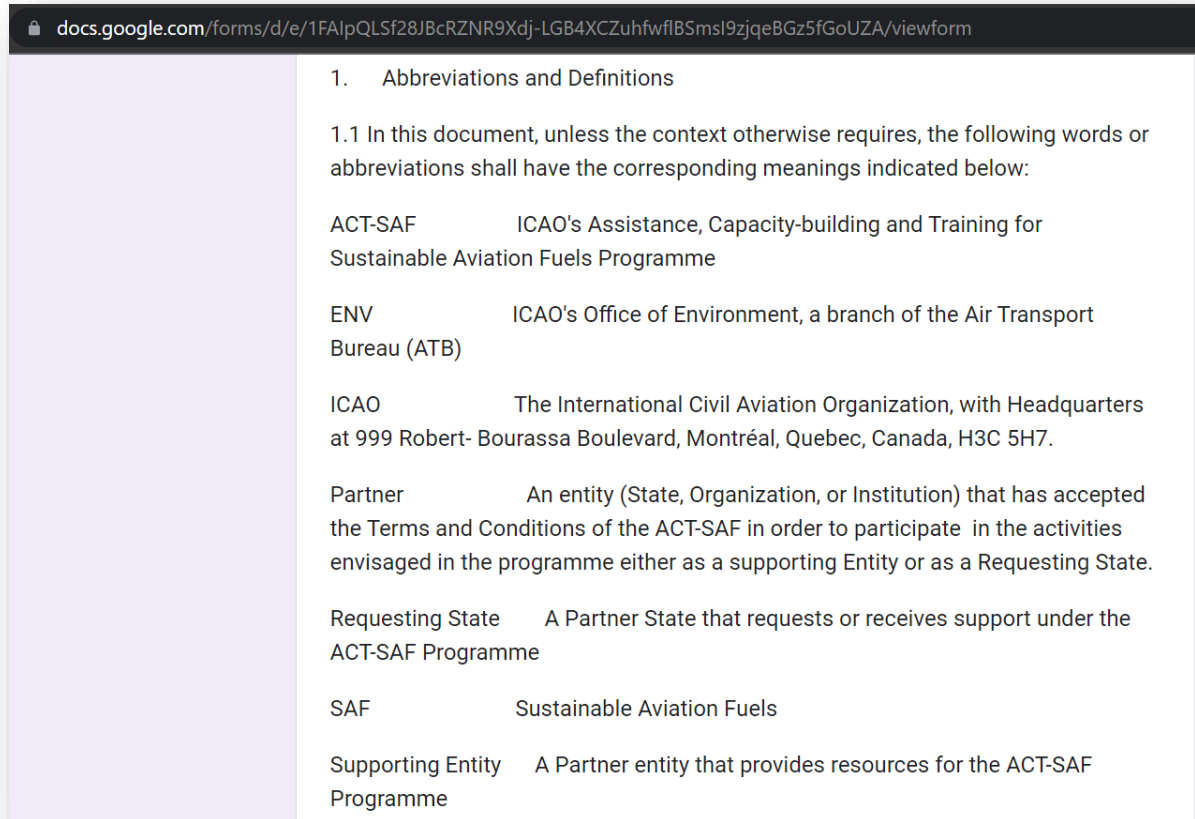
The ACT-SAF Programme is open to all interested parties in supporting the programme.

To become a partner, the interested party shall accept the Terms and Conditions on the ICAO website.



How to become an ACT-SAF Partner?

You can become an ACT-SAF Partner by agreeing to the [ACT-SAF Terms and Conditions](#). For those interested in further information, an e-mail can be sent to the Office of Environment (officeenv@icao.int). ICAO will schedule a meeting to discuss potential needs and/or contributions under ACT-SAF and further steps into the programme.



docs.google.com/forms/d/e/1FAIpQLSf28JBcRZNR9Xdj-LGB4XCZuhfwf1BSmsl9zjqeBGz5fGoUZA/viewform

1. Abbreviations and Definitions

1.1 In this document, unless the context otherwise requires, the following words or abbreviations shall have the corresponding meanings indicated below:

ACT-SAF	ICAO's Assistance, Capacity-building and Training for Sustainable Aviation Fuels Programme
ENV	ICAO's Office of Environment, a branch of the Air Transport Bureau (ATB)
ICAO	The International Civil Aviation Organization, with Headquarters at 999 Robert- Bourassa Boulevard, Montréal, Quebec, Canada, H3C 5H7.
Partner	An entity (State, Organization, or Institution) that has accepted the Terms and Conditions of the ACT-SAF in order to participate in the activities envisaged in the programme either as a supporting Entity or as a Requesting State.
Requesting State	A Partner State that requests or receives support under the ACT-SAF Programme
SAF	Sustainable Aviation Fuels
Supporting Entity Programme	A Partner entity that provides resources for the ACT-SAF Programme



1) Interested party expresses interest in becoming an ACT-SAF Partner

2) ICAO deploys ACT-SAF activities based on States tailored needs and capabilities

3) ICAO connects ACT-SAF Participants

4) ICAO facilitates agreements and coordinates concrete SAF projects

Deployment of ACT-SAF activities

- Coordination calls with States to assess needs and offers
- ACT-SAF Series on a monthly basis
- Preparations to launch feasibility studies
- Development of ICAO template for feasibility studies
- Inception of ACT-SAF Platform on monitoring and reporting of SAF

Connection with financing institutions

Regional workshops & meetings with banks
Identification of financial tools relevant for SAF

