ICAO ENVIRONMENT

ACT-SAF #12 SERIES

ICAO State Action Plans and SAF

6 June 2024

1. Opening

Mrs. Jane Hupe
Deputy Director
ICAO Environment

Objectives

Provide participants with presentations of State Action Plans and the inclusion of SAF

ICAO ENVIRONMENT

ACT-SAF Series #12 Speakers

ACT SAF

Sin Ying Chua

Senior Assistant Director
Sustainability Office

Civil Aviation Authority of Singapore

Kudzai Ndidzano

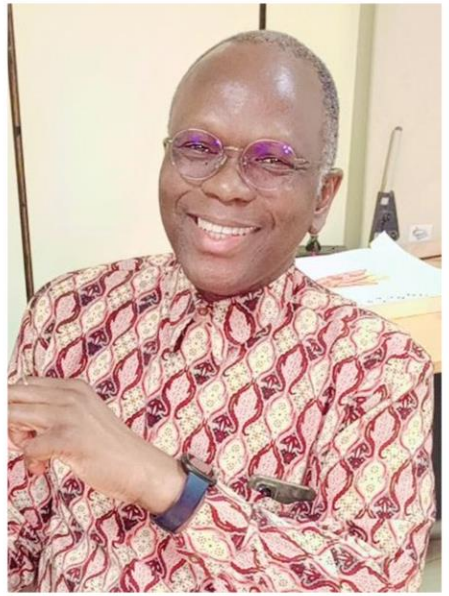
Deputy Director

Climate Change Management Department, Zimbabwe

Waogninlin Traore

Airworthiness Inspector

Autorité Nationale de l'Aviation Civile, Côte d'Ivoire

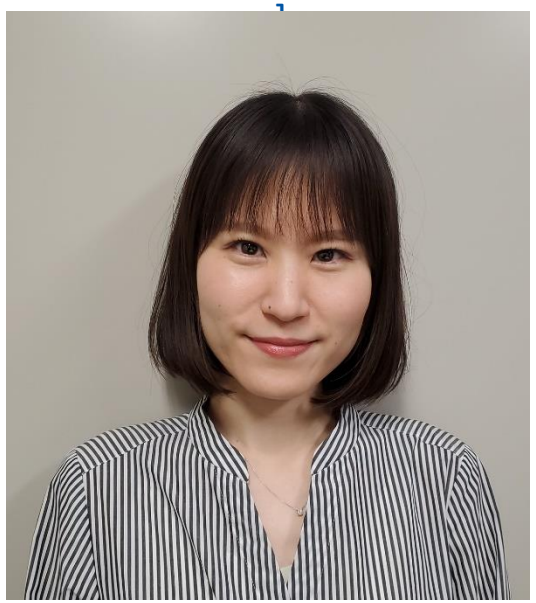


Hikari TAMURA

Chief Carbon Neutral Officer

Carbon Neutrality Promotion Office

Civil Aviation Bureau, MLIT



Agenda

- Opening remarks by ICAO
- ICAO update on ACT-SAF activities
- ICAO presentation on State Action Plans, including update of ICAO Doc. 9988
- Presentation of the Singapore SAP and inclusion of SAF
- Presentation of the Zimbabwe SAP and inclusion of SAF
- Presentation of the Cote d'Ivoire SAP and inclusion of SAF
- Presentation of the Japan SAP and inclusion of SAF
- Questions and answers with the audience
- Closing remarks by ICAO

ICAO update on ACT-SAF programme

ACT-SAF newsletter provides useful updates on SAF developments

Now available on the ACT-SAF website

ACT-SAF Newsletter

The latest information on ACT-SAF is provided on the ACT-SAF newsletters.

March 2024 April 2024 May 2024

ICAO ENVIRONMENT

ACT SAF Newsletter

May 2024

The "**ICAO Assistance, Capacity-building and Training for Sustainable Aviation Fuels (ACT-SAF) programme**" is supporting States to develop their full potential in SAF, through specific training activities, development of feasibility studies, and other implementation support initiatives.

For more details on ACT-SAF click here

ICAO ACT-SAF Series

The ACT-SAF Series offers training sessions held on a monthly basis. It delivers comprehensive training to ACT-SAF Partners on an array of important SAF-related topics, ranging from sustainability, to policy, economics/financing certification and logistics.

Eleven ACT-SAF training sessions have been delivered to date, and are available at the ACT-SAF Series website.

ACT-SAF Series – List of Training Sessions

ICAO ACT-SAF SERIES

#1 – An introduction to SAF
#2 – SAF Sustainability and Reporting under CORSIA
#3 – SAF technology and certification
#4 – SAF Policies
#5 – SAF conversion processes
#6 – SAF Accounting and book and claim systems
#7 – SAF logistics
#8 – Launch of the 2024 ACT-SAF Season
#9 – Green Hydrogen for Aviation
#10 – ICAO methodologies and tools for life cycle assessment
#11 – Implementing ICAO Global Framework – Step-by-step examples of SAF policy making

ACT-SAF Series #11

The eleventh event of the ACT-SAF Series, held on 6 May 2024, focused on providing participants with real-life examples of step-by-step SAF policy making, and its processes. Close to 100 ACT-SAF partners attended the training, which covered the following aspects:

- **ICAO Global Framework on SAF, Lower Carbon Aviation Fuels (LCAF) and other Aviation Cleaner Energies, focusing on Building Block 1 – Policy and Planning**
- **Presentations on SAF policy development by:**
  - **Directorate General for Mobility and Transport (DG MOVE) of the European Commission;**
  - **National Agency for Civil Aviation (ANAC) of Brazil; and**
  - **Federal Aviation Authority (FAA) of the United States**

The recording of this session and the presentation are now available at the ACT-SAF Series website.

ICAO Global Implementation Support Symposium 2024

At the recently concluded ICAO Global Implementation Support Symposium (GISS) 2024, held in Punta Cana, Dominican Republic, from 30 April to 2 May 2024, much focus was placed on the ICAO Finvest Hub initiative, exploring innovative financing mechanisms to support aviation infrastructure development and the transition to a greener industry. Panel discussions on scaling up global collaboration and enhancing capacity for LTAG implementation and operationalizing the Finvest Hub for green skies also highlighted the key role of ACT-SAF efforts in training, feasibility studies, business implementation support, and encouraging resource mobilization. Recordings of GISS 2024 may be accessed here.

ACT-SAF Projects
Feasibility Studies and Business Implementation

The ICAO ACT-SAF programme is also developing **feasibility studies** that will assess the potential for production and use of SAF in ICAO Member States, aligned with sustainability criteria of CORSIA Eligible Fuels.

The first three feasibility studies developed under the programme were funded by the EU, and delivered during the CAAF/3 Conference in November 2023. These feasibility studies were developed with the use of the **ACT-SAF template and guide for feasibility studies** developed in 2023 with the support of ACT-SAF partners, which will be updated in 2024.

Feasibility studies template and guide (click to open):

ICAO is currently coordinating support to many other States through SAF feasibility studies and business implementation plan development, thanks to the support offered by ACT-SAF Partners.

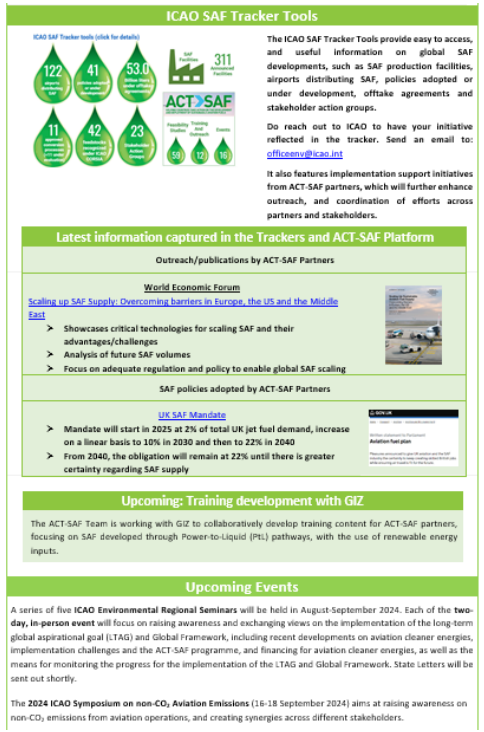
On 29 April 2024, as part of the ICAO-EU ACT-SAF Assistance Project, a Kick-off Meeting was held, initiating a series of SAF feasibility studies that will be implemented across nine African States, and India from 2024-2026.

The Meeting provided updates on the status of the project, governance, timelines, and expected results. Discussions also included project expectations and the engagement with States.

States interested in providing and receiving support under ACT-SAF may contact the ICAO Office of Environment (officeenv@icao.int) for further information.

Upcoming: ACT-SAF Business Implementation Template

The ACT-SAF team is currently preparing **a new template to support SAF business case development.** This provides follow-up support for States where a SAF feasibility study has already been successfully completed, delivering conclusive prospects for the establishment of a domestic SAF supply chain. **The template will detail** processes and key parameters in a business implementation report, which will facilitate final investment decisions to drive the start of a concrete SAF project. Subsequent ACT-SAF business implementation studies



ICAO SAF Tracker Tools

The ICAO SAF Tracker Tools provide easy to access, and useful information on global SAF developments, such as SAF production facilities, airports distributing SAF, policies adopted or under development, offtake agreements and stakeholder action groups.

Do reach out to ICAO to have your initiative reflected in the tracker. Send an email to: officeenv@icao.int

It also features implementation support initiatives from ACT-SAF partners, which will further enhance outreach, and coordination of efforts across partners and stakeholders.

Latest information captured in the Trackers and ACT-SAF Platform

Outreach/publications by ACT-SAF Partners

World Economic Forum

Scaling up SAF Supply: Overcoming barriers in Europe, the US and the Middle East

- **Showcases critical technologies for scaling SAF and their advantages/challenges**
- **Analysis of future SAF volumes**
- **Focus on adequate regulation and policy to enable global SAF scaling**

SAF policies adopted by ACT-SAF Partners

UK SAF Mandate

- **Mandate will start in 2025 at 2% of total UK jet fuel demand, increase on a linear basis to 10% in 2030 and then to 22% in 2040**
- **From 2040, the obligation will remain at 22% until there is greater certainty regarding SAF supply**

Upcoming: Training development with GIZ

The ACT-SAF Team is working with GIZ to collaboratively develop training content for ACT-SAF partners, focusing on SAF developed through Power-to-Liquid (PtL) pathways, with the use of renewable energy inputs.

Upcoming Events

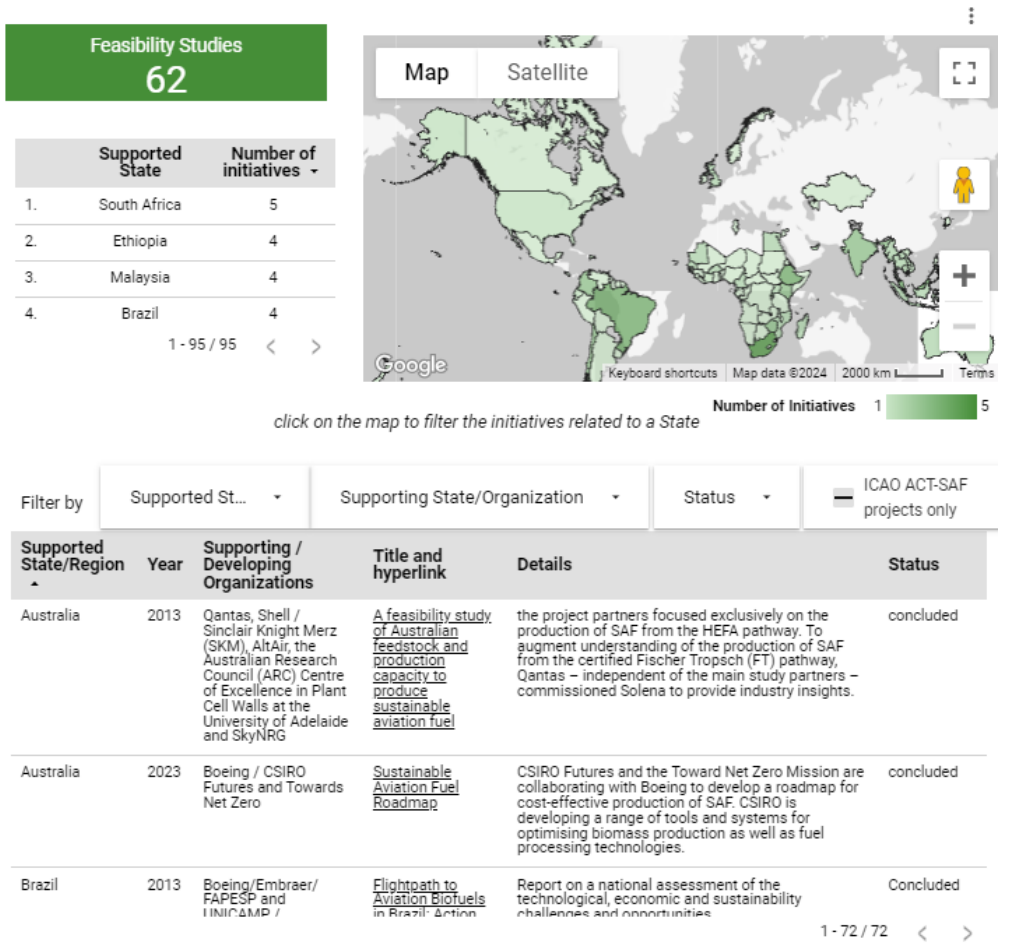
A series of five **ICAO Environmental Regional Seminars** will be held in August-September 2024. Each of the **two-day, in-person event** will focus on raising awareness and exchanging views on the implementation of the long-term global aspirational goal (LTAG) and Global Framework, including recent developments on aviation cleaner energies, implementation challenges and the ACT-SAF programme, and financing for aviation cleaner energies, as well as the means for monitoring the progress for the implementation of the LTAG and Global Framework. State Letters will be sent out shortly.

The **2024 ICAO Symposium on non-CO_2 Aviation Emissions** (16-18 September 2024) aims at raising awareness on non-CO_2 emissions from aviation operations, and creating synergies across different stakeholders.

