

# SUSTAINABLE AVIATION FUEL (SAF)

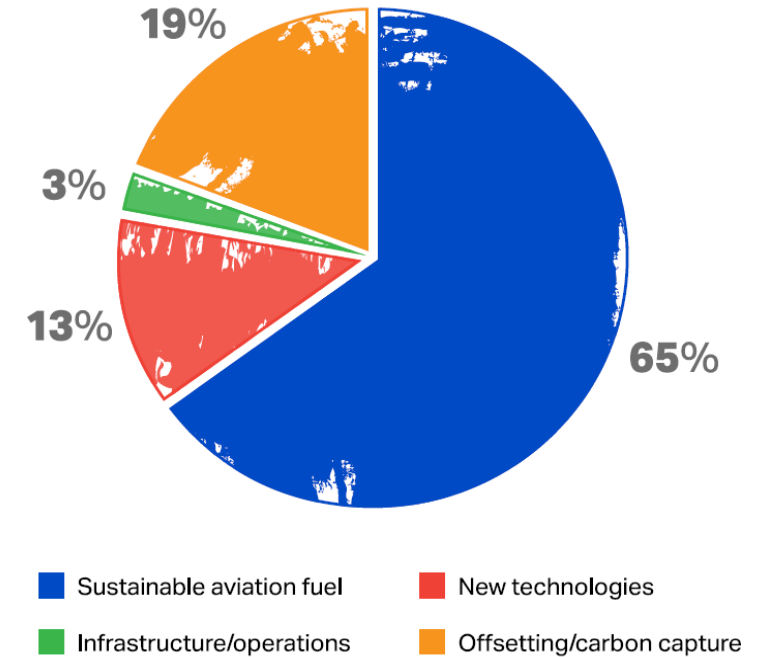
Background on SAF



# SAF is a Critical Aviation Decarbonisation Lever

- Aviation is currently responsible for approximately 2% of global CO<sub>2</sub> emissions<sup>1</sup>, and could grow to 22%<sup>2</sup> by 2050 if no action is taken.
- ICAO and its Member States are committed to achieving net-zero carbon emissions by 2050<sup>3</sup> and adopted a collective global vision to reduce carbon emissions by 5% by 2030<sup>4</sup> using cleaner energies, including SAF.
- SAF is estimated to reduce 65% of global aviation emissions by 2050. New aircraft technologies, operations/infrastructure improvements and carbon offsetting measures will make up the remaining.
- SAF represented around 0.2% of global jet fuel consumption in 2023<sup>5</sup>.

Contribution to achieving Net Zero Carbon in 2050



Source: IATA Net Zero Resolution Factsheet

<sup>1</sup> Aviation is currently responsible for approximately 2.4% of global CO<sub>2</sub> emissions. Without action, those emissions are estimated to reach around 2 gigatons by 2050 (Source: IATA Economics Report, July 2023).

<sup>2</sup> Source: European Parliament Policy Department A for the Committee on Environment, Public Health and Good Safety, “Emission Reduction Targets for International Aviation and Shipping”.

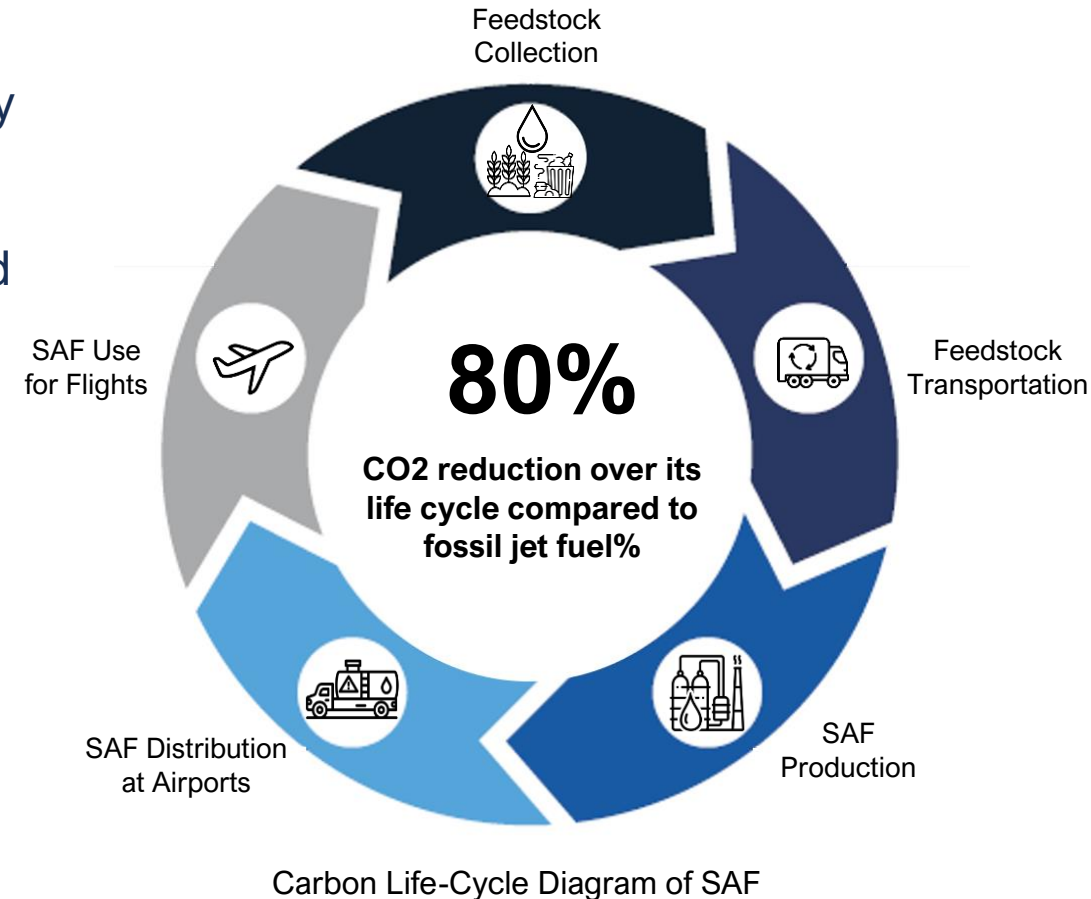
<sup>3</sup> At its 41st Assembly in 2022, ICAO adopted a collective long-term aspirational goal for international aviation of achieving net-zero carbon emissions by 2050.