Ongoing

Facilitate the matching of needs and opportunities between States and industry



- **Technical Knowledge of SAF is a pre-requisite for implementation of specific SAF projects and policies.**
- **Training on SAF is a key request of ACT-SAF partners**
- **ICAO is offering the “ACT-SAF Series” of training events to the ACT-SAF partners**
 - ACT-SAF partners participate live and can directly ask questions and have feedback
 - Recordings and presentations publicly available after the events
 - Exploring the possibility of offering events in other ICAO languages



Introduction to SAF
Nov/2022



SAF sustainability and reporting under CORSIA
Jan/2023



SAF technology & certification
Feb/2023



SAF policies
Mar/2023



SAF market outlook
TBD



SAF Economics and financing
TBD



SAF logistics
TBD



SAF feasibility assessment
TBD

icao.int/environmental-protection/Pages/ACT-SAF-Series.aspx

- Home
- Scientific Understanding
- Environmental Trends
- Technology Goals & Standards
- Aircraft Noise
 - Trends
 - Technology Goals
 - Technology Standards (Reduction of noise at source)
 - Land Use Planning and Management
 - Noise Abatement Procedures
 - Operating Restrictions
 - Noise from Emerging Technology Aircraft
- Local Air Quality
 - Trends
 - Technology Goals
 - Technology Standards
 - Guidance on Airport Air Quality
- Climate Change
 - LTAG - Long-term global aspirational goal
 - Trends
 - Technology Goals
 - Technology Standards
 - Operational Measures
 - Sustainable Aviation Fuels
 - CORSIA
 - Adaptation



ACT-SAF Series

Coordination with ACT-SAF partners identified that many States need conceptual training on SAF.

To address that, ICAO is developing the **ACT-SAF Series of training sessions**, to be held on a monthly basis. This will allow delivering comprehensive training to ACT-SAF Partners on an array of important SAF-related topics, ranging from sustainability, to policy, economics/financing certification and logistics.

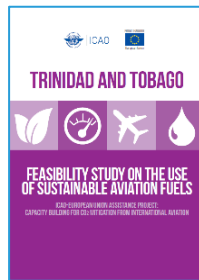
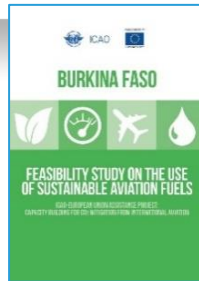
The ACT-SAF Series will empower the ACT-SAF Partners with training material designed with the support of Supporting States and Organisations from the air transport, fuels and finance sectors, as well as academics and actors with niche expertise such as SAF reporting under CORSIA.

Want to participate on the ACT-SAF Series? Join ACT-SAF now ([click here to access the ACT-SAF Terms and Conditions](#)). Participation is open to all States and Organizations interested in further action on SAF.

ACT-SAF Series	Date	Topics	Contributor(s)	Abstract	Video and Presentation
#1	25 November 2022	An introduction to SAF	ICAO	<ul style="list-style-type: none"> Introduction to ACT-SAF Basics of SAF 	 <p>Download Presentation</p>
#2	25 January 2023	SAF sustainability and reporting under CORSIA	ISCC RSB Verifavia	<ul style="list-style-type: none"> process for sustainability certification of SAF Reporting and 	

A feasibility study is the first step to assessing the SAF potential in a State

- ICAO Experience - four successful feasibility studies previously developed under an ICAO-EU project
- Many feasibility studies will be developed in the ACT-SAF programme
 - Three new feasibility studies under the existing ICAO-EU project
 - Financial resources provided by Cote D'Ivoire, France, Netherlands and the European Commission will allow several additional feasibility studies
 - ICAO and World Bank project being structured
 - Studies also being pursued by ACT-SAF partners





TEMPLATE FOR FEASIBILITY STUDIES ON SUSTAINABLE AVIATION FUELS

The ICAO Assistance, Capacity-building and Training for Sustainable Aviation Fuels (ACT-SAF) Programme was launched in June 2022. Its objective is to enable States to develop their full potential in SAF development and deployment, in line with the ICAO's *No Country Left Behind initiative*, the 2050 ICAO Vision for SAF, and the three main pillars of sustainable development – economic, social, and environmental, recognized by the United Nations.

This template has been developed in the context of the ACT-SAF Programme to facilitate the preparation of standardized feasibility studies. The template can be used to assess the feasibility of SAF development and deployment both at the State and Regional (i.e. group of States) level. ICAO has developed an interactive guide to assist in the preparation of feasibility studies following the structure defined in this template ([link to be provided once the guide is developed](#)). The use of the template and the interactive guide is not mandatory.

The information to be included in a feasibility study will be determined by the preparer to demonstrate the potential for the SAF development and deployment in the State under consideration. To ensure the consistency of information across different feasibility studies, it is recommended that all sections of the template be elaborated in a clear and concise manner. In parts where this may not be applicable, an appropriate explanation should be provided. It should also be noted that this template is by no means exhaustive, and a feasibility study may incorporate additional elements as appropriate.