- Links to access **past ACT-SAF training** material
- Updates on support for **SAF feasibility studies / business implementation** from ACT-SAF partners
- **ACT-SAF platform updates**
  - Feasibility studies
  - Training and outreach
  - Events

ACT-SAF platform of implementation support initiatives

- Easy to access resource in ICAO ACT-SAF website, with information on feasibility studies, training/outreach, and events
- Reduces duplication of efforts across partners/stakeholders
- **New - filtering capabilities on feasibility studies tracker**
- Reach out to ICAO to have your initiative reflected in the platform



Scaling up SAF feasibility studies & business cases

Upcoming SAF feasibility studies & business cases (2024 - 2026) with contributions to ENV Voluntary Fund

European Union	France	United Kingdom
• Support 10 SAF feasibility studies for African States and India • 1st project kick-off meeting in April 2024	• Support 3 SAF feasibility and business implementation studies, focused in African States	• Support 3 SAF feasibility and business implementation studies, focused in African States
Netherlands	**Austria**	**Airbus**
• Support 3 SAF feasibility studies, for States in various regions	• Support SAF feasibility studies (TBD)	• Support SAF feasibility studies (TBD)

- **Targeting ACT-SAF feasibility studies & business cases in 20 States by 2025, and 50 States by 2028**

Ongoing: ICAO-EU ACT-SAF Assistance Project

- Kick-off Meeting on **29 April 2024**
  - Provided updates on status of project, governance, timelines, expected results
  - Project expectations and engagements with States
- **Job descriptions of projects have been published – ongoing evaluation of prospective consultants**
- Project implementation for 10 States, starting with Ethiopia, India, and South Africa this year

Recently concluded Events

ICAO Global Implementation Support Symposium

30 April – 2 May 2024

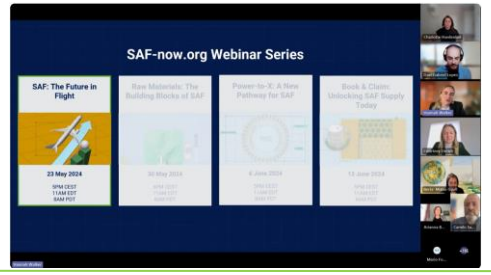
- Exploring the ICAO Finvest Hub initiative as an innovative financing mechanism to support aviation infrastructure development
- Panel discussions on scaling up global collaboration and enhancing capacity for LTAG implementation highlighted key role of ACT-SAF efforts in training, feasibility studies, business implementation support, and encouraging resource mobilization
- https://www.icao.tv/global-implementation-support-symposium/season:3

Upcoming events/training offered by ICAO ACT-SAF partners

RSB SAF-now webinars

May – June 2024

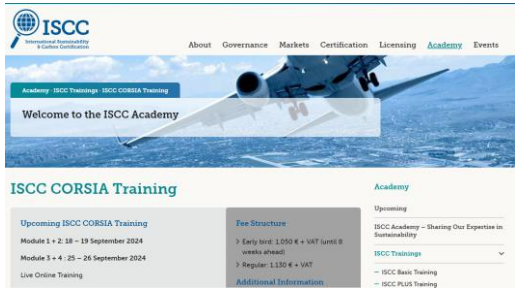
- Provides value-added information and insight to leverage SAF opportunity and support decarbonization goals
  - ✓ SAF: The future in flight
  - ✓ Raw materials: The building blocks of SAF
  - ✓ Power-to-X: A new pathway for SAF
  - ✓ Book & Claim: Unlocking SAF supply today
- https://www.saf-now.org/webinars



ISCC CORSIA Training

September 2024

- Provides training focused towards Certification Bodies and its auditors, and open to all interested parties
  - ✓ Regulatory framework for CORSIA Eligible Fuels
  - ✓ Comprehensive information on ISCC CORSIA certification systems
- https://www.iscc-system.org/academy/iscc-trainings/iscc-corsia-training/



Business Implementation Report Template

Ongoing: SAF business implementation report template

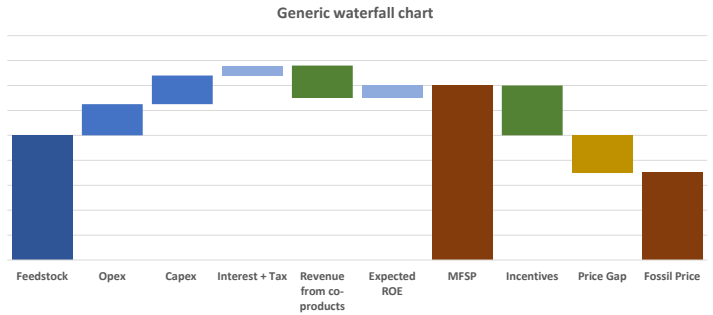
- **As a follow up to the SAF feasibility study template/guide, ICAO has prepared a draft template to support SAF business implementation**
  - Provides follow up support to States where preceding studies have already identified SAF feedstock/pathway prospects
  - With the support from a small group of ACT-SAF partners, ICAO has since developed an advanced draft
  - Template forms the reference for the implementation several ACT-SAF business implementation studies that will be developed
  - It can be used to support a “ready-to-invest” report at a project level
  - We will send the advanced draft to all ACT-SAF partners for additional comments. Plan to circulate Template in the ACT-SAF website in late June.

Key elements:
1) Market analysis (scenario and assumptions)

- Deep dive into at least one shortlisted feedstock / pathway
- Setting out of the valuation model (e.g. discounted cashflow), and key outputs (e.g. NPV, MFSP)
- Provides technical information and assumptions, on SAF production facilities, with explanations
  - Location, supply chain, scale (e.g. energy infrastructure, demand)
  - General facility inputs (e.g. timeframes, capacities, lifespan)
  - Process and energy/utility inputs
  - Financial inputs (e.g. cost of capital, depreciation, IRR)

Key elements:
2) Techno-economic assessment and results

- **Applies input parameters from preceding section, to assess viability of SAF project in question**
- Typically incorporates a waterfall chart with key outputs such as MFSP, price gaps, and CO2 abatement costs
- Sensitivity analysis to account for bear/bull variations in each input parameter – deviations from base scenario have to be explained
- Description of potential policies to address the price gap, if necessary



Key elements:
3) Financial and operational assessment of the project

- **Development of the business case**, defining the economic and operational potential
- Operational assessments may provide information on
  - Facility general plot plans
  - Development timelines
  - Availability of local resources (incl impact on jobs)
- Assessments in cases of positive NPV (most ideal scenario), vis-à-vis negative NPVs (consideration of supporting policy)
- Assessments on potential regulatory issues (e.g. permits, expected timelines)
- Review of sustainability assessments, aligned with CORSIA eligible fuels
- Incorporate feedback from key stakeholders

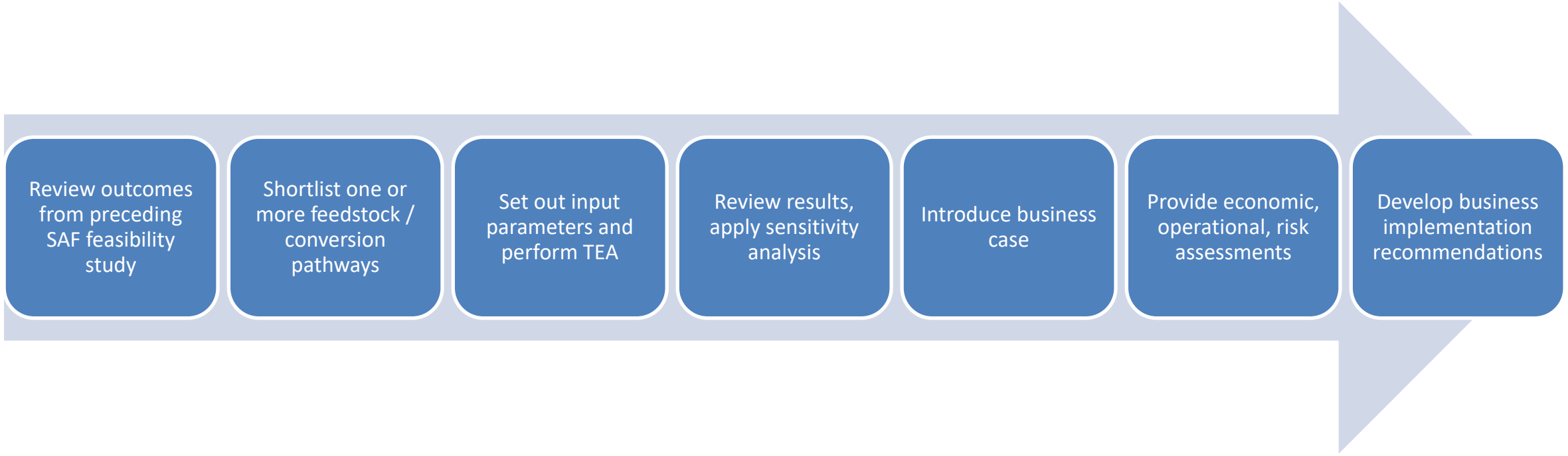
Key elements:
4) Risk assessment

- **Highlights challenges and barriers** that need to be addressed in order to realizer SAF opportunities, with a focus on risks
- Common challenges include:
  - Scalability
  - Feedstock supply (seasonal variations, regional availability)
  - Technology risks
  - Competition with other refinery outputs
- Challenges may be evaluated in terms of probability, as well as impact to project success
- Mitigation means to address risks/challenges

Key elements:
5) Business implementation recommendations

- **Explores final recommendations for the business case**
- Should aim to identify interested project partners – support towards setting out implementation structure
- Identification of potential financing, together with strategies for securing project finance
- Action plan to be aligned with the State's existing and planned policies related to clean energy/SAF development, as with linkages to the ICAO State Action Plan processes to support LTAG monitoring

Overall flow of the development of a business implementation project



ICAO presentation on the update of the Guidance Document on SAPs

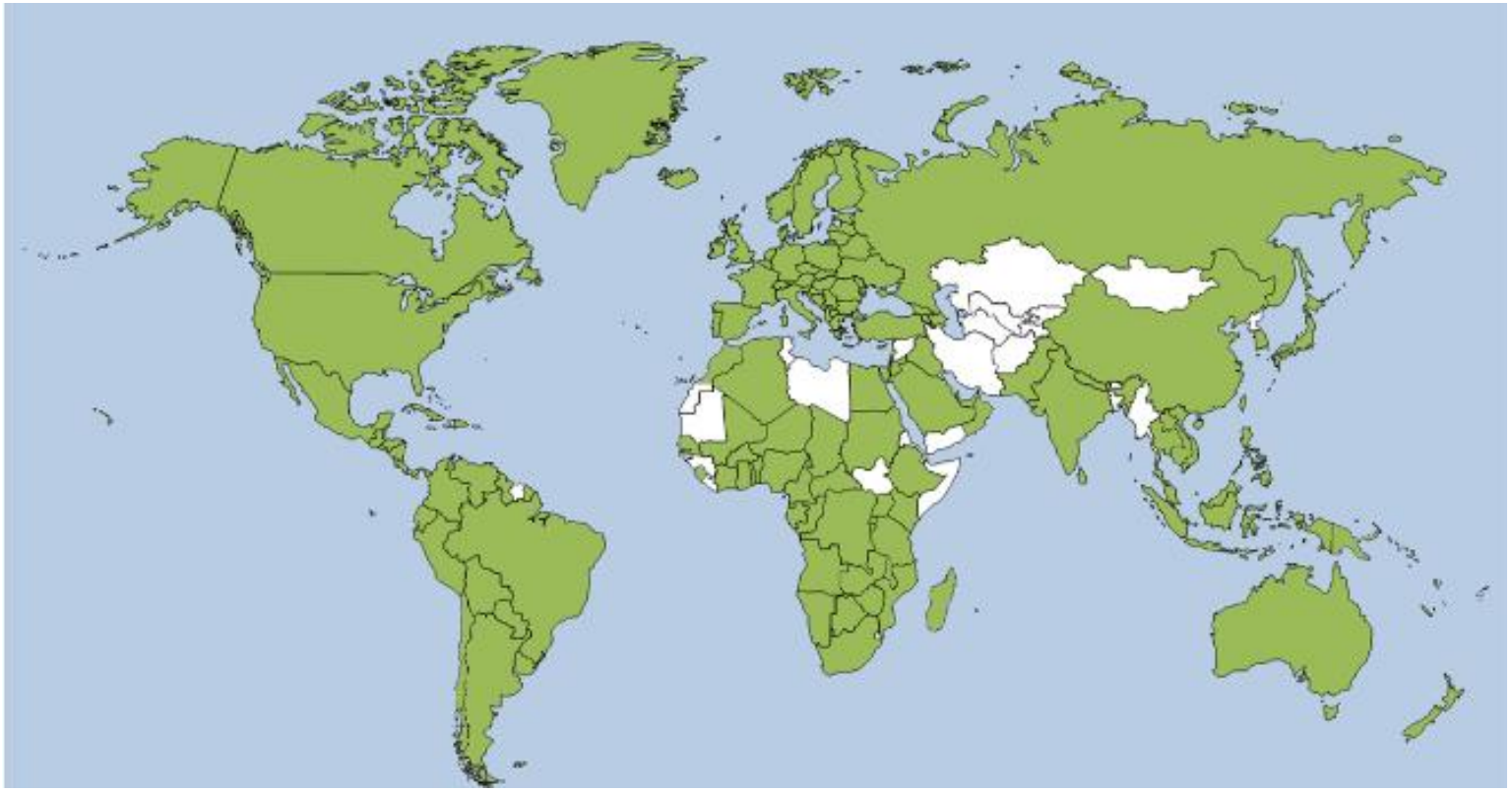
State Action Plan Initiative

- The State Action Plan is a voluntary planning and reporting initiative whereby States can communicate information on their activities to address CO_2 emissions from international civil aviation.
- A State Action Plan is a living document that defines a State's actions to reduce CO_2 emissions from international civil aviation.

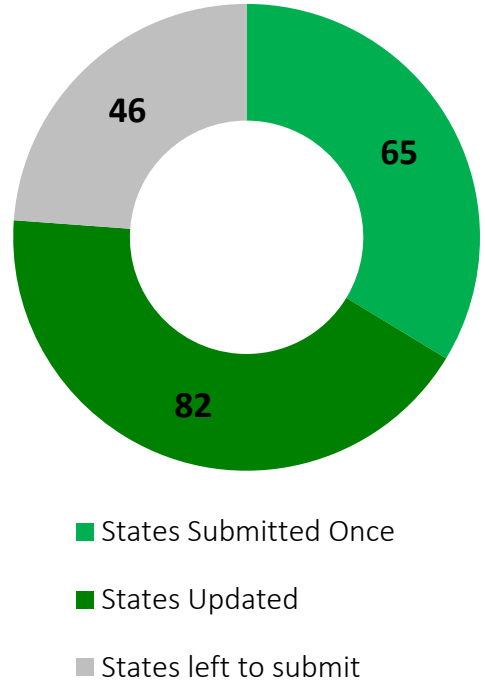
- For States
  - Submit an action plan with quantified information that identifies the measures to address environmental challenges and reduce CO_2 emissions.
  - Involves planning and coordination with stakeholders to identify policies and actions and provide a clear communication route to ICAO.

- For ICAO
  - Assess future progress towards the achievement of ICAO global aspirational goals.

147 States representing **98.99% of global RTK** have voluntarily submitted their State Action Plan



Global SAP Submissions /Updates



Connection between *LTAG and State Action Plans*

Resolution A41-21 associates LTAG and SAP

SAP information use for LTAG Monitoring (A41-21 Para 9)

Invitation to submit SAPs with quantified information (A41-21 Para. 10 and 11)
-before the end of June 2024-

Dissemination of information to support SAP development (A41-21 Para. 12 and 13)

ICAO LTAG
Adopted by ICAO Assembly
Resolution A41-21 (2022)
https://www.icao.int/environmental-protection/Documents/Assembly/Resolution_A41-21_Climate_change.pdf

ICAO
LTAG
NET-ZERO 2050

Connection between *the ICAO Global Framework for SAF, LCAF and other Aviation Cleaner Energies* and *State Action Plans*

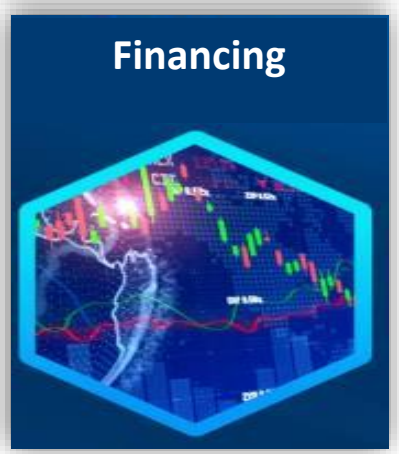
- Encourages States to **include** their respective **policies, actions and roadmaps for the development and deployment of SAF, LCAF and other aviation cleaner energies**, in their **State Action Plans**.

- ICAO, with the technical contribution of CAEP, should identify and develop methodologies for **monitoring the progress on emissions reductions** from SAF, LCAF and other aviation cleaner energies **toward the achievement of the LTAG**, including through the **gathering, compiling and analyzing**, by ICAO, **of actions undertaken by States according to their State Action Plans** and **other relevant State reporting mechanisms.**

- **Encourages** States, ICAO, industry, academia and other relevant stakeholders to **work together** to deliver a **robust and substantial capacity-building and implementation support programme**, which should also assists in the **development of relevant aspects of State Action Plans and roadmaps**, including ICAO guidance and tools, and State-to-State support partnerships, noting that State Actions Plans may also include information on specific assistance needs for the implementation of measures to reduce aviation CO2 emissions, which may facilitate access to investment and technology.

CAAF/3

ICAO Global Framework on SAF, LCAF and other Aviation Cleaner Energies



Why develop a State Action Plan?