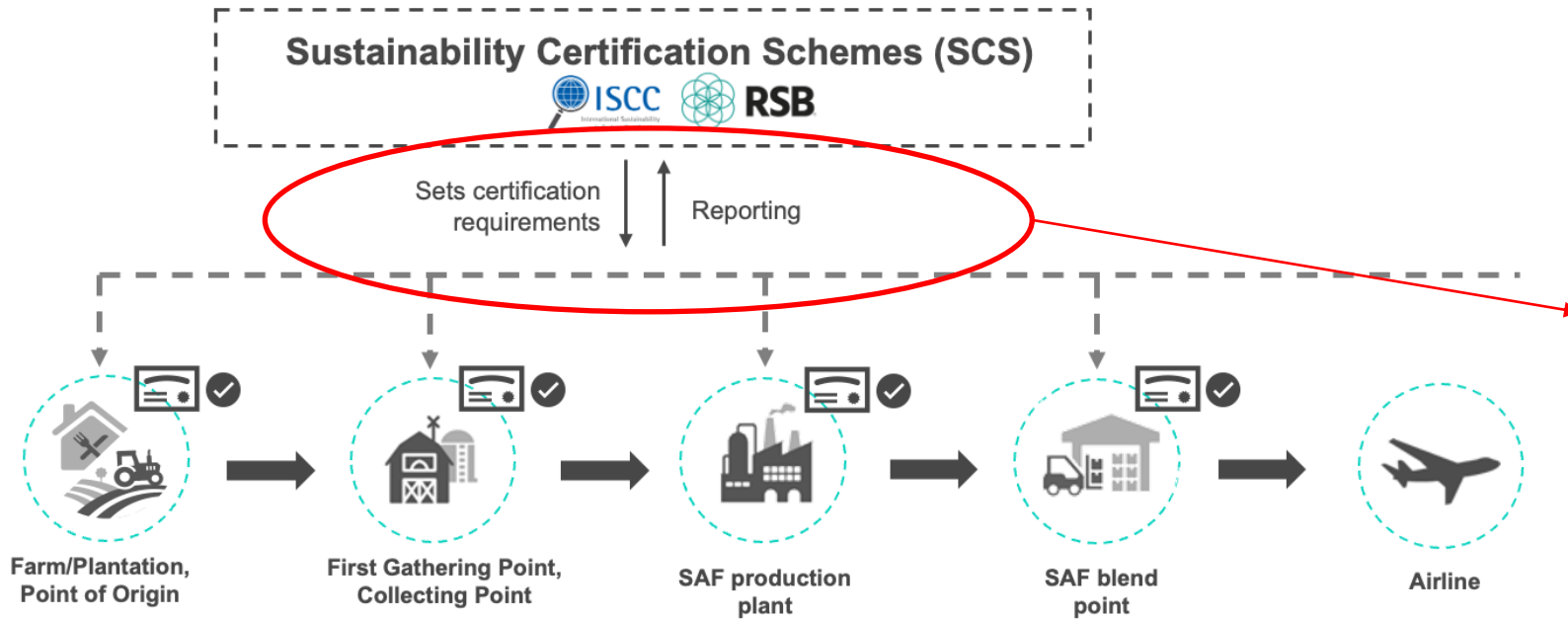
The structure of the template is summarized as follows ([to be reviewed upon finalization of template](#)):

- Executive Summary
- Section 1: State-specific Information
- Section 2: Evaluation of Feedstocks and Pathways for SAF Production
- Section 3: Implementation Support and Financing
- Section 4: Action Plan

ICAO is currently developing a template for SAF Feasibility Studies and guidance

- Ensure coherence across studies, increased quality
- Harmonized structure (more practical/quantitative)
- Ensure alignment with ICAO's methodologies and guidance
- Include information relevant to facilitate financing
- Facilitate outreach of results of the studies

ACT-SAF can assist in the SAF sustainability certification processes



Potential support

from ACT-SAF partners or ICAO

- Support to data gathering and reporting
- Assistance with the certification process



Many policies are available to support SAF development

Potential Policy Categories*	
Government funding for SAF research, development, demonstration and deployment (RDD&D)	SAF mandates
Targeted incentives and tax relief	Update of existing policies to incorporate SAF
Recognition of SAF environmental benefits	Demonstrate government leadership

ACT-SAF can support States in the policy development process, by connecting partners and sharing experiences

Identify tailored policy solutions

Implement a policy framework

ICAO is connecting with financial institutions across all regions and has organized regional workshops and sessions with the ICAO Council on the financing of projects, including public and private financing institutions, and has learned many lessons in this process.



Break for questions and answers



ICAO

ENVIRONMENT

Financing cleaner energies





Outline of the presentation

- I. Assembly request on financing**
- II. ICAO outreach activities with financial institutions**
- III. Next steps on financing cleaner energy**



LTAG financing – A41-21 requests to Council

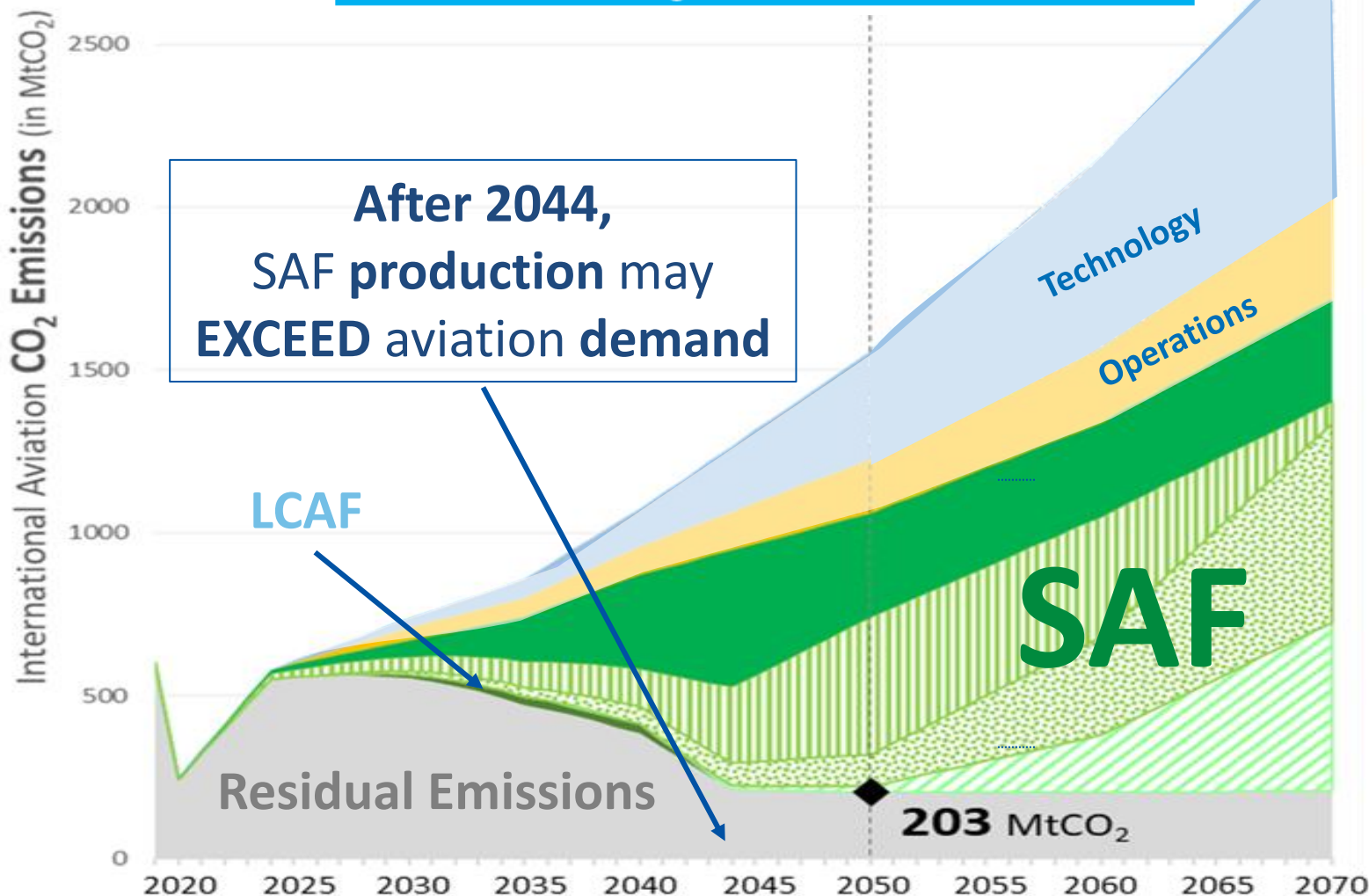
18. a) initiate specific measures or mechanisms so as to facilitate, in particular for developing countries and States having particular needs, better access to private investment capacities, as well as funding from financial institutions, such as development banks, for projects contributing to the decarbonisation of international aviation, as well as encourage new and additional funding to this purpose;

b) further consider the establishment of a climate finance initiative or funding mechanism under ICAO, while addressing the possible financial, institutional and legal challenges, and report to the 42nd Session of the ICAO Assembly.

(...)

28. d): Requests the Council to work with financial institutions to facilitate access to financing infrastructure development projects dedicated to SAF and LCAF and incentives to overcome initial market hurdles;

IS3 LTAG Integrated Scenario 3



2022: 0.15 Billion Liters of SAF being produced



2045: 636 billion liters needed to replace all fossil fuels



By 2050: ca. USD 3,200 billion investment needs



Need for close cooperation with financing institutions

References:
<https://www.icao.int/environmental-protection/LTAG/Pages/LTAG-data-spreadsheet.aspx>
<https://www.iata.org/en/iata-repository/pressroom/fact-sheets/fact-sheet---alternative-fuels/>



In the context of the ICAO ACT-SAF Programme, **ICAO is connecting with financial institutions across all regions** with the objectives to:

1. Raise awareness of financial institutions on the role of SAF to achieve the LTAG, and on the interest of aviation/fuel industries for immediate and massive SAF scale-up;
2. Inform financial institutions of the significant investments needs to scale-up SAF production capacity across all regions, in particular for developing countries.
3. Explore financial institutions' existing or future financing instruments to support SAF deployment and inform financing institutions of ways in which they can best contribute to SAF deployment.

- Since September 2022, ICAO has organized workshops and initial discussions with **public and private financing institutions and foundations**
- The ICAO Council held 3 informal meetings with high-level representatives from international financing institutions (IFIs), energy companies, and private investors.



European
Investment
Bank



European Bank
for Reconstruction and Development



مصرف الإمارات للتنمية
Emirates Development Bank



IDB
Inter-American
Development Bank



THE WORLD BANK



Examples of financing opportunities

Asian Development Bank

- Non-sovereign finance window of \$4.5bn in 2020 to stimulate private sector investments, including in renewable energy projects (25% of project cost covered).

Bank of America

- Mobilizing \$2 billion in sustainable finance for the production of SAF and other low-carbon aviation solutions.

Green Investment Group

- USD 30+bn committed and arranged to support green energy projects by Q1 2021.

Green Climate Fund

- USD 11.3bn committed through a range of financing instruments, including on energy and transport projects.

Green Climate Fund

- USD 11.3bn committed through a range of financing instruments, including on energy and transport projects.

First Abu Dhabi Bank

- Committed to facilitate sustainable financing of more than USD 75 billion by 2030, with aviation/SAF being a key topic.