A State Action Plan can help States:

-Report international aviation CO2 emissions

-Outline their policies and actions

-Provide information on the implementation of basket of measures and any specific assistance needs

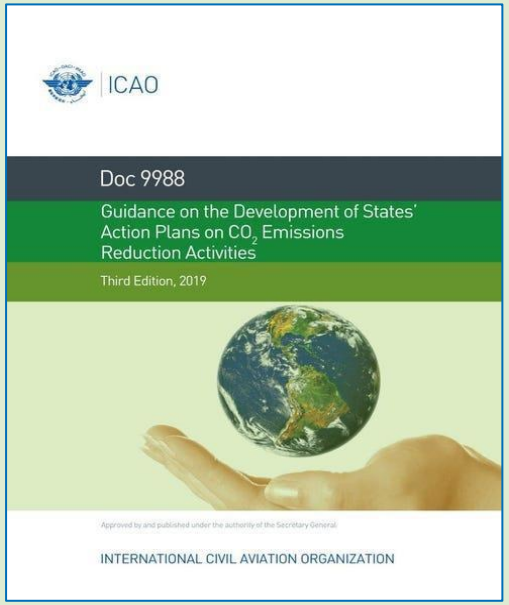
A State Action Plan will help ICAO:

-Compile information on achieving the global aspirational goals

-Provide guidance and technical assistance on preparing action plans

-Identify and respond to States' needs for technical and financial assistance

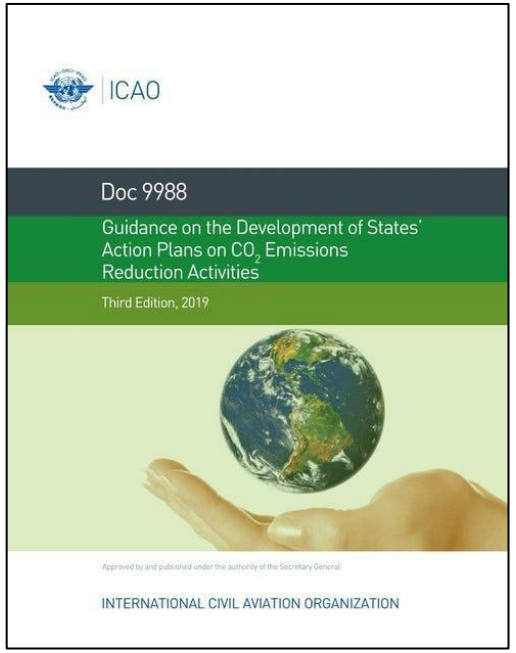
ICAO Doc 9988 provides guidance to develop a State Action Plan



Guidance on the Development of State Action Plans on CO2 Emissions Reduction Activities (Doc 9988)

General updates in the Guidance (Fourth Edition):

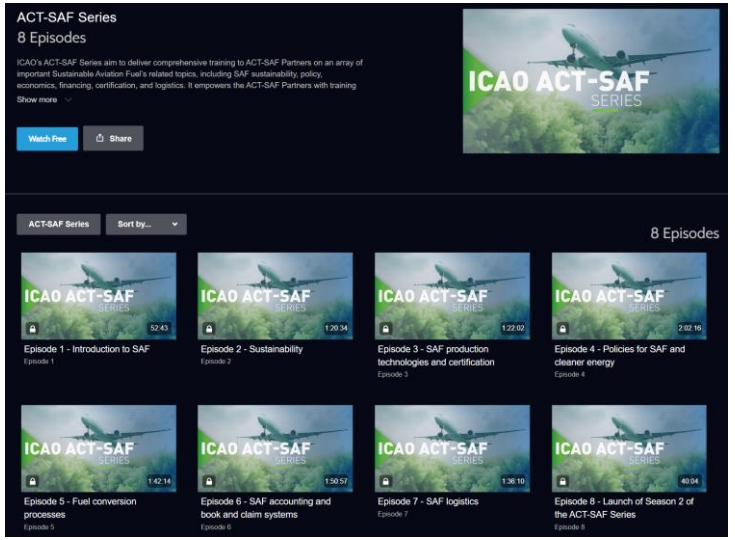
- ✓ Reflects 2022 ICAO Assembly's **agreement on a long-term global goal for aviation (LTAG)** and **highlights importance of State Action Plans** in contributing to the achievement of the international aviation sector's collective goal and monitoring the global progress.
- ✓ Details **benefits of sustainable aviation fuels (SAF), lower carbon aviation fuels (LCAF), and other clean energy options**, guided by the ICAO Global Framework adopted by CAAF/3.
- ✓ Updates the **Action Plan template**, which allows States to report quantified data in a harmonized manner.
- ✓ Adds information on **assistance needs**, ICAO's latest **capacity-building programs**, **possible financial instruments**, and **examples of eligibility criteria for financing** decarbonization projects.
- ✓ Includes lessons from the past decade, updated information resources, and best practices for CO2 mitigation.



Guidance on the Development of State Action Plans on CO2 Emissions Reduction Activities (Doc 9988)

Updates in the Guidance pertaining to SAF:

- ✓ Provides information on the Global Framework on SAF, LCAF and other aviation cleaner energies adopted at CAAF/3 in November 2023.
- ✓ Introduces the ACT-SAF Programme which seeks to support States in the development and deployment of SAF and other cleaner energies.
- ✓ Highlights the ACT-SAF Training Series as a way of training States on SAF through addressing topics including policy, economics/financing, certification and logistics.
- ✓ Provides templates and guidance materials with the aim of facilitating the development of SAF feasibility studies under the ACT-SAF programme.
- ✓ Emphasizes on the usefulness of conducting SAF feasibility studies.
- ✓ Provides examples of feasibility studies conducted on the use of SAF.
- ✓ Encourages States to provide information on their feasibility studies (if applicable) in their State Action Plans.



How to include SAF plans in the State Action Plan?

States are encouraged to include in their State Action Plans specific activities regarding the development and deployment of SAF, LCAF and other aviation cleaner energies,

This includes volumes of SAF and/or LCAF (current or estimated), together with estimates of their associated life-cycle emissions.

CORSIA methodologies for life cycle assessment (LCA) of fuel should be used (accepted basis for the eligibility of fuels used in international aviation.)

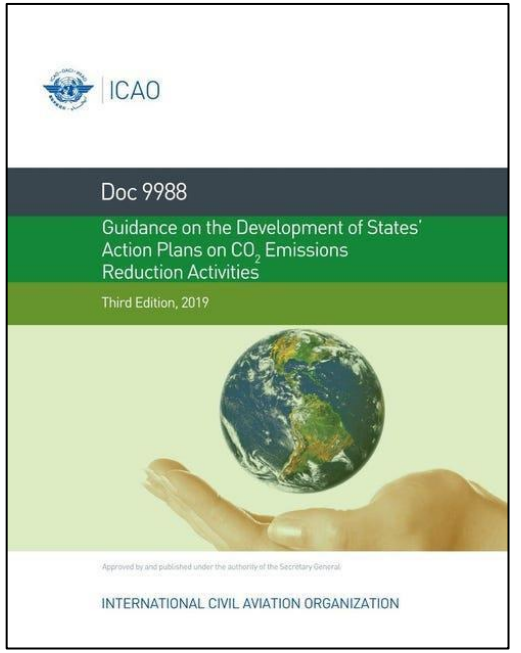
$$emission\ reduction\ [tonnes] = 3.16 \times M \times \left(1 - \frac{L}{89}\right)$$

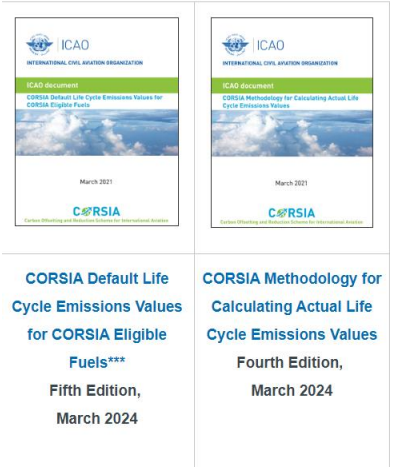
Where:

M – Mass of SAF or LCAF (tonnes), and

L – life cycle emission value of the SAF or LCAF (gCO2e/MJ), which can be obtained with the CORSIA LCA methodologies

✓ For technical details – ACT-SAF Series #10 - ICAO methodologies and tools for life cycle assessment





CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels*** Fifth Edition, March 2024

CORSIA Methodology for Calculating Actual Life Cycle Emissions Values Fourth Edition, March 2024

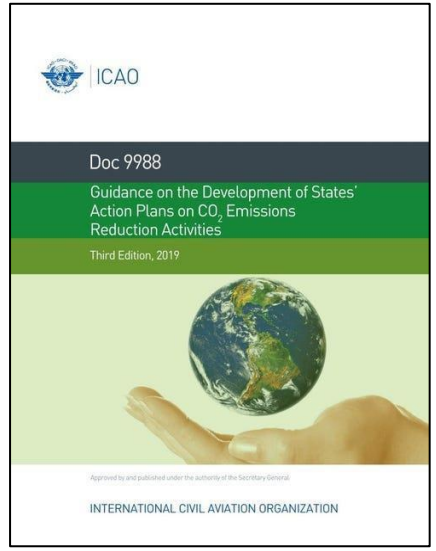
What other details to include in the State Action Plan?

a) Details on Dialogue with stakeholders:

b) Identification of State's capacities through feasibility studies

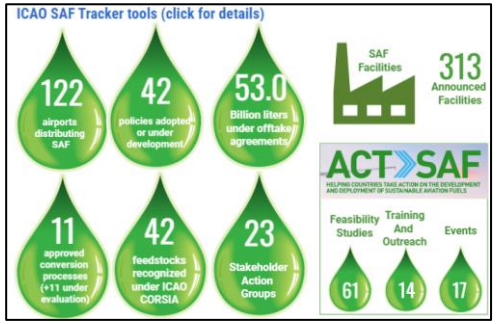
c) Policies chosen to promote the development and deployment of cleaner energy for aviation:

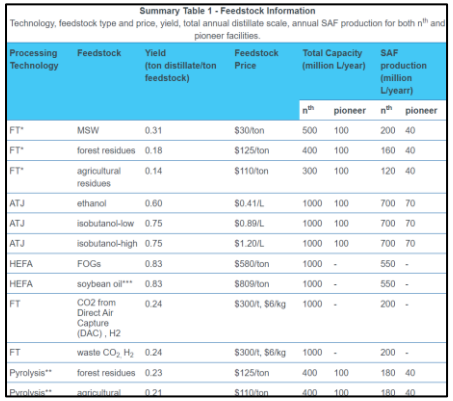
d) Implementation and fuel accounting information



Guidance references various information sources to support States

1. ICAO guidance on potential policies and coordinated approaches to develop and deploy SAF
2. ICAO SAF rules of thumb
3. ICAO ACT-SAF templates and guidance for feasibility studies
4. ICAO SAF website and SAF tracker tools





Summary Table 1 - Feedstock Information

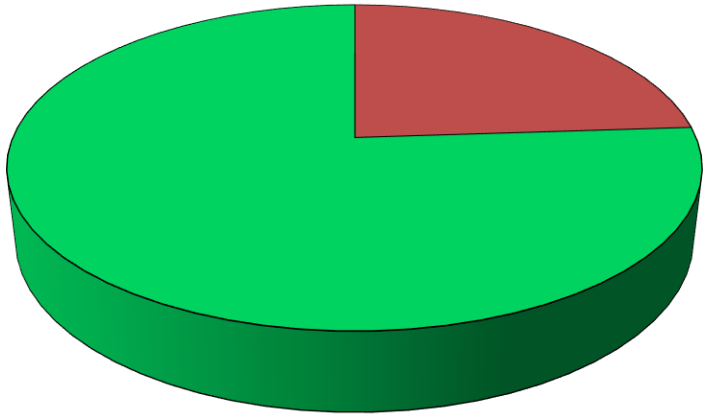
Technology, feedstock type and price, yield, total annual distillate scale, annual SAF production for both n^{th} and pioneer facilities.

Processing Technology	Feedstock	Yield (ton distillate/ton feedstock)	Feedstock Price	Total Capacity (million L/year)		SAF production (million L/yearr)	
				n^{th}	pioneer	n^{th}	pioneer
FT*	MSW	0.31	$30/ton	500	100	200	40
FT*	forest residues	0.18	$125/ton	400	100	160	40
FT*	agricultural residues	0.14	$110/ton	300	100	120	40
ATJ	ethanol	0.60	$0.41/L	1000	100	700	70
ATJ	isobutanol-low	0.75	$0.89/L	1000	100	700	70
ATJ	isobutanol-high	0.75	$1.20/L	1000	100	700	70
HEFA	FOGs	0.83	$580/ton	1000	-	550	-
HEFA	soybean oil***	0.83	$809/ton	1000	-	550	-
FT	CO2 from Direct Air Capture (DAC) , H2	0.24	$300/t, $6/kg	1000	-	200	-
FT	waste CO_2, H_2	0.24	$300/t, $6/kg	1000	-	200	-
Pyrolysis**	forest residues	0.23	$125/ton	400	100	180	40
Pyrolysis**	agricultural	0.21	$110/ton	400	100	180	40

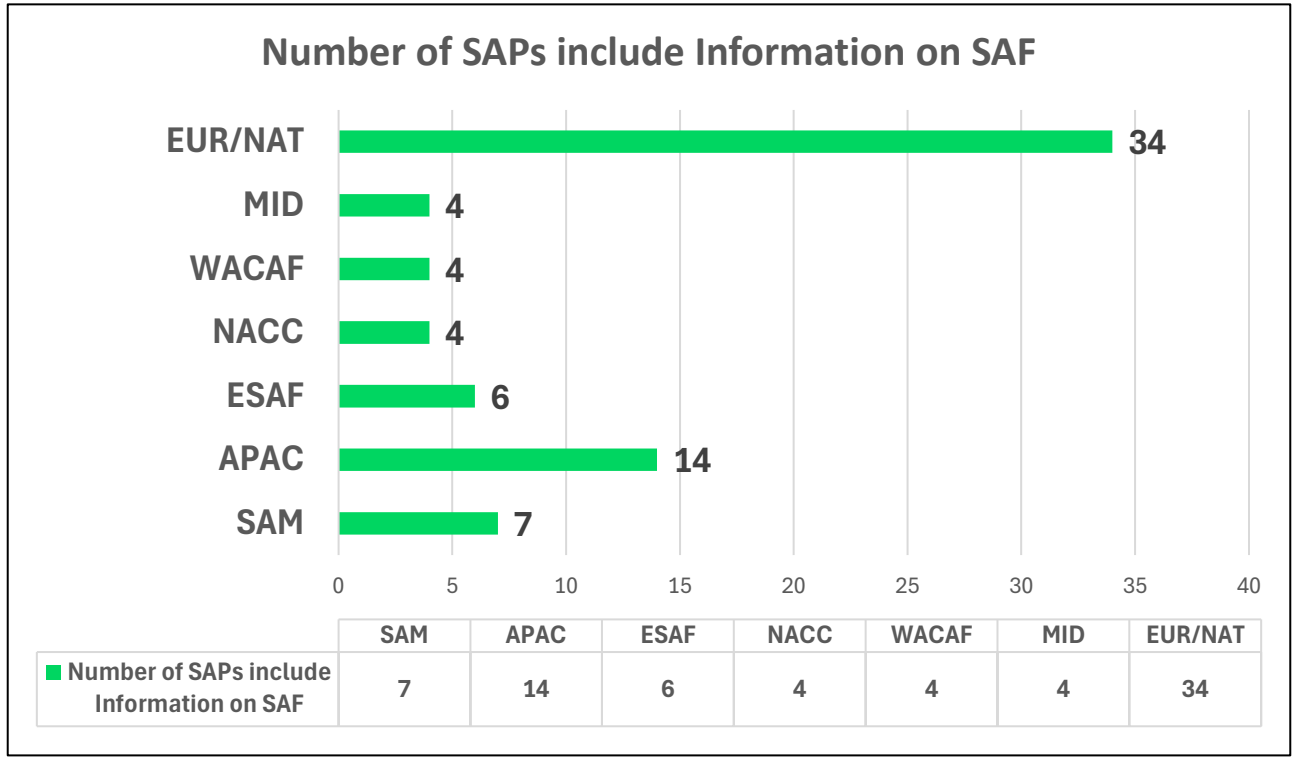
Reference to Sustainable Aviation Fuels in State Action Plans

Out of 96 SAP submissions/updates as of 2020,

73 States provided information on SAF in their SAPs



No information on SAF in SAPs Information on SAF in SAPs



	SAM	APAC	ESAF	NACC	WACAF	MID	EUR/NAT
Number of SAPs include Information on SAF	7	14	6	4	4	4	34

Conclusion

- ICAO encourages all Member States to update their State Action Plans and subsequently keep them up-to-date – every 3 years – **NEXT UPDATE BEFORE END OF JUNE 2024.**
- Assembly encourages the submission of **robust and quantified** State Action Plans to allow ICAO to assess future progress toward the achievement of ICAO global aspirational goals.
- Opportunity for States to identify **long-term measures** that will improve fuel efficiency and reduce emissions.
- ICAO encourages States to **implement new green technologies and innovations, SAF and other clean energies** and include this information in their SAPs

Presentation of the Singapore SAP and inclusion of SAF

Singapore aviation sector must play its part in drive towards sustainability

In 2019, Singapore's airports contributed to around 0.7% of Singapore's domestic emissions and Singapore's aircraft operators contributed 1.9% of global aviation emissions

- **In Feb 2022, the Civil Aviation Authority of Singapore (CAAS) convened the International Advisory Panel (IAP) on Sustainable Air Hub to discuss how international aviation can be made more sustainable and accessible for all, and how Singapore can contribute to this international effort**
  - Held four meetings and six deep dives across three key domains from Feb to Jul 2022
  - Engaged more than 120 representatives from 40 local and international partners
  - Published recommendations in Sep 2022, with 15 initiatives
  - CAAS studied the IAP's recommendations and did further consultations

Singapore Sustainable Aviation Fuel (SAF) Pilot

- **CAAS also conducted a 20-month Sustainable Aviation Fuel (SAF) pilot with Singapore Airlines, GenZero, Changi Airport Group, ExxonMobil and Neste**

- Key objectives:
  - Validate supply chain readiness
  - Understand demand for SAF credits
  - Understand end-to-end cost components of SAF deployment

- SAF was first uplifted onto Singapore Airlines flight at Changi Airport on 7 Jul 2022, via the airport's fuel hydrant system

- Sale of SAF credits launched in Jul 2022 to customers such as corporate and individual travellers

Pilot found that Singapore is operationally ready to supply SAF but more is needed to support adoption

Singapore Sustainable Air Hub Blueprint

- Launched the Singapore Sustainable Air Hub Blueprint on 19 Feb 2024
- Singapore's State Action Plan for the decarbonisation of its aviation sector
- Incorporates and builds upon the recommendations by the International Advisory Panel on Sustainable Air Hub
- Adopts a balanced approach to the long term, sustainable growth of Singapore's aviation sector, taking into account the need for environmental sustainability while ensuring that the Singapore air hub remains competitive
- Sets out Singapore's medium-term and long-term targets, as well as concrete steps that CAAS and the aviation stakeholders will take to decarbonise Singapore aviation

CAAS
Civil Aviation Authority of Singapore

Overview of Blueprint

Singapore Sustainable Air Hub Blueprint

Reduce domestic aviation emissions from airport operations by 20% from 2019 levels in 2030 and achieve net zero domestic and international aviation emissions by 2050

Airport domain
Maximal efforts to reduce energy use and deploy renewables

- Solar power deployment
- Clean energy airside vehicles
- Building energy efficiency
- Low-carbon electricity imports
- Resource circularity through waste-to-energy

Airline domain
Build ecosystem to support the use of Sustainable Aviation Fuel (SAF) in Singapore

- National SAF target and SAF levy
- Central SAF procurement
- SAF production in Singapore and the region
- Airline fleet renewal and operational improvements

Air Traffic Management (ATM) domain
Operational improvements to increase efficiency and reduce fuel burn

- Advanced demand-capacity balancing implementation
- Performance-based navigation enhancement
- Gate-to-gate trajectory optimisation

Critical enablers
Build coalitions for action

- Policy and regulation
- Industry development
- Infrastructure planning and provision
- Workforce transformation
- International partnerships and collaborations

CAAS
Civil Aviation Authority of Singapore

Domestic and international aviation emissions reduction targets

Domestic emissions target

- Domestic emissions come from operations of vehicles, facilities, and buildings for aircraft, passenger, baggage, and cargo handling at Changi and Seletar Airports
- In 2019, domestic emissions were 404 kilotonnes of CO_2
- **CAAS will work with aviation stakeholders to reduce domestic aviation emissions from Changi and Seletar Airports operations by 20% from 2019 levels in 2030**
- In the longer term, the aviation sector will target to achieve **net zero emissions by 2050,** in line with national commitment

International emissions target

- International aviation emissions come from international flights operated by Singapore-based operators
- In 2019, international emissions from Singapore-based airlines was at 17.5 million tonnes of CO2
- **CAAS will contribute to ICAO's goals of carbon neutral growth from 2019 and the long term global aspirational goal of net zero carbon emissions by 2050 for international aviation**

Airport Domain: Increasing solar power deployment

- **CAAS will work with Changi Airport Group to increase solar power deployment at Changi and Seletar Airports, by installing more solar panels on available rooftop spaces of airport buildings**
  - As of end-2023, Changi Airport has more than 20MWp of installed solar capacity, generating close to 4% of its 2019 electricity consumption of about 700GWh
  - Ongoing plans to install more solar panels on available rooftop will further generate 6%
  - Solar panels will be deployed at Seletar Airport as well

- **Changi Airport will commence feasibility study on solar panel deployment on airfield**, without compromising the safety and efficiency of airport operations

CAAS
Civil Aviation Authority of Singapore

Airport Domain: Expanding cleaner energy use for airside vehicles

- **CAAS will work with the Changi Airport community to expand the use of cleaner energy for airside vehicles,** to have the entire fleet operate on cleaner energy by 2040, and for all new light vehicles and certain new heavy vehicles registered from 2025 to be cleaner energy vehicles

- Working with stakeholders to advance three main pathways:

  - Electrification: 20% of around 2,500 airside vehicles at Changi Airport are electric. There are over 100 electric vehicle charging stations across the four terminals, increasing to over 300 chargers in the next few years

  - Biofuels: In 2024, to trial the use of renewable diesel for heavy and specialised vehicles to study feasibility, cost, and operational impact

  - Hydrogen-powered airside vehicles: Work with stakeholders to conduct hydrogen fuel cell vehicle (HFCV) trials to understand the regulatory challenges, operational impact, and infrastructural changes required to support HFCV adoption

Airline Domain: Requiring use of SAF and introducing a SAF levy

- Use of SAF is a critical pathway for the decarbonisation of aviation and is expected to contribute around 65% of the carbon emission reduction needed to achieve net zero by 2050
  - Experience around the world and the SAF pilot at Changi Airport have shown that SAF adoption cannot depend on voluntary use alone

- **To kickstart SAF adoption in Singapore, flights departing Singapore will be required to use SAF from 2026. We will aim for a 1% SAF target for a start, to encourage investment in SAF production and develop an ecosystem for more resilient and affordable supply**

- **Goal is to raise the SAF target beyond 1% in 2026 to 3 – 5% by 2030, subject to global developments and the wider availability and adoption of SAF**

Airline Domain: SAF Levy

- **CAAS will introduce a SAF levy for the purchase of SAF to achieve the uplift target**
- As the market for the supply of SAF is still nascent and the price of SAF can be volatile, we will adopt a fixed cost envelope approach to provide cost certainty to airlines and travellers
  - Levy will be set at a fixed quantum, based on the SAF target and projected SAF price at that point in time; for example, the quantum of the SAF levy in 2026 will be set based on the volume of SAF needed to achieve a 1% SAF target and the projected SAF price in 2026
  - Amount collected through the SAF levy will be used to purchase SAF, based on the actual price of SAF at the time of purchase
  - SAF levy will not change, even if the actual SAF price differs from what is projected. Instead, the actual uplift volume of SAF will be adjusted based on the pre-determined SAF levy and prevailing SAF price
- Levy will vary based on factors such as distance travelled and class of travel
  - As an indication, we estimate that the levy to support a 1% SAF uplift in 2026 could increase ticket price for an economy class passenger on a direct flight from Singapore to Bangkok, Tokyo and London by around S$3, S$6 and S$16 respectively
  - Passengers in premium classes will pay higher levies
- Continue close consultation with stakeholders on the implementation of the SAF levy, before announcing more details in 2025 nearer the date of implementation

Airline Domain: Centralising procurement of SAF

- **To further manage the cost of using SAF, the procurement of SAF will be centralised for the Singapore air hub, using the levies collected to aggregate demand and reap economies of scale**

- Businesses and organisations will also be invited to use the central procurement mechanism for their respective voluntary SAF purchases to reduce their carbon emissions from air travel

- Central procurement function can also take on the management and allocation of SAF credits generated from SAF use through central purchases
  - For SAF procured under the national SAF target, SAF credits will be allocated back to the airlines based on the share of SAF levies collected
  - Credits generated from SAF procured voluntarily by businesses and organisations will be allocated based on the amount of SAF bought

Airline Domain: Anchoring SAF production in Singapore and the region

- **Work closely with industry partners to increase SAF production capacity in Singapore and the region**
- Given the tremendous increase in SAF production capacity required globally, there is scope for more local and regional SAF production
- We can tap on the wide availability of potential feedstocks in the region and the presence of an existing petrochemical sector in Singapore
- This will support the increasing demand for SAF in Singapore and the wider region

ATM Domain: Operational improvements to increase efficiency and reduce fuel burn

- **Advanced Demand-Capacity Balancing**
  - Expand suite of Air Traffic Flow Management (ATFM) solutions to include Long Range ATFM and improve coordination and management of longer-haul flights
  - Strengthen the integration between meteorology and ATM to improve reliability, timeliness and accuracy of weather forecast information for air traffic controllers

- **Performance-Based Navigation**
  - Collaborate with partner ANS Providers to implement more direct routings on a wider scale
  - Develop smart tools to facilitate the optimisation of descent flight profiles within Changi Airport to help reduce fuel burn and emissions

- **Gate-to-Gate Trajectory Optimisation**
  - Implement a decision support tool for air traffic controllers to optimise the departure intervals between aircraft, which will enhance runway efficiency and increase fuel savings
  - Collaborate with stakeholders and partner ANS Providers to work towards Trajectory-Based Operations

Five critical enablers to build coalitions for action

1. **Policy and Regulation**
   - CAAS will introduce several policies to drive tangible actions, including setting domestic aviation emissions reduction targets to spur collective action and introducing a national SAF target to drive more SAF production and adoption

2. **Industry Development**
   - CAAS has set up S$50 million Aviation Sustainability Programme to fund sustainable aviation projects, such as feasibility study for the deployment of solar panels on the airfield, a simulation and modelling study for the electrification of airside vehicles, and trials on the use of renewable diesel for ground handling equipment and vehicles
   - CAAS has set up the International Centre for Aviation Innovation (ICAI) to drive innovation initiatives across all aspects of aviation including air traffic management, airport operations, advanced air mobility, and aviation sustainability

3. **Infrastructure Planning and Provision**
   - New Changi Airport Terminal 5 is being designed and developed to achieve the Building and Construction Authority's Green Mark Platinum Super Low Energy standard
   - Working with partners to study technical feasibility of hydrogen adoption and infrastructure requirements

Five critical enablers to build coalitions for action

4. **Workforce Transformation**
   - Identify new and emerging sustainability-related job roles through a tripartite effort involving the government, companies and unions
   - Accompanied by upskilling and job redesign efforts, relevant lifelong learning and skills-upgrading initiatives
   - Work with Institutes of Higher Learning to embed aviation sustainability resources and content into the curriculum and stimulate interest through sustainability-linked internships and learning journeys

5. **International Partnerships**
   - Work with partners to establish the Asia-Pacific sustainable aviation centre to develop capabilities for sustainable aviation policy research specific to the needs of the Asia-Pacific region
     - Includes building deeper scientific understanding of regional SAF feedstocks, validating prevailing policy recommendations against the region's context to value-add perspectives, and providing capacity-building activities
   - Continue to advance multilateral and bilateral partnerships to drive sustainable aviation, e.g. Aviation Green Lane with Japan and the US, ASEAN Sustainable Aviation Action Plan

Presentation of the Zimbabwe SAP and inclusion of SAF

Presentation of the Zimbabwe SAP and inclusion of SAF

Kudzai Ndidzano – SAP Alt Focal Point
Deputy Director - Climate Change Management Department
Ministry of Environment, Climate and Wildlife
kudzie013@gmail.com

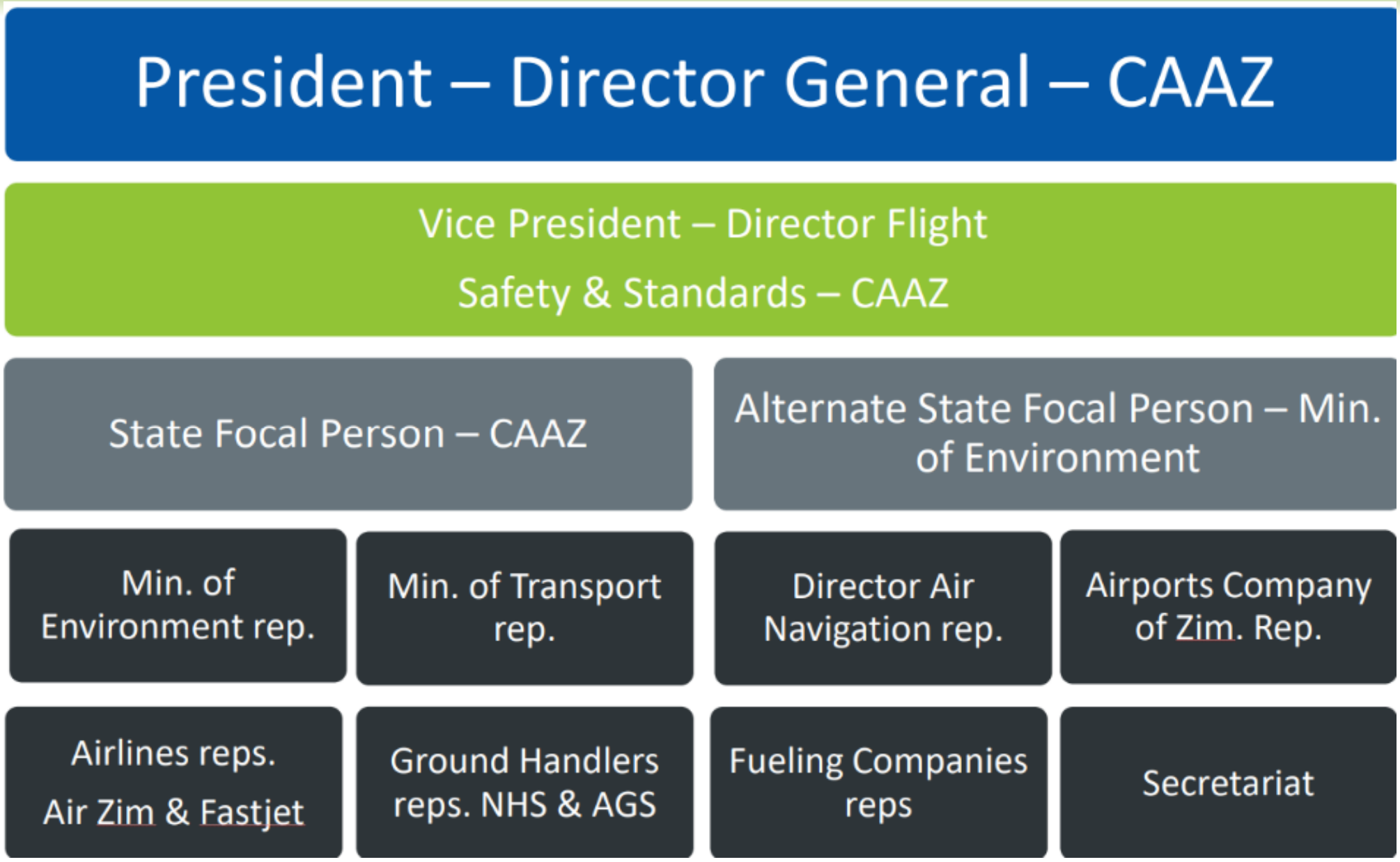
PRESENTATION OUTLINE

1. Background of development of the State Action Plan
2. Structure of the National Action Planning Team
3. Zimbabwe State Action Plan (SAP) Categories
4. SAP Implementation Plan
5. SAP Implementation Needs
6. SAF Introduction to the SAP
7. Successes
8. Future Plans

Background of development of the State Action Plan

- Recognising the threat of climate change and efforts under the UNFCCC, Paris Agreement and ICAO and Chicago Convention
- Acknowledges the Long-Term Aspirational Goal (LTAG)
- As part of the domestication of the global movement towards sustainability established the National Action Plan Team (NAPT) to steer the work towards the SAP in a consultative manner,
- SAP provides an overview of the primary initiatives of the Civil Aviation Authority of Zimbabwe (CAAZ) in partnership with the Zimbabwean aviation industry and other Zimbabwean Government Departments to reduce carbon dioxide emissions from international aviation in Zimbabwe

National Action Plan Team (NAPT)



- SAP identified five broad categories for reduction of emissions:
    1. Aircraft related technology development
    2. Improved ATM and Infrastructure use
    3. Operational improvements
    4. Market based measures
    5. Airport improvements