Banque de Montreal

- Sustainable financing guarantee programme sharing 50% of the risk up to USD 60m on loans. Bio energy, CCS and hydrogen are eligible sectors.

Brasil Development Bank

- Climate Fund is open for clean energy investments and comes with low interest rates and a ceiling of 80 million Reals



Many alliances and initiatives support the financing of sustainable aviation fuels. Examples include the following:

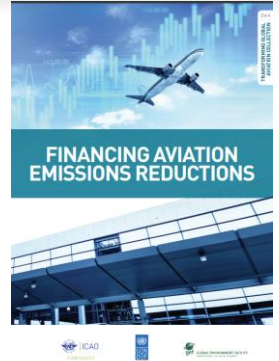
- **Clean Skies for Tomorrow** is an initiative supported by the **World Economic Forum**.
- **Renewable and Low-Carbon Fuels Value Chain Industrial Alliance** is an initiative of the European Commission.
- The **Sustainable Aviation Buyers Alliance (SABA)** aims to accelerate the path to net zero aviation by driving investment in and adoption of sustainable aviation fuel.
- The **Net-Zero Banking Alliance** has working groups involving financing institutions, aiming to define roadmaps for actors of the economy to decarbonize their activities thanks to the financing of SAF.



• Main takeaways from the discussions:

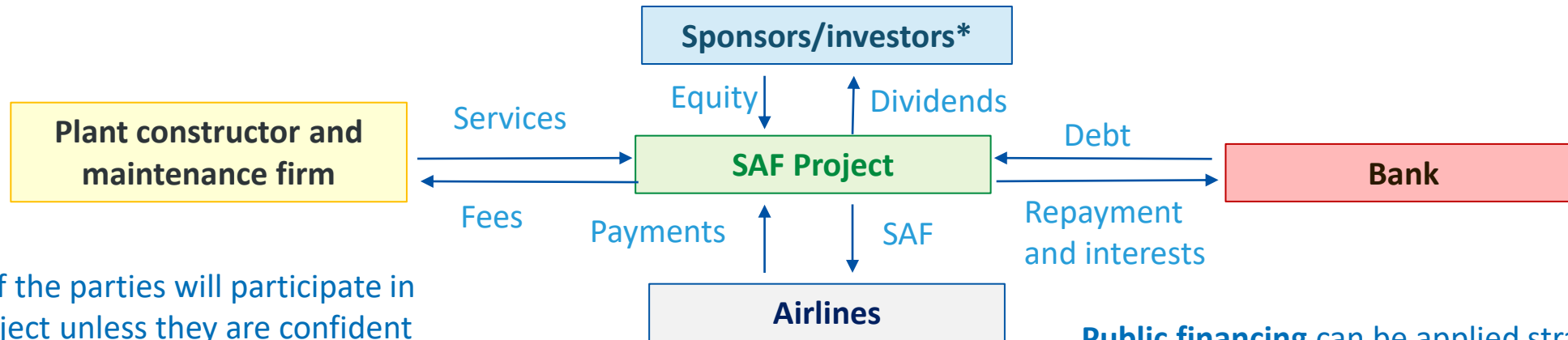
- Strong interest from banks for decarbonization of aviation and deployment of SAF
- **The transition towards SAF is key**; it will require significant investments across all world regions.
- Both public and private investments will have a key role
- **Blended finance (public and private)** can act as a catalyst to de-risk SAF projects.
- **Clear criteria and harmonized frameworks for SAF financing** will support IFIs' analysis of SAF projects and facilitate investments.
- **Predictability of SAF offtakes and reliability of the regulatory landscape** are essential to provide confidence to investors and reduce risk

ICAO Guidance on financing Aviation Emission Reductions – guidance on how to finance projects to reduce CO2 emissions from international aviation activities



Available at <https://www.icao.int/environmental-protection/Pages/financing.aspx>

Basics on SAF project financing



None of the parties will participate in the project unless they are confident that they will **earn an adequate return on their investment** for their effort

Public financing can be applied strategically in the development of a project where there exist market weaknesses **to support project success.**

* Investors can be a large variety of actors, including banks, airlines, SAF producers, and many others

Industry actors (airlines, SAF producers, others) resort to various financing strategies to invest in SAF.

On August 7, 2014, Cathay Pacific Airways, a Hong Kong-based airline, announced that it has made a strategic equity investment in Fulcrum BioEnergy Inc., a U.S.-based leader in the development and commercialization of converting municipal solid waste into sustainable aviation fuel. Cravath represented Cathay Pacific in connection with this transaction.

United Airlines Launches \$100 Million Investment Vehicle for SAF

Governments and organisations also deploy financing instruments to kick-start their domestic market

The Department of Energy today announced the **Sustainable Aviation Fuel Grand Challenge**, a government-wide effort to reduce the cost, enhance the sustainability, and expand the production and use of Sustainable Aviation Fuel (SAF). The effort is part of the Biden-Harris Administration's overall strategy to decarbonize the aviation sector by 2050. Read more in the [White House fact sheet](#).

Commercial-scale SAF projects that utilize innovative technology and avoid, reduce, or sequester greenhouse gas emissions and meet other program requirements may be eligible for loan guarantees under the LPO's Title 17 Innovative Energy Loan Guarantee Program. LPO has received strong interest from SAF project developers about the potential for DOE financing of SAF production facilities.

How LPO Can Support the Sustainable Aviation Fuel Grand Challenge



3 June 2022

Neste signs a green term loan agreement

Published in [Releases and news](#) under [Investors](#)

Neste Corporation, Press Release, 3 June 2022 at 11:45 a.m. (EET)

Neste has signed today a EUR 500 million green term loan agreement. The proceeds of the loan will be used to finance Eligible Assets and Projects in accordance with Neste's Green Finance Framework. The loan has a tenor of 3 years with two 1-year extension options.

International Airlines Group (IAG), the airline's parent company, is investing \$400 million over the next 20 years into the development of SAF and British Airways has existing partnerships with several companies to develop plants and purchase the sustainable fuel.

Advanced Fuels Fund (AFF) competition winners

Each organisation will receive a share of £165 million for the development of sustainable aviation fuel (SAF) production plants in the UK. The following projects have been awarded funding.



- ICAO will further explore collaborations with financial institutions, exchanging information on current projects, in order to facilitate new initiatives.
- Council will continue dialogues with public and private IFIs during its 229th Session (May / June 2023).
- ICAO will continue to invite financial institutions to participate and contribute to all ACT-SAF activities and projects
- ICAO will explore the establishment of a climate finance initiative or funding mechanism under ICAO.



Break for questions and answers



ICAO

ENVIRONMENT

Looking forward to CAAF/3





- **Background on previous CAAF and CAAF/2 meetings**
- **Recommendations and Declaration from CAAF/2, including:**
 - 2050 ICAO Vision for Sustainable Aviation Fuels
- **Decisions at the 41st ICAO Assembly, and process for CAAF/3**

- **The ICAO Conference on Aviation and Alternative Fuels (CAAF) was held in Brazil on 16 – 18 November 2009**
 - Responds to A36-22: *Consolidated statement of continuing ICAO policies and practices related to environmental protection*, which recognized the **urgent need for more concerted and effective action to reduce the carbon footprint of international aviation**, the importance of research and development in fuel efficiency and **alternative fuels**



- **The second ICAO Conference on Aviation and Alternative Fuels (CAAF/2) was held in Mexico on 11-13 October 2017**
 - Responds to A39-2: *Consolidated statement of continuing ICAO policies and practices related to environmental protection – climate change*, which reaffirmed the need for alternative fuels to be developed and deployed in an economically, socially and environmentally acceptable manner
 - The 39th ICAO Assembly also welcomed the convening of CAAF/2, which the aim of developing an **ICAO Vision** on Aviation Alternative Fuels



• Declaration of the CAAF/2 (1/3)

Declares that:

1. The Conference endorses the 2050 ICAO Vision for Sustainable Aviation Fuels as a living inspirational path and calls on States, industry and other stakeholders, for a significant proportion of conventional aviation fuels (CAF) to be substituted with sustainable aviation fuels (SAF) by 2050, for international civil aviation to reduce carbon emissions significantly, and whilst pursuing all opportunities in the basket of mitigation measures to reduce emissions as necessary;

2. The Conference recognizes that the sustainability of alternative aviation fuels is of essential importance to the efforts of international civil aviation to reduce its CO₂ emissions. This is ensured by application of sustainability criteria to SAF as is currently under consideration by ICAO;

3. The Conference notes that this path is based on the assumptions of a progressive increased use of SAF, and should be periodically reviewed through a stocktaking process to continuously assess progress on the SAF development and deployment, including the necessity to consider policies and actions, and the organization of regular workshops and seminars, leading up to the convening of CAAF/3 no later than 2025, with a view to updating the 2050 ICAO Vision to include a quantified proportion of CAF to be substituted with SAF by 2050, and carbon reductions achieved by SAF;

4. ICAO and its Member States, in cooperation with the aviation industry and other stakeholders, will work together to pursue any opportunities to implement necessary policies, technology and financing measures, with an increasing proportion of SAF into the fuel supply over time towards the 2050 ICAO Vision, without any attribution of specific obligations to individual States;

5. ICAO will act primarily as a facilitator to support States on their efforts to develop and deploy SAF, by sharing information and best practices, communicating the economic and environmental value of SAF, facilitating discussions between financial institutions and industry, and developing guidance material;

6. ICAO will facilitate capacity building and assistance for States to develop and deploy SAF that are well suited to their national circumstances and resources;

7. ICAO, States, and stakeholders should develop guidance materials describing the drop-in nature of SAFs to support SAF deployment by aircraft operators, including for the integration of SAF into the hydrant system; and on the different models available for funding, incentives, development, and transfer of technology for SAF;

Policy planning

- 2050 ICAO Vision for SAF as a living aspirational path and calls on States, industry and other stakeholders for a significant proportion of CAF to be substituted with SAF by 2050
- Periodically reviewed, through a stocktaking process, and CAAF/3 no later than 2025, with a view to update the 2050 ICAO Vision
- 2050 ICAO Vision, without any obligation to specific obligations to individual States

Regulatory framework

- Application of sustainability criteria to SAF by ICAO

Implementation support

- ICAO to share information and best practices
- ICAO to facilitate capacity building and assistance to States
- ICAO, States and stakeholders to develop guidance material



• Declaration of the CAAF/2 (2/3)

8. States are encouraged to support ICAO efforts for international cooperation on SAF development and deployment by sharing examples of policy implementation, results, and lessons learned, which could be useful to other States and CAEP work, as well as other ICAO outreach and capacity building initiatives;

9. ICAO should continue to work with States, industry and other stakeholders to update the Global Framework on Aviation Alternative Fuels (GFAAF);

10. States are encouraged to support the approval of new conversion processes under development, and explore means and policies for reducing time and expenses required for technical certification of SAF, such as the D4054 Clearinghouse concept;