SAP IMPLEMENTATION ROADMAP

State Action Plan Implementation Roadmap

No.	Mitigation Measure	2022	2023	2024	2025	2026	2027
1	Purchase of new aircraft						
2	Use of optimum routings						
3	Efficient departures and approaches						
4	Implement en-route PBN						
5	Airspace management						
6	Engine wash						
7	Single engine taxi						
8	Minimise reverser use						
9	Select best aircraft for mission						
10	Participate in CORSIA						
11	Installation of LED lights						
12	Installation of GPUs and PCA units						
13	Installation of solar energy sources						
14	New technology HVAC						
15	Economic use of electricity						
16	Minimise GSE distance						
17	Purchase GSE which uses green fuels						

Figure 13 - State Action Plan Implementation Roadmap

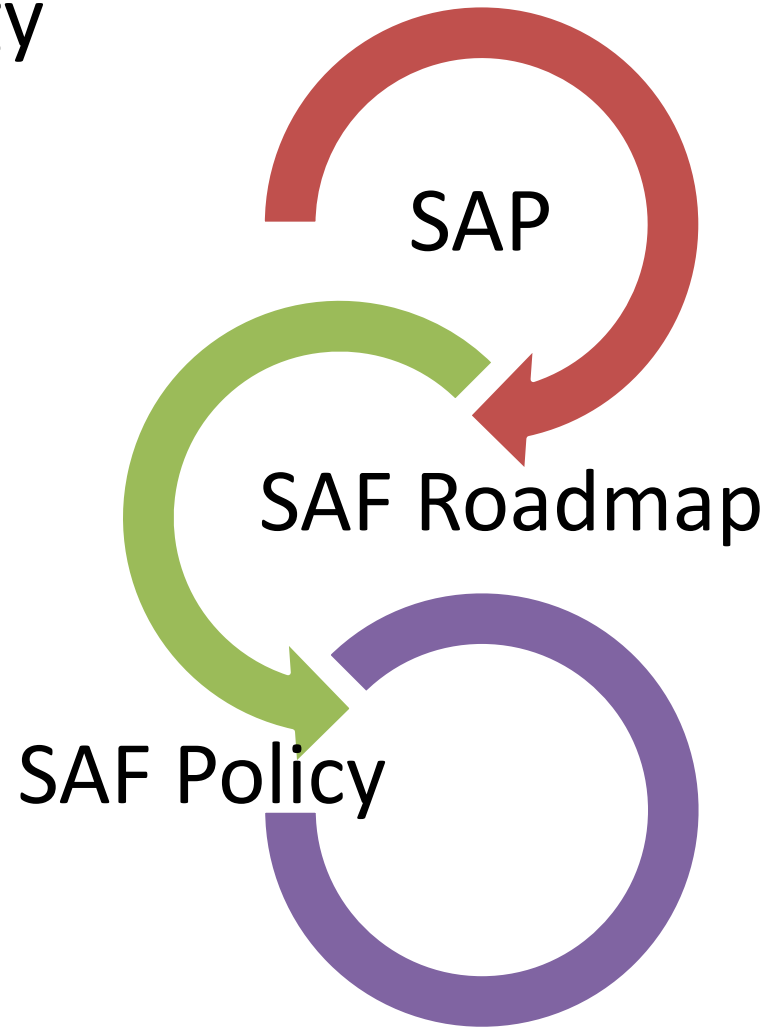
SAP IMPLEMENTATION NEEDS

- **Funding - F**unding is the main enabler for the implementation of most mitigating measures.

- **Capacity –** Some of the mitigation measures require expertise in the implementation and the State has to outsource these skills at a cost.

- **Lack of Understanding –** Some of the implementing partners do not have understanding of the potential benefits of environmental programs as they have traditionally been classified as non – essential, need sensitization and capacity building.

SAF Strategy



Sustainable Aviation Fuels (SAF)

- The LTAG brought a new vision for the State to contribute to the Paris Agreement.
- Following the LTAG report, the State revisited its State Action Plan in Jan 2022 on the Mitigation of CO_2 Emissions from International Aviation and made the first amendment.
- LTAG Report showed SAF's great potential to decarbonise the sector, the State added the Development and Deployment of Sustainable Aviation Fuels as the 19th mitigating measure.
- Decision based on Zimbabwe's previous experience in Biofuels which was being driven by an existing National Biofuels Policy.
- Coupled with abundance of land and a conducive climate placed Zimbabwe on course for being a global runner in SAF production from agricultural feed stock and waste.

SAF Development Work

- A feasibility study on the development and deployment of Sustainable Aviation fuels was carried out, June – November 2023 under the ICAO – EU Project
- Feasibility study showed great potential in 14 feedstocks with Alcohol to Jet (using ethanol from sugar cane bagasse) and HEFA (using jatropha seed oil) being the pathways with the most potential.
- The report states that production can begin within the next 3-5 years if resources are availed.

- Zimbabwe recently received confirmation of assistance from ICAO funded by the United Kingdom.
- The assistance will support the development of a Business Plan that will inform the State on exactly what needs to be done to make SAF a reality.
- Formation of an inter-ministerial Technical Committee through the Ministry of Transport and Infrastructural Development.
- The committee's role to spearhead the implementation of the Feasibility Study and lay the foundation for a Cabinet Level Inter-Ministerial SAF Steering Committee.

SUCCESSES

- Initiated implementation of 80% of mitigating measures adopted in our State Action Plan.
- More land allocated to the production of ethanol in the lowveld as part of following through the construction of Tokwe-Mukosi, the largest inland dam in Zimbabwe.
- Agronomical research has produced a gene bank of high yielding jatropha varieties for Zimbabwe.
- Continued active participation in ACT-SAF and ACT- CORSIA.
- Started monitoring, verification and reporting international aviation emissions through the ICAO Aviation Environmental System

Future Plans

- National SAF Roadmap to implement national SAF Strategy.
- Comply with ICAO Sustainability Criteria to have Zimbabwe Jatropha seed certified as SAF feedstock.
- Continue revising SAP plan so that it remains relevant.
- To start monitoring, verification and reporting domestic emissions in a bid to account for each gram of carbon emitted.
- Set up SAF production plants in Zimbabwe.
- Build relationships with other SAF Stakeholders for enhancement of capacity.

Presentation of the Cote d'Ivoire SAP and inclusion of SAF

Summary

1. Context of the development of the State Action Plan
   - National Action Plan Team
   - Key steps
2. Historical and projected data
   - Estimated baseline scenario
   - Estimated expected results
3. Overview of selected mitigation measures
   - Technologies and standards
   - Sustainable Aviation Fuels (SAF)
   - Operational Improvements
   - Market-based measures
   - Improvement at airports
4. Assistance needs and roadmap
5. Feedback

1. Context

In accordance with the provisions of resolutions A39-2 and A40-18 of the International Civil Aviation Organization (ICAO), Côte d'Ivoire has voluntarily decided to develop and submit to ICAO, a State Action Plan (SAP) to reduce carbon emissions attributable to civil aviation.

1. Context of the development of the SAP

ANAC SAP Team

Main Focal Point and Coordinator

Waogninlin TRAORE
+225 07 08 18 56 13
+225 01 01 47 19 11
watraore@anac.ci

Alternate Focal Point and Coordinator

Philippe LEGBEDJI
+225 07 48 48 20 75
---
nlegbedji@anac.ci

	STAKEHOLDERS	Participants
01	Ministry in charge of transport	01
02	National Civil Aviation Authority (ANAC)	02
03	Ministry in charge of the Environment	01
04	Ministry in charge of Energy	01
05	Agency for Air Navigation Safety in Africa and Madagascar (ASECNA)	02
06	Air Ivory Coast	02
07	Solenta Aviation Ivory Coast	01
08	Max'Air	01
09	AERIA: Manager of Abidjan Félix Houphouët Boigny International Airport (FHB)	02
10	SODEXAM: Airport, Aeronautical and Meteorological Exploitation and Development Company	01
11	NAS Ivoire: Ground handling company at FHB Airport	02
12	Oil pool	01

1. Context of the development of the SAP

Key steps

2018

September 2018
Establishment of the Civil Aviation CO_2 Committee

November 2018
Official launch of ANAC CO_2 Committee activities

1st meeting of the CO_2 Committee

2019

January 2019
2nd meeting of the CO2 Committee

March 2019
3rd meeting of the CO_2 Committee

2020

February 2020
Notification to Côte d'Ivoire of its eligibility for the ICAO/EU Assistance Project-Phase II

December 2020
"Kick-off seminar" of the ICAO/EU Assistance Project

Presentation: "Initial assessment of the international aviation sector in Côte d'Ivoire"

December 2020
Integration to the CO_2 Committee of the Ministry in charge of the environment

1. Context of the development of Côte d'Ivoire SAP

Key Steps (Continued)

2021

May 2021

Integration of the Ministry in charge of energy SAP Committee

October 2021

Nomination of ANAC Focal Points and Coordinators for SAP and CORSIA

SAP Committee meetings

January 2021:	4th meeting
February 2021:	5th meeting
March 2021 :	6th meeting
May 2021 :	7th meeting
June 2021:	8th & 9th meeting
August 2021:	10th meeting

August 2021 – December 2021

Several sectoral meetings with Air Côte d'Ivoire, Solenta CI, ASECNA, AERIA, NAS Ivoire.

Key steps (Continued)

1. Context of the development of the SAP

Key Steps (Continued)

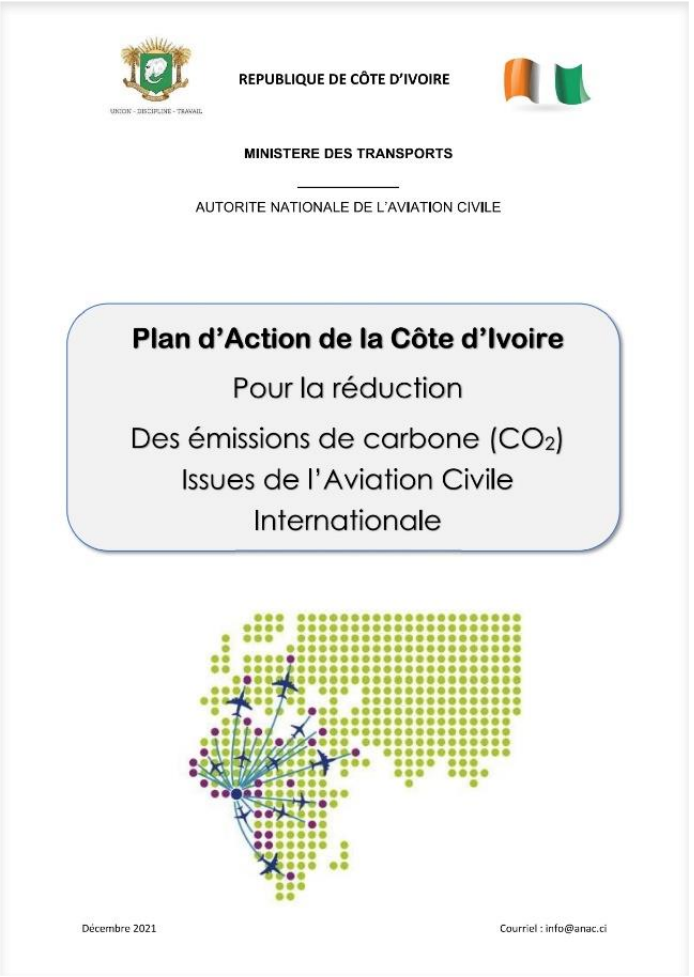
2022

January 2022

1. Committee Meeting for the validation of the draft of Côte d'Ivoire SAP

2. Validation by the DG of ANAC of Côte d'Ivoire SAP

3. Submission to ICAO of Côte d'Ivoire's State Action Plan


REPUBLIQUE DE CÔTE D'IVOIRE

MINISTERE DES TRANSPORTS

AUTORITE NATIONALE DE L'AVIATION CIVILE

Plan d'Action de la Côte d'Ivoire

Pour la réduction

Des émissions de carbone (CO_2)

Issues de l'Aviation Civile

Internationale

Décembre 2021

Courriel : info@anac.ci

https://www.icao.int/environmental-protection/Lists/States_Action_Plans/Attachments/154/Plan%20d%E2%80%99Action%20de%20la%20C%C3%B4te%20d%E2%80%99Ivory . pdf