11. States are encouraged to support the development and implementation of stable policy frameworks that facilitate the deployment of SAF, including via policy incentives, collaborative research, and assistance, while avoiding distortions of fair competition;

12. States are encouraged to develop policies that promote the use of SAF, or promote policies that strive to establish a level playing field between aviation and other transportation sectors on the use of sustainable fuels;

13. States are encouraged to evaluate the policy effectiveness by means of qualitative metrics such as flexibility, certainty, financial costs and benefits, price sensitivity to externalities, ease of implementation, contribution to SAF deployment and CO₂ reduction, unintended consequences, and robustness, while recognising the importance of quantitative metrics to inform policy decisions;

14. States are encouraged to provide examples of successful renewable energy and SAF policy implementation case studies; results and possible lessons learned, which could be useful to other States and current CAEP work, and could be used to promote the economic, social, and environmental advantages that may arise from the development of a SAF industry;

Policy planning

- Updating of the GFAAF
- States to support development and implementation of stable policy frameworks that facilitate the deployment of SAF, and to evaluate policy effectiveness

Regulatory framework

- States to support the approval of new conversion processes under development

Implementation support

- States to support ICAO efforts for international cooperation on SAF development and deployment
- States to provide examples of successful renewable energy and SAF policy implementation case studies; results and possible lessons learned



- Declaration of the CAAF/2 (3/3)**

15. States are encouraged to evaluate available funding sources, and to the extent possible, facilitate accessibility to funding sources appropriate to development needs. This includes supporting airlines and airports that decide to implement the supply of SAFs and support new feasibility studies for the supply of SAFs at airports;

16. States are encouraged to promote collaborative initiatives amongst States, and with industry, in supporting global efforts to pursue price parity between SAF and CAF, including utilizing of existing facilities to produce SAF, and identifying and exploring sustainable feedstock resources and conversion processes;

17. States are encouraged to foster the further development of innovative technological pathways to produce SAF from sources such as renewable electricity, while additional efforts should be made to scale up the market of these fuels;

18. The 2050 ICAO Vision does not set a precedent for or prejudice the work to be undertaken by the ICAO Council regarding the exploration of a long term global aspirational goal for international aviation under paragraph 9 of Assembly Resolution A39-2, or the periodic review of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) under paragraph 18 of Assembly Resolution A39-3.

Financing

- States to evaluate available funding sources, and to extent possible, facilitate accessibility to funding sources appropriate to development needs

Implementation support

- States to promote collaborative initiatives amongst States, and with industry, in supporting global efforts to pursue price parity between SAF and CAF
- States to foster further development of innovative technological pathways

Policy planning

- 2050 ICAO Vision does not set a precedent for or prejudice work undertaken on exploration of an LTAG, or periodic review of CORSIA

<https://www.icao.int/environmental-protection/GFAAF/pages/ICAO-Vision.aspx>



Policy planning

- 2050 ICAO Vision for SAF as a living aspirational path and calls on States, industry and other stakeholders for a significant proportion of CAF to be substituted with SAF by 2050
- Periodically reviewed, through a stocktaking process, and CAAF/3 no later than 2025, with a view to update the 2050 ICAO Vision
- 2050 ICAO Vision, without any obligation to specific obligations to individual States
- Updating of the GFAAF
- States to support development and implementation of stable policy frameworks that facilitate the deployment of SAF, and to evaluate policy effectiveness
- 2050 ICAO Vision does not set a precedent for or prejudge work undertaken on exploration of an LTAG, or periodic review of CORSIA

Regulatory framework

- Application of sustainability criteria to SAF by ICAO
- States to support the approval of new conversion processes under development

Implementation support

- ICAO to share information and best practices
- ICAO to facilitate capacity building and assistance to States
- ICAO, States and stakeholders to develop guidance material
- States to support ICAO efforts for international cooperation on SAF development and deployment
- States to provide examples of successful renewable energy and SAF policy implementation case studies; results and possible lessons learned
- States to promote collaborative initiatives amongst States, and with industry, in supporting global efforts to pursue price parity between SAF and CAF
- States to foster further development of innovative technological pathways

Financing

- States to evaluate available funding sources, and to extent possible, facilitate accessibility to funding sources appropriate to development needs



- A41-21, para 28 f) – (requests the Council to) continue to assess progress on the development and deployment of SAF, LCAF and other cleaner energy sources for aviation as part of the ICAO stocktaking process, and **convene the CAAF/3 in 2023 for reviewing the 2050 ICAO Vision for SAF, including LCAF and other cleaner energy sources for aviation, in order to define a global framework** in line with the No Country Left Behind (NCLB) initiative and taking into account national circumstances and capabilities;
- A41-21, para 6 to 9 – LTAG and monitoring of progress
- A41-21, para 10 to 13 – States Actions Plans, including aviation cleaner energy
- A41-21, para 17 and 18 – Implementation support and financing
- A41-21, para 27 and 28 – States and ICAO actions on aviation cleaner energy



CAAF/3 – Possible themes/issues for ICAO Global Framework for Aviation Cleaner Energy

1. Policy and planning (linked to A41-21, para 7 to 13, 28)

- Quantified and collective ICAO Vision/goals for SAF, LCAF and other aviation cleaner energy, in support of the LTAG
- Development and implementation of voluntary State Action Plans and roadmaps, with the ICAO guidance and tools
- Monitoring of progress and enabling adjustment mechanisms
- Non-financial policy options for States to consider to support scale-up and deployment of fuels at national/regional level