2. Historical and projected fuel consumption and CO_2 emissions data

Baseline

Historical data 2018-2019

Reference year: 2019

Air Côte d'Ivoire

SOLENTA AVIATION CÔTE D'IVOIRE

Maxair

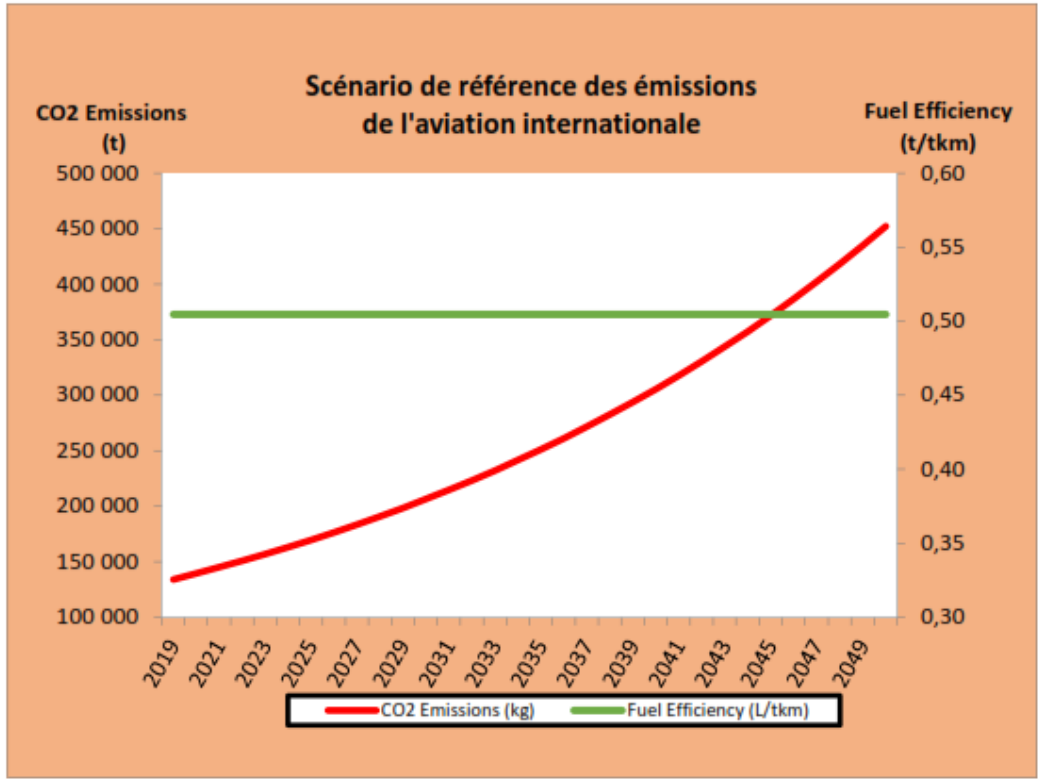
2019 — 134,064 tons of CO_2

EBT

2050 — 452,217 tons of CO_2

% annual growth: **+7.65%**

Energy efficiency: **0.5 L/ tkm**



2. Historical and projected fuel consumption and CO_2 emissions data

Expected results

Gain

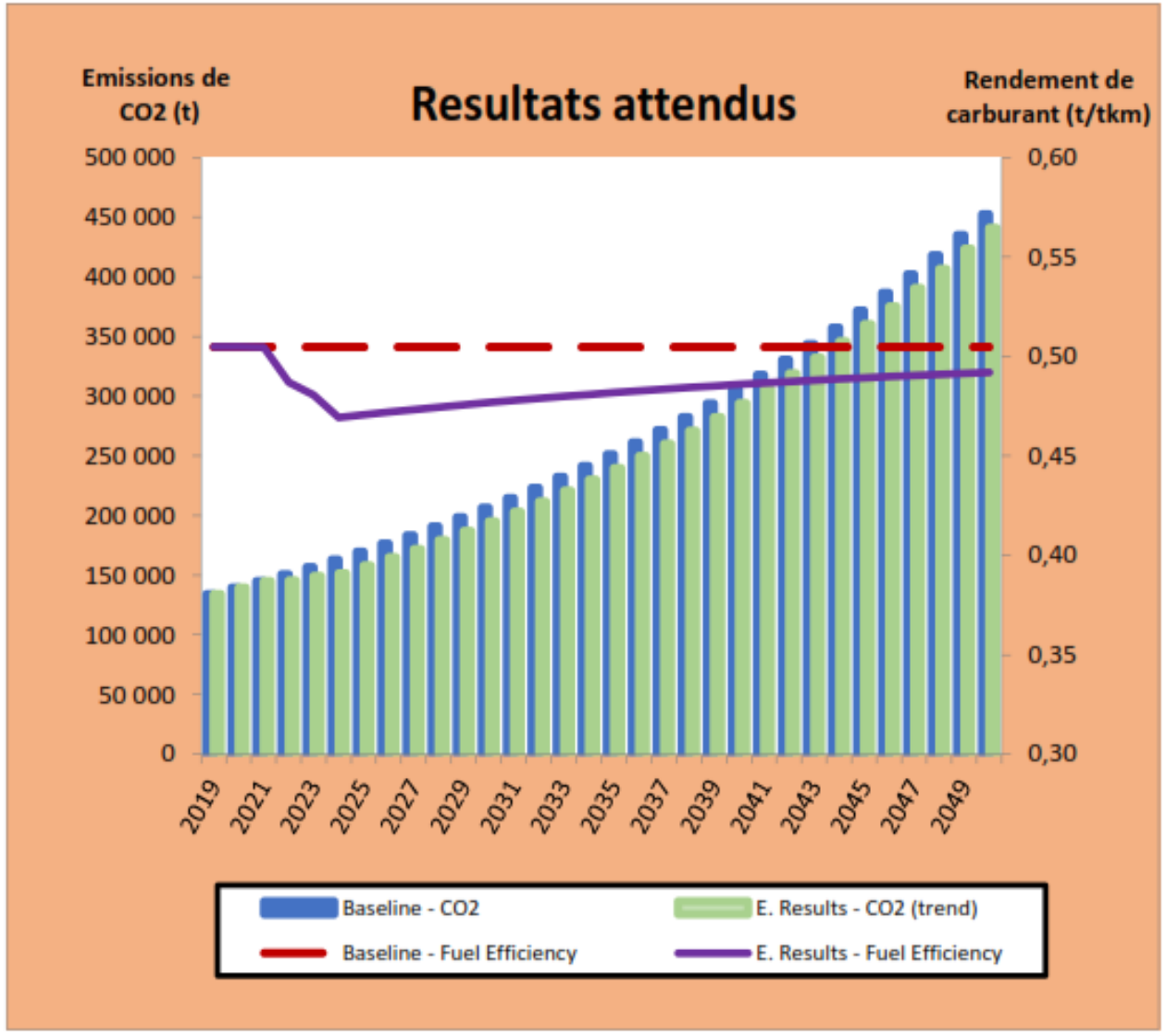
322,027 tons of CO_2

(cumulative over the period 2022-2050)

Gain

11,451 tons of CO_2

(per year from 2024)



3. Overview of selected mitigation measures

Five (05) categories of measures:

Technologies and standards 01	Sustainable aviation fuels 01	Operational Improvements 12	Market-based measures 01	Airport Improvements 05

20 selected CO_2 emissions reduction measures

3. Overview of selected mitigation measures

Technologies and standards category

One (01) measure / two actions:

M01 - Action 01	M01 – Action 02
Replacement of one (01) Airbus A319-112 aged 16 years with one (01) Airbus New A320-251 NEO	*Replacement of two (02) Airbus A319-111 aged 17 years in pairs (02) Airbus A320-112 aged 12 years each*
2,275.2 tCO_2	**773.6 tCO_2**

3. Overview of selected mitigation measures
Sustainable Aviation Fuels (SAF)

One (01) measure:

M02

Development of sustainable aviation fuels (*)

To be determined

(*) Conditional on the prior completion of a feasibility study aimed at assessing the potential of Côte d'Ivoire in terms of the production of alternative fuels (SAF and LCAF).

3. Overview of selected mitigation measures

Operational Improvements

Twelve (12) measures:

M03 *Improved pre-departure planning and arrival planning* **632 tCO_2**	**M04** *Optimization of engine startup and traffic management* **2,132 tCO_2**	**M05** *Improved collaborative decision-making process at FHB Airport (A-CDM)* **570 tCO_2**
M06 *Implementation of CDO procedures at FHB International Airport* **1,021 tCO_2**	**M07** *Implementation of CCO procedures at FHB International Airport* **1,702 tCO_2**	**M08** *Optimization of RNAV/RNP capabilities* **867 tCO_2**

3. Overview of selected mitigation measures

Operational Improvements (continued)

Twelve (12) measures (cont.):

M09

Mitigation of the use of civil and military airspace

1.1 t CO_2

M10

Late engine start-up

8.5 tCO_2

M11

Documentation on board aircraft

45 tCO_2

M12

Optimization of aircraft descent rates

203.7 tCO_2

M13

Reduced use of thrust reversers

638.4 tCO_2

M14

Reducing acceleration altitude after takeoff

1649.5 tCO_2

3. Overview of selected mitigation measures

Market-based measures

CORSIA

One (01) measure:

M15

Voluntary inclusion of Côte d'Ivoire in CORSIA

To be determined

3. Overview of selected mitigation measures

CORSIA

Additional benefits for national sectors / *Improvement at airports*

Five (05) measure:

M16

Implementation of a Clean Development Mechanism (CDM)

18,383 t CO_2

M17

Installation of LED lighting systems

52.3 tCO_2

M18

Installation of solar panels at FHB airport

2100 tCO_2

M19

Reduction in energy demand and preference given to clean energy sources

60 tCO_2

M20

Replacement of diesel GPUs with electric GPUs

1702 tCO_2

4. Assistance needs and roadmap

Assistance needs (10 measures)

Sustainable aviation fuels	Operational Improvements		Market-based measures	Airport Improvements
M02 *Development of sustainable aviation fuels*	**M03** *Improved pre-departure planning and arrival planning*	**M06** *Implementation of CDO procedures at FHB International Airport*	**M15** *Voluntary inclusion of Côte d'Ivoire in CORSIA*	**M16** *Implementation of a Clean Development Mechanism (CDM)*
	M05 *Improving Collaborative Decision Making Process at FHB Airport (A-CDM)*	**M09** *Relaxation of the use of civil and military airspace*	**M19** *Reduction in energy demand and preference given to clean energy sources*	**M17** *Installation of LED lighting systems*
				M18 *Installation of solar panels at FHB airport*

4. Assistance needs and **roadmap**

Roadmap

Effective implementation

Implementation in progress or to come

No.	Title of measures	2016	2017	2018	2019	2020	2021	2022	2023	2024	>2024
M01	Renewing of the aircraft fleet										
M02	Development of sustainable aviation fuels										
M03	Improved pre-departure planning and arrival planning										
M04	Optimization of engine startup and traffic management										
M05	Improving Collaborative Decision Making Process at FHB Airport (A-CDM)										
M06	Implementation of CDO procedures at FHB International Airport										
M07	Implementation of CCO procedures at FHB International Airport										

4. Assistance needs and **roadmap**

Roadmap (continued)

Effective implementation

Implementation in progress or to come

No.	*Title of measures*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*>2024*
M08	*Optimization of RNAV/RNP capabilities*										
M09	*Mitigation of the use of civil and military airspace*										*2050*
M10	*Late engine start-up*										
M11	*Electronic documentation on board aircraft*										
M12	*Optimization of aircraft descent rates*										
M13	*Reduced use of thrust reversers*										
M14	*Reduction of acceleration altitude after takeoff*										
M15	*Voluntary inclusion of Côte d'Ivoire in CORSIA*										

5. Feedback

Measures implemented, initiated or planned

<u>Category 1</u> (Technologies and standards)

- Effective launch of the process of renewing Air Côte d'Ivoire's fleet
- Validation of Air Côte d'Ivoire's strategic development plan over the period **2022 to 2027**

<u>Category 3</u> (Operational improvements)

- Launch by ASECNA of concrete actions for the implementation of CDO/CCO procedures

5. Feedback

Measures implemented, initiated or planned (continued)

<u>Category 4</u> (Market-based measures)

- Effective implementation of CORSIA:
  - State of Côte d'Ivoire voluntary
  - 01 eligible operator: the national company Air Côte d’Ivoire
    - Effective MRV process
    - Data submitted to ICAO via the CORSIA Central Register (CCR)

5. Feedback

Measures implemented, initiated or planned (continued)

<u>Category 5</u> (Additional benefits for domestic sectors)

- Installation of LED lighting systems within the Félix Houphouët Boigny (FHB) International Airport
- Installation of solar fields at FHB airport
- Implementation of a policy to reduce energy demand
- Ground handling assistant project for the transition to electrical equipment at FHB International Airport

5. Feedback

Feasibility study on production of SAF in Côte d'Ivoire

<u>Category 2</u> (Sustainable Aviation Fuels)

- **November 2022** : Notification to Côte d'Ivoire (by ICAO) of its eligibility for carrying out a feasibility study on the production of Sustainable Aviation Fuels (SAF)
- Planning of steps feasibility study process

5. Feedback

Feasibility study on production of SAF in Côte d'Ivoire (continued)

Launch of the feasibility study

July 14, 2023 : Workshop in Abidjan for the launch of a feasibility study on production of SAF in Côte d'Ivoire

1. ICAO	5. Oil and gas industry
2. ANAC	6. Academics/Researchers
3. Ministries	7. Research institutes
4. Aviation industry	8. Private sector (Federations & Associations)

5. Feedback

Feasibility study on production of SAF in Côte d'Ivoire (continued)

Stakeholder consultations :

Make a realistic inventory of Côte d'Ivoire's potential in terms of production of biofuels and alternative fuels (SAF and LCAF)

Agenda of consultations

July 17, 2023: Aviation sector
July 18, 2023: Fuel industry
July 19, 2023: Technical ministries
July 20, 2023: Société Ivoirienne de Raffinage (SIR) and Academics
July 21, 2023: Support Ministries, and Private Sector (Associations and Federations)


Aviation Sector


Ministries


Fuel industry

5. Feedback

Feasibility study on production of SAF in Côte d'Ivoire (continued)

Inventory

- → Human ressources
- → Raw materials with high energy potential
- → Fossil fuel production capacities
- → State and private sector initiatives
- → University research
- → Availability of stakeholders

Ivorian Refining Company (SIR)

Academics

Finance - Government - Private sector

5. Feedback

Feasibility study on production of SAF in Côte d'Ivoire (continued)

Raw materials

→ Agricultural waste
- cassava starch and peelings
- cashew apples
- rubber tree seeds
- etc.

→ Organic fraction of municipal solid waste

→ Used cooking oils

→ Fossil fuels

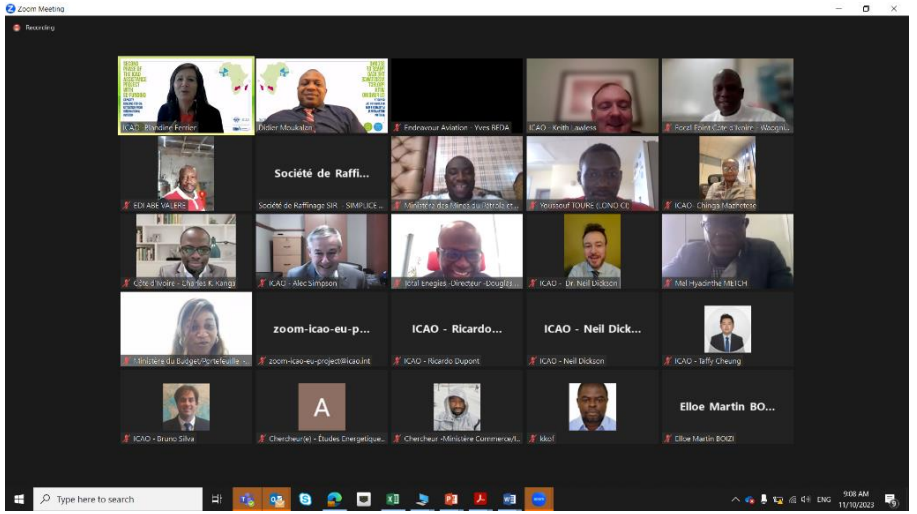
5. Feedback

Feasibility study on production of SAF in Côte d'Ivoire (continued)

Mid-term results

→ **October 11, 2023 :** Online mid-term restitution seminar of the feasibility study organized by ICAO

- participants: ICAO, ANAC and stakeholders
- presentation by the Expert in charge of the feasibility study, of the results of the mid-term study project
- observations, recommendations and/or validation of results by stakeholders



5. Feedback

Feasibility study on production of SAF in Côte d'Ivoire (continued)

Improved results

From October 20 to 24, 2023:

→ Restitution seminar in Montreal, improved results of the feasibility studies of the three selected states:

- Côte d'Ivoire
- Rwanda
- Zimbabwe

Third Capacity Building Seminar
ICAO – Assistance Project with EU Funding Phase II

European Union
JOINT ASSISTANCE PROJECT

ICAO – European Union Assistance Project Phase II

Montreal, Canada
24 to 26 October 2023

PROGRAMME

TUESDAY, 24 OCTOBER 2023	
08:30 – 09:00	**Registration of Participants**
09:00 – 09:05	**Housekeeping** *ICAO*
09:05 – 09:45	**Welcome Address and Seminar Objectives and Expectations** *Mohamed Rahma, Director, Air Transport Burueau* *Delphine Micheaux-Naudet, European Union* *Jane Hupe, Deputy Director, Environment, Air Transport Bureau, ICAO*
09:45 – 10:30	**Update on the Project Progress** *Didier Moukalan, Technical Project Consultant, ICAO*
10:30 – 11:00	*Coffee Break*
11:00 – 12:00	**Session 1: Feasibility Studies – Preliminary Findings:** **Zimbabwe (ESAF)** *Damiana Serafini*
12:00 – 14:00	*Lunch Break*
14:00 – 15:00	**Session 1: Feasibility Studies – Findings *(continued)*** **Rwanda (ESAF)** *Jon McKechnie*
15:00 – 15:30	*Coffee Break*
15:30 – 16:30	**Session 1: Feasibility Studies – Findings *(continued)*** **Cote d'Ivoire (WACAF)** *Keith Lawless*
16:30 – 17:00	**Wrap Up – Day 1**

5. Feedback

Feasibility study on production of SAF in Côte d'Ivoire (continued)

Official ceremony for handing over the feasibility study

CAAF/3, Dubai November 20 to 24, 2023

→ Official handover of the Côte d'Ivoire feasibility study, by Mr. **Juan Carlos SALAZAR, Secretary General of ICAO** , to His Excellency **Mr. DIABY Vacaba**, Ambassador Extraordinary and Plenipotentiary of the Republic of Côte d'Ivoire to the State of United Arab Emirates

5. Feedback

Establishment of a SAF production unit in Côte d'Ivoire

Atlantic Renewables

- → Headquarters in Abidjan
- → Installation of a bioethanol and SAF production unit in "Tiebissou" (277 km from Abidjan)
- → Raw material: Cassava
- → Area: 40,000 hectares available
- → Estimated peak production
  - Bioethanol: 63 million liters
  - SAF: 63 million liters (by april 2027)

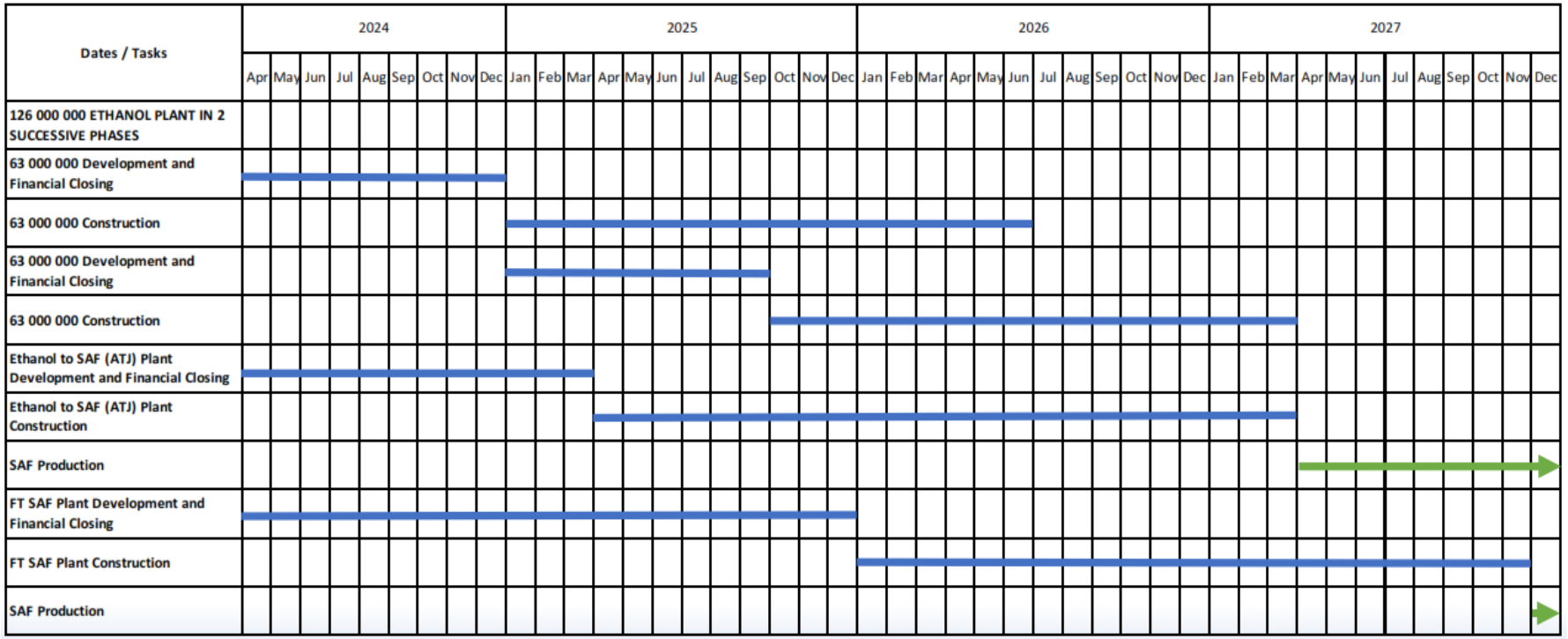
5. Feedback

SAF production in Côte d'Ivoire

Atlantic Renewables

Estimated start of SAF production:

By april 2027



5. Feedback

SAF production in Côte d'Ivoire (continued)

Conclusion

The abundance and diversity of raw materials, as well as the mastery of techniques for refining fossil fuels and producing biofuels, are undeniable assets which make Côte d'Ivoire a potential producer of alternative fuels (SAF and LCAF)

However, actions must be taken to:

→ Optimize the collection processes for said raw materials, particularly agricultural ones

→ Intensify the mechanization of agriculture

→ Establish an adequate regulatory framework

→ Develop skills and secure funding

→ Work to popularize the State Action Plan and the feasibility study.

Presentation of the Japan SAP and inclusion of SAF

Organization Structure

Ministry of Land, Infrastructure, Transport and Tourism, JAPAN

Minister

Director-General

Civil Aviation Bureau

Director-General, Aviation Network Department

Director for Aviation Strategies Office

Director of the Carbon Neutrality Promotion Office

Planning team: *General affairs, legislation, budget etc.*

International affairs team: *International affairs issues, including ICAO issues (CORSIA, LTAG) and domestic administration of CORSIA*

SAF team: *Strategy for SAF expansion*

Carbon Neutrality Promotion Office:

* The Aviation Safety and Security Department is in charge of new technology.
**The Air Navigation Services Department is in charge of operational improvement

ICAO

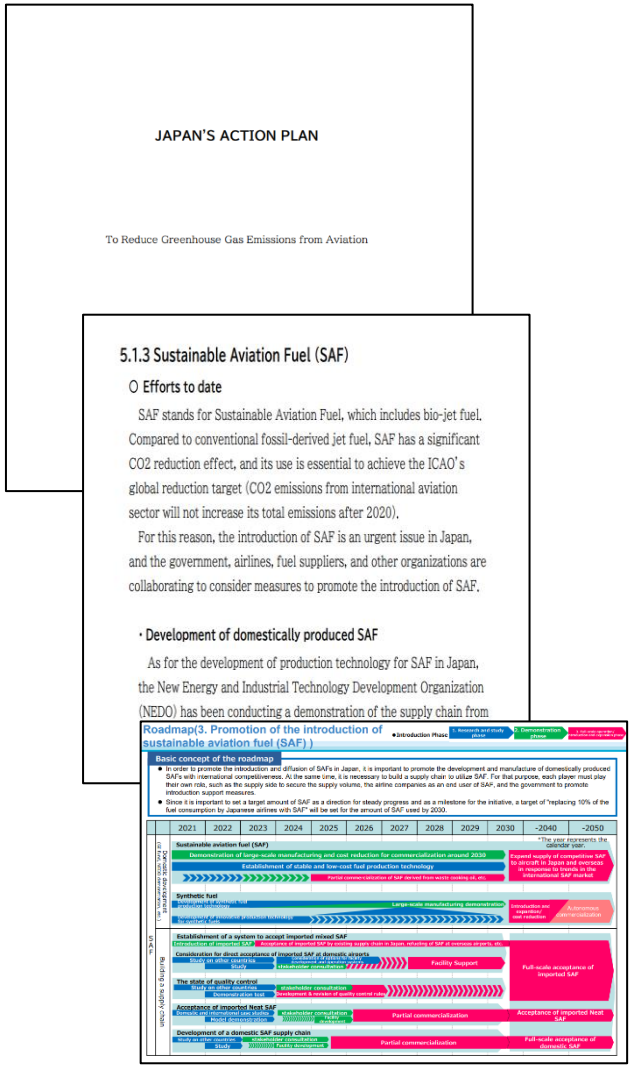
United Nations Climate Change

環境省 Ministry of the Environment

外務省 Ministry of Foreign Affa

経済産業省 Ministry of Economy, Trade and Industry

Japan's State Action Plan related to SAF


JAPAN'S ACTION PLAN

To Reduce Greenhouse Gas Emissions from Aviation

5.1.3 Sustainable Aviation Fuel (SAF)

O Efforts to date

SAF stands for Sustainable Aviation Fuel, which includes bio-jet fuel. Compared to conventional fossil-derived jet fuel, SAF has a significant CO2 reduction effect, and its use is essential to achieve the ICAO's global reduction target (CO2 emissions from international aviation sector will not increase its total emissions after 2020).

For this reason, the introduction of SAF is an urgent issue in Japan, and the government, airlines, fuel suppliers, and other organizations are collaborating to consider measures to promote the introduction of SAF.

・Development of domestically produced SAF

As for the development of production technology for SAF in Japan, the New Energy and Industrial Technology Development Organization (NEDO) has been conducting a demonstration of the supply chain from

Roadmap(3. Promotion of the introduction of sustainable aviation fuel (SAF))

Basic concept of the roadmap

2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 ~2040 ~2050

Sustainable aviation fuel (SAF)

Demonstration of large-scale manufacturing and cost reduction for commercialization around 2030

Establishment of stable and low-cost fuel production technology

Partial commercialization of SAF derived from waste cooking oil, etc.

Expand supply of competitive SAF to aircraft in Japan and overseas in response to trends in the international SAF market

Synthetic fuel

Large-scale manufacturing demonstration

Introduction and expansion

Autonomous commercialization

Establishment of a system to accept imported mixed SAF

Consideration for direct acceptance of imported SAF at domestic airports

Study on other countries

Study

Development of facilities, etc.

Facility Support

Full-scale acceptance of imported SAF

The state of quality control

Study on other countries

Domestically-alike test

Development & revision of quality control rules

Acceptance of imported Neat SAF

Partial commercialization

Acceptance of imported Neat SAF

Development of a domestic SAF supply chain

Study

Partial commercialization

Full-scale acceptance of domestic SAF

Japan's most recent State Action Plan was issued in 2021, and it consists of the followings,

✓Efforts to date

Development of domestically produced SAF
Establishment Fuel subcommittee etc.

✓Future initiatives

Setting SAF usage target, Establishment of public-private council, Domestic SAF development, Conversion of domestic SAF to CORSIA eligible fuels etc.

Contents to be updated in Japan's SAP 2024

✓Progress from 2021

Public-private council toward promoting the introduction of SAF, Domestic SAF supply and demand forecast, CORSIA eligible fuel registration/certification support, Regulations and Support etc.

✓SAF Roadmap

Initiatives to Promote the Introduction of SAF in Japan

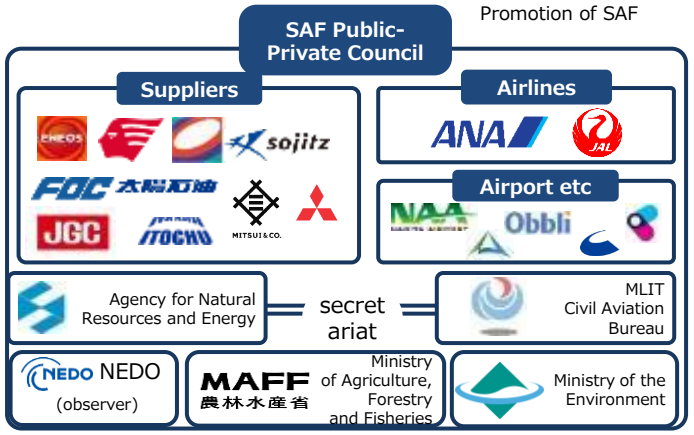
ACT SAF

■Public-private council toward promoting the introduction of SAF

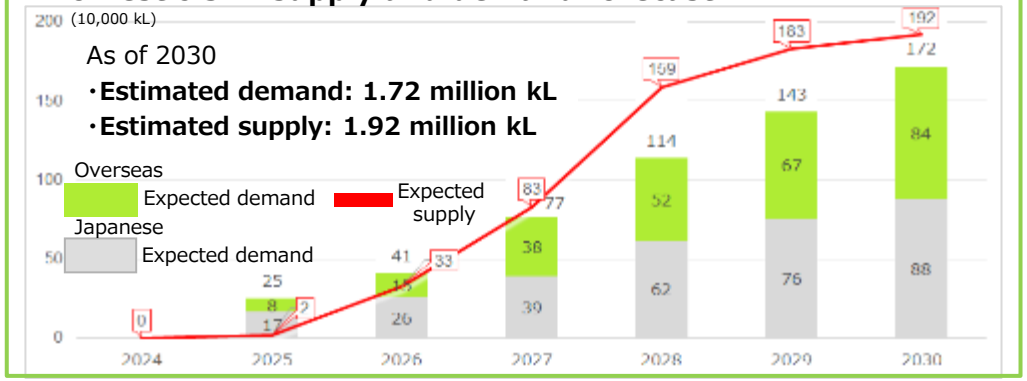
Schedule

1st APR 2022
2nd NOV 2022
3rd MAY 2023
4th JAN 2024

the 4th Public-Private Council for the Promotion of SAF



■Domestic SAF supply and demand forecast



■Regulations

supplier

✓ The target amount of SAF supply will be set at Act on the Promotion of Use of Non-Fossil Energy Sources and Effective Use of Fossil Energy Materials by Energy Suppliers (Sophisticated Methods Act) (planned)

airline

✓ SAF utilization targets set in the Basic Policy for the Promotion of Decarbonisation of Aviation. **"10% fuel consumption replacement in 2030"**

■Support

Utilizing GX transition bonds

✓ Capital investment support for building large-scale SAF manufacturing facilities (approximately 340 billion yen)

✓ Tax credits of 30 yen per litre of SAF produced and sold in Japan under the "Tax incentives to Promote Domestic Production in Strategic Fields".

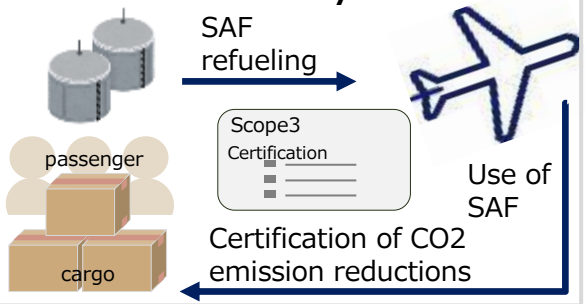
■CORSIA eligible fuel registration/certification support

①Support for pilot operators

②Creating guidelines

③Participation in ICAO FTG and addition to the list

■Visualization of CO2 emission reductions by SAF



■ First domestic blend of imported neat SAF

■Support for the introduction of facilities and equipment necessary for accepting SAF at airports

SAF – Public-Private Council

ACT SAF

Public–Private Councils for the promotion of SAF deployment

Japan's quantified target : Replacing 10% of the fuel consumed by Japanese airlines with SAF by 2030

Accelerating the actions to reach the target, JCAB has established the **Public-Private Council**

Purposes

- ✓ To facilitate the domestic SAF production
- ✓ To construct the SAF supply chains including imported SAF

Key outcomes

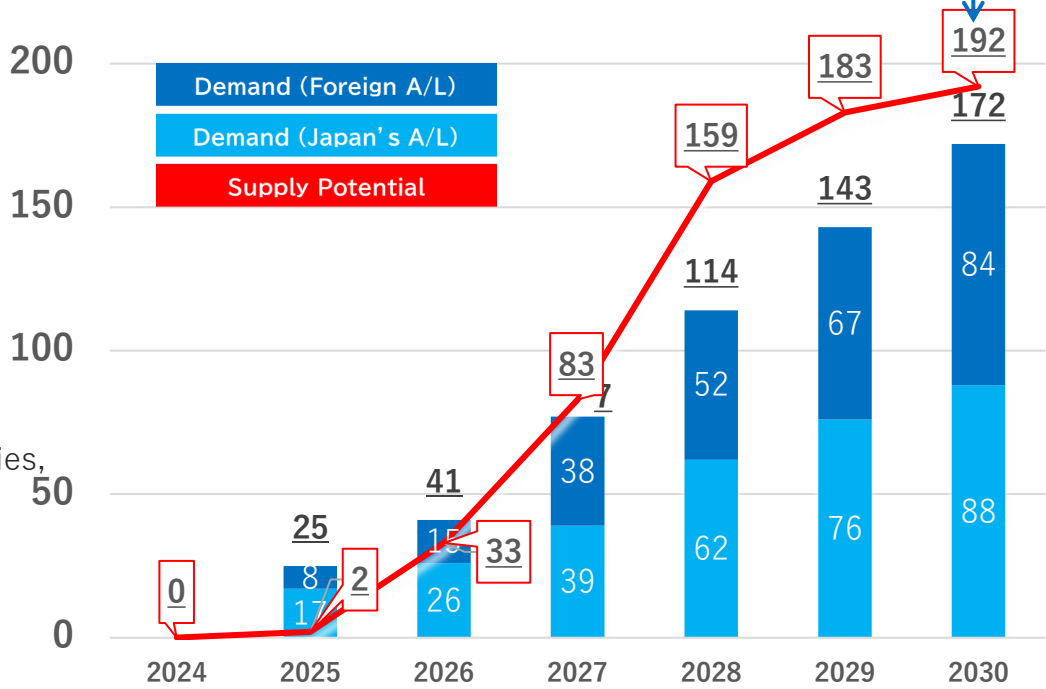
- ✓ **Set future projection of supply & demand**
- ✓ Established policy of regulation and Support

Members

- ✓ Private sector:Airlines, airport companies, oil companies, BOAR etc.
- ✓ Public sector:METI (Energy), MoE (Environment), MAFF(Agriculture), MLIT (JCAB)

Projection of SAF Demand and Supply in Japan

Demand 1.72 bn L, 454 M gal.
Supply 1.92 bn L, 507 M gal.



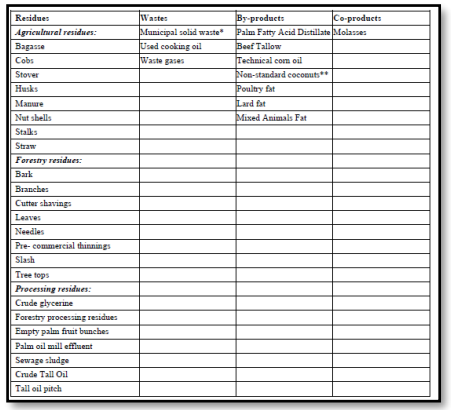
New SAF feedstock was approved by ICAO based on Japan's proposal

- The proposal from Japan Civil Aviation Bureau (JCAB) to include "Non-standard Coconuts" in Positive List was approved by ICAO as new SAF feedstock.