2. Regulatory framework (linked to A41-21, para 9, 27, 28)

- Continued harmonized-approach on fuel sustainability criteria, life-cycle values, and certification
- Aviation infrastructure framework to support deployment and use to alternate fuels.
- Harmonized fuel accounting & reporting methodologies (as part of LTAG monitoring)

3. Implementation support (linked to A41-21, para 17, 18, 28)

- ACT-SAF (assistance, capacity-building and training) programme for SAF/LCAF and other aviation cleaner energy
- Specific support to States on feasibility studies, policy development, pilot projects
- Facilitating State-based action for business implementation
- Partnerships amongst States, industry and other stakeholders, and coordination/cooperation at national/regional levels

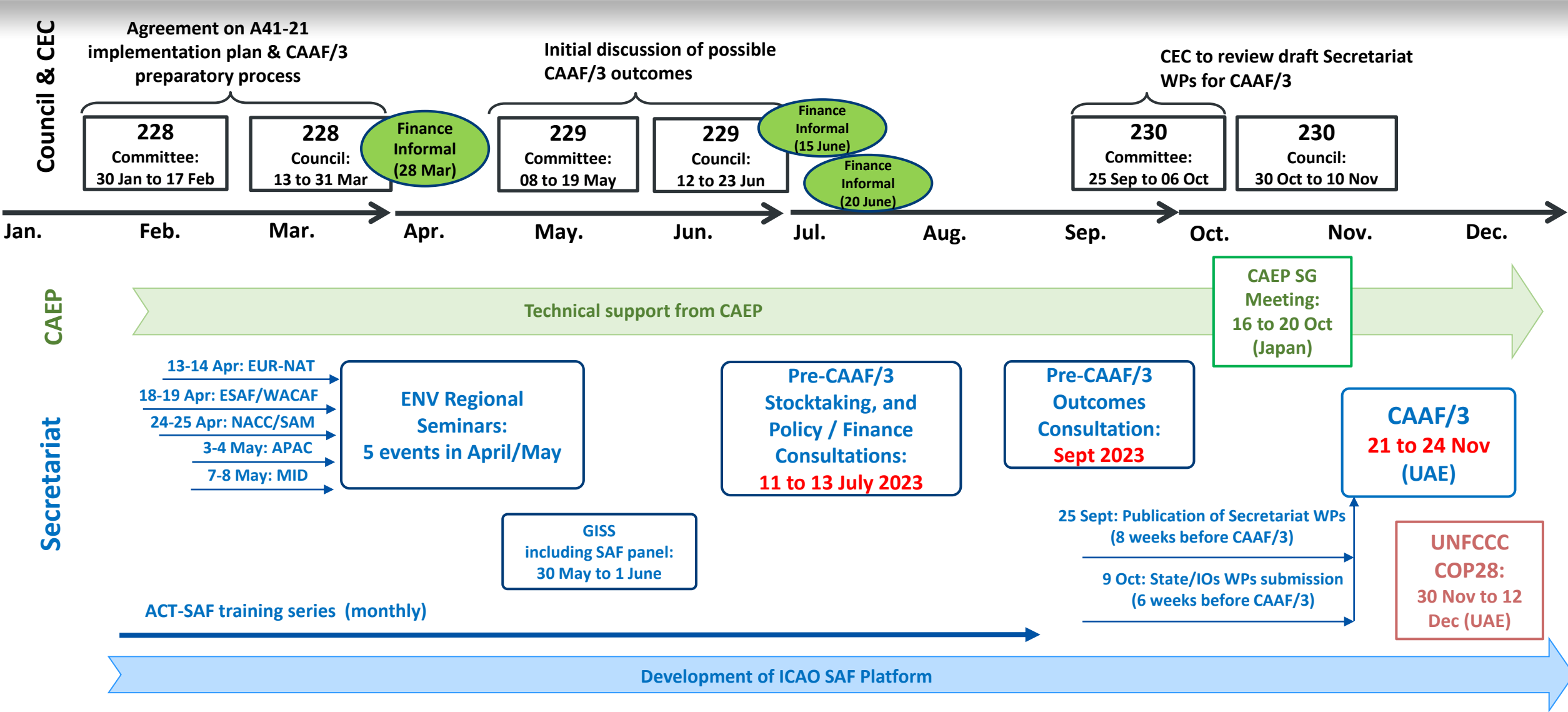
4. Financing (linked to A41-21, para 17, 18, 28)

- Financial-support measures for States to consider (e.g. grant, incentive, tax relief) to de-risk and establish the supply-chain at national/regional levels
- ICAO and States working with financial institutions to facilitate better access to public & private finance and investment for development and deployment of aviation cleaner energy
- ICAO climate finance initiative / ICAO funding mechanism



Third ICAO Conference on Aviation and Alternative Fuels (CAAF/3) – A41-21 para. 28

f) continue to assess progress on the development and deployment of SAF, LCAF and other cleaner energy sources for aviation as part of the ICAO stocktaking process, and **convene the CAAF/3 in 2023 for reviewing the 2050 ICAO Vision for SAF, including LCAF and other cleaner energy sources for aviation, in order to define a global framework** in line with the No Country Left Behind (NCLB) initiative and taking into account national circumstances and capabilities





Break for questions and answers



Key takeaways

- LTAG implementation requests the engagement of all aviation actors.
- SAF has a major role in the decarbonization of aviation and brings great opportunities along.
- ACT-SAF is providing support for States
- Preparations for CAAF/3



ICAO ENVIRONMENT



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