Proposed to ICAO in March and July 2023

ICAO Document revised in March 2024

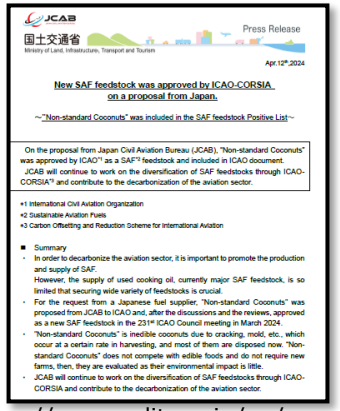
CORSIA METHODOLOGY FOR CALCULATING ACTUAL LIFE CYCLE EMISSIONS VALUES



Residues	Wastes	By-products	Co-products
Agricultural residues:	Municipal solid waste*	Palm Fatty Acid Distillate	Molasses
Bagasse	Used cooking oil	Beef Tallow	
Cobs	Waste gases	Technical corn oil	
Stover		Non-standard coconuts**	
Husks		Poultry fat	
Manure		Lard fat	
Nut shells		Mixed Animals Fat	
Stalks			
Straw			
Forestry residues:			
Bark			
Branches			
Cutter shavings			
Leaves			
Needles			
Pre- commercial thinnings			
Slash			
Tree tops			
Processing residues:			
Crude glycerine			
Forestry processing residues			
Empty palm fruit bunches			
Palm oil mill effluent			
Sewage sludge			
Crude Tall Oil			
Tall oil pitch			

Positive list

Press release issued by JCAB in April 2024


JCAB
国土交通省
Ministry of Land, Infrastructure, Transport and Tourism
Press Release
Apr.12th,2024

New SAF feedstock was approved by ICAO-CORSIA on a proposal from Japan.

~"Non-standard Coconuts" was included in the SAF feedstock Positive List~

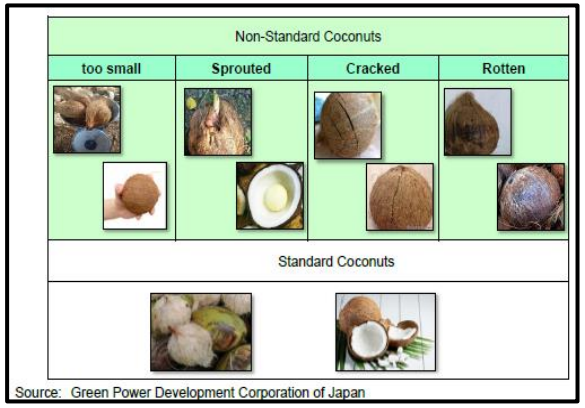
On the proposal from Japan Civil Aviation Bureau (JCAB), "Non-standard Coconuts" was approved by ICAO*1 as a SAF*2 feedstock and included in ICAO document. JCAB will continue to work on the diversification of SAF feedstocks through ICAO-CORSIA*3 and contribute to the decarbonization of the aviation sector.

*1 International Civil Aviation Organization
*2 Sustainable Aviation Fuels
*3 Carbon Offsetting and Reduction Scheme for International Aviation

■ Summary

- In order to decarbonize the aviation sector, it is important to promote the production and supply of SAF. However, the supply of used cooking oil, currently major SAF feedstock, is so limited that securing wide variety of feedstocks is crucial.
- For the request from a Japanese fuel supplier, "Non-standard Coconuts" was proposed from JCAB to ICAO and, after the discussions and the reviews, approved as a new SAF feedstock in the 231st ICAO Council meeting in March 2024.
- "Non-standard Coconuts" is inedible coconuts due to cracking, mold, etc., which occur at a certain rate in harvesting, and most of them are disposed now. "Non-standard Coconuts" does not compete with edible foods and do not require new farms, then, they are evaluated as their environmental impact is little.
- JCAB will continue to work on the diversification of SAF feedstocks through ICAO-CORSIA and contribute to the decarbonization of the aviation sector.

https://www.mlit.go.jp/en/report/press/kouku08_hh_000003.html



Classification of Non-standard Coconuts

Regulations and Supports for SAF Deployment

Objective

- Secure SAF manufacturing capacity and feedstock supply chain
- Establish a stable supply system for SAF at internationally competitive prices
- Set legal targets for SAF use and supply, and consider government supports

Regulations

* Under planning

(Fuel Supplier)

- **SAF supply target for 2030 based on the existing law**

(Aircraft Operator)

- **Targeted amount of SAF use in 2030 (10%) in the decarbonization promotion plan**

Supports

* Under planning

(CAPEX) **(336.8 bn JPY in total)**

- **Support for initial investment and feedstock supply chain**

(OPEX)

- **Consideration of tariff and petroleum tax exemptions for feedstock and imported SAF**
- **Introduction of tax credit for SAF production (30 JPY/liter)**

(Technology Development / Demonstration / Certification)

- **Support for SAF derived from inedible feedstocks***

* Second generation ethanol, algae and waste

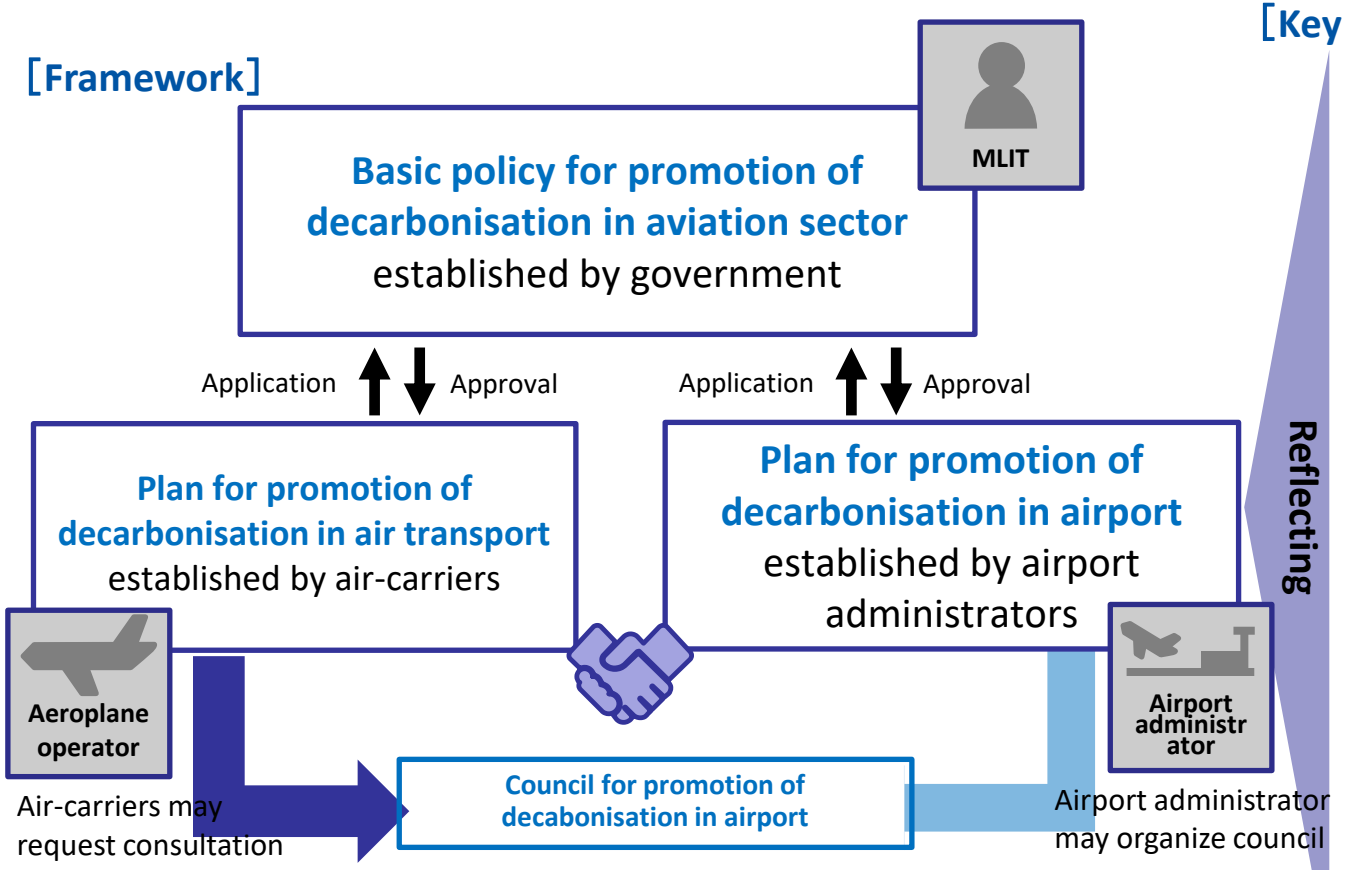
Framework for promotion of decarbonization in aviation sector

- The MLIT introduces an institutional decarbonization framework to share actions based on the roadmaps and to allow each operator and airport to take action voluntarily and systematically and to increase their accountability.

➡ **Amendment of the Civil Aeronautics Act/Airport Act :**

The Promotion of decarbonisation is stipulated in the provision for the purpose of the acts.

[Framework]



[Key actions] Contents listed in Roadmaps

Reflecting

Aircraft operation field

- **New technologies**
- **Improvement of flight operation**
- **Promotion of the introduction of SAF**

Airport field

- **Reduction of airport facility and GSE**
- **Introduction of renewable energy**
- **Reduction of aircraft on the ground and airport access etc.**

Revised schedule
(Promotion of SAF introduction)

● Legend: 1. Investigation /examination phase | 2. Demonstration phase | 3. Full-scale operation/ Introduction expansion phase

SAF

2024 2025 2026 2027 2028 2029 2030 ~ 2040 ~ 2050

* Year represents the calendar year

Domestic SAF production/supply

Domestically produced SAF (Agency for Natural Resources and Energy)

- Demonstration of large-scale production with GI Fund
- SAF supply target for 2030 set in Energy Supply Structure Enhancement Act
- GX Economy Transition Bonds (construction of mass production SAF facilities)
- Tax credits according to production volume, etc. under the tax system for promoting domestic production in strategic areas
- Expand SAF produced by HEFA process･Commercialize SAF produced by ATJ process
- → SAF supply expansion

Supply chain building

Support for setting up of facilities to accept SAF at airports

- Facilitiy set up subsidy →
- → Full-scale SAF accceptance

Information sharing with airport stakeholders

- Collaborate with the Airport Decarbonization Promotion Councils and share information on quality control, etc. with airport stakeholders

Local production for local consumption

Promote the use of SAF at regional airports * Collaboration with the " Study Group on CO2 Reduction in the Airport Sector"

- Study to supply at regional airports
- Locally-led "local production for local consumption" business
- Nationwide expansion

International certification of fuels

Obtain international certification (CEF: CORSIA Eligible Fuels)

- Sort out issues through collaboration with pilot economic operators and acquire knowledge through collaboration with international consultants →
- Discuss in ICAO expert meetings, promote rule-making and registration in ICAO
- Application to ICAO for registration of new feedstocks and production processes and development of default values
- → Robust supply of domestically produced SAF through various feed stocks and production processes
- Collect and analyze information related to ASTM discussions
- Relax limit of co-mingle
- → Apply 100% SAF in the domestic

Enhance support system for international certification

- Continuous updates of the guide to register and certify as CEF →
- Collaboration with universities, research institute, etc.
- → Independent activities by economic operators and expertized organizations
- Support for launching a certification scheme
- Support against growing certification demands

Visualization and evaluation of CO2 reduction through SAF use

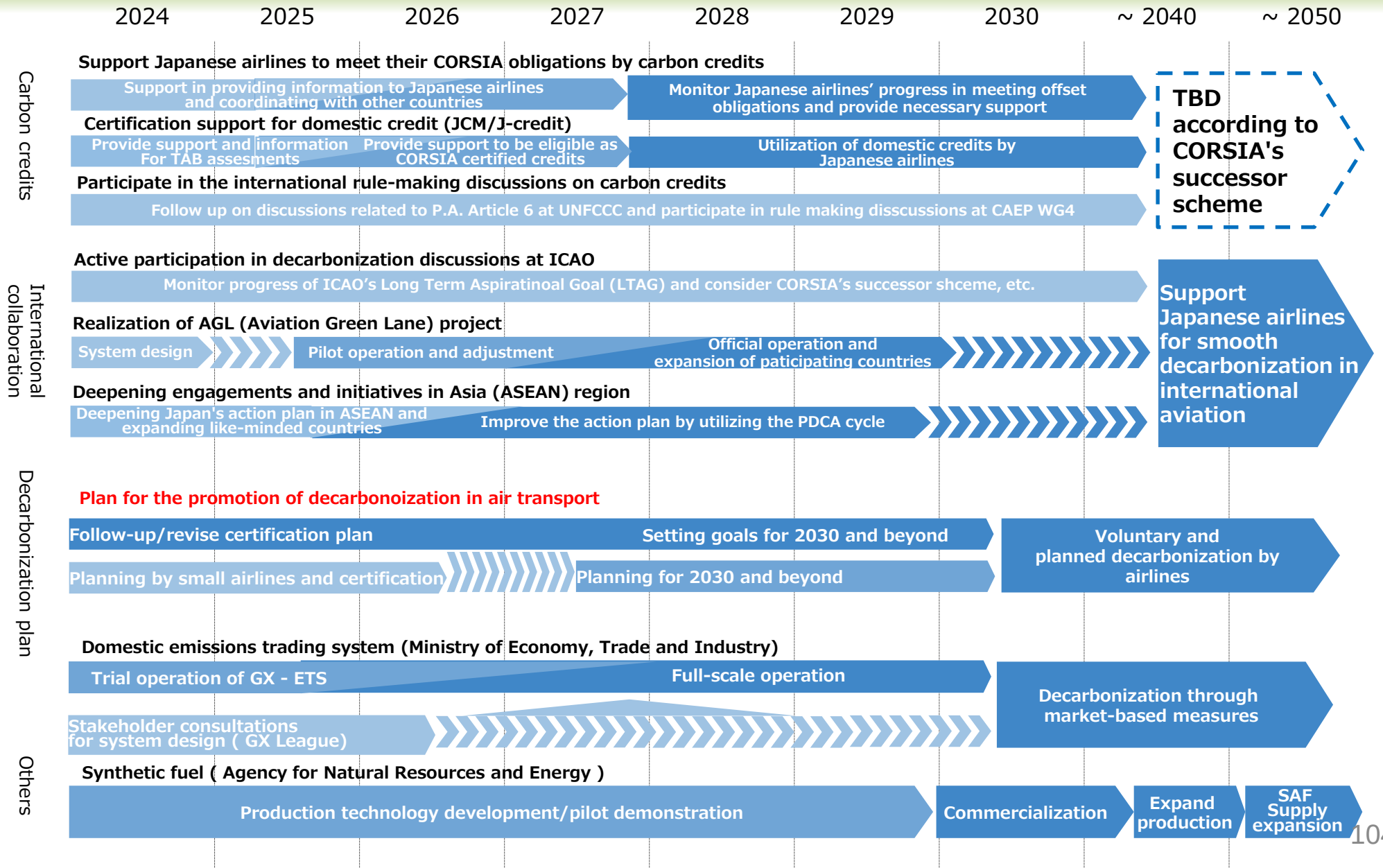
- Validate guide with pilot project
- Launch cerrtification services by private sector
- Full-scale operation and expansion of certification services
- → Sustained use of SAF for increasing environmental awareness in the aviation users

Public relations activities aimed at building momentum for SAF use

- Hold symposiums, disseminate information on the web, etc.

Schedule

(Carbon credits, International collaboration, Decarbonization plan, etc.)



Future Vision

- Japan will continue to work on the following initiatives and incorporate them into the SAP 2024, together with activities under the Public-Private Council.
  - CORSIA eligible fuel registration/certification support
  - Visualization of CO2 emission reductions by SAF
  - Establishing Supply Chain for SAF
  - SAF production Support

- JCAB would like to emphasize the importance of setting targets and plans in SAP, and introduction of SAF along with SAP.

Questions and Answers

Closing Remarks

Upcoming ICAO Events

ICAO Symposium on Non-CO2 Aviation Emissions

16-18 September 2024, ICAO HQ, Montreal, Canada

https://www.icao.int/Meetings/SymposiumNonCO2AviationEmissions2024/

ICAO LTAG Stocktaking event

7-10 October 2024, ICAO HQ, Montreal, Canada

https://www.icao.int/Meetings/LTAGStocktaking2024/

Follow up actions

We need your assistance on the following actions:

- **Support the development of the SAF business implementation template**
  - **Inputs/comments will be welcome**
- Suggest “latest news” for inclusion in next ACT-SAF series
- Suggest possible consultants with suitable expertise for the upcoming ACT-SAF Projects.
- Contact ICAO if your State is looking for any specific support (e.g. local training)

Responses to officeenv@icao.int will be appreciated

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