<sup>4</sup> At the Third ICAO Conference on Aviation and Alternative Fuels (CAAF/3) in 2023, ICAO and its Member States agreed to strive to achieve a collective global aspirational Vision to reduce CO<sub>2</sub> emissions in international aviation by 5 per cent by 2030, through the use of cleaner energies.

<sup>5</sup> In 2023, SAF production doubled to 600 million liters from 300 million liters in 2022, representing 0.2% of global jet fuel use (Source: IATA Net Zero 2050 - SAF Factsheet)

# What is SAF?

- Cleaner fuel that can reduce CO2 emissions over lifecycle by up to 80%, compared to fossil jet fuel.
- Can be produced from feedstock such as waste fats, oils and greases, municipal solid waste, agricultural and forestry residues as well as crops cultivated on marginal land. Also produced synthetically by capturing carbon directly from the air.
- Chemically similar to fossil jet fuel and can be safely used as a drop-in fuel with no modifications to aircraft or infrastructure. Today, commercial flights can fly with a 50-50 blend of SAF and fossil jet fuel (i.e., 50% SAF blend). The industry is working towards commercial aircraft being permitted to fly with 100% SAF by 2030.
- HEFA (Hydroprocessed Esters & Fatty Acids) is currently the predominant SAF pathway, given that it is the most commercially mature. HEFA uses feedstock such as waste fats, used oils and grease. AtJ (Alcohol-to Jet) and GFT (Gasification Fischer-Tropsch) are undergoing commercial pilots while PtL (Power-to-Liquid) technology is still under development.



# SAF Price Premiums and Volatility

- The SAF industry is very nascent.
- High price premium of 3-5 times over fossil jet fuel, mainly due to the high feedstock prices (due to limited supply) and production costs.
- Greater price volatility compared to fossil jet fuel, likewise due to small supply and high demand.
- Still niche market with no global price index or futures market for risk management or price discovery.

## SAF trades at a premium compared to conventional jet fuel



Note: All prices in U.S. cents per gallon

An indicative price trend and volatility of SAF price relative to fossil jet fuel.  
Source: Argus Media (Copyrights: Reuter Graphics)

# SAF Policy in other regions

- Within Asia-Pacific region
  - Japan is planning a SAF mandate of 10% by 2030
  - India is considering a SAF mandate of 1% by 2027 and increasing to 5% by 2030 for international flights.
  - In its Aviation Green Paper released in September 2023, Australia is considering setting a SAF mandate and providing supply-side support measures to encourage SAF production in Australia.
- Other regions
  - Norway implemented SAF mandate of 0.5% in 2020. Sweden and France started 1% SAF mandate in 2021 and 2022 respectively.
  - The EU is planning a SAF mandate of 2% in 2025, increasing this to 6% and 70% by 2030 and 2050.
  - The UK planning a SAF mandate of 10% by 2030.
  - The US adopted incentives to support SAF production and use.

Country	SAF Uptake Level	Status
European Union	<b>2% by 2025</b> , 6% by 2030 (of which 1.2% synthetic fuel), 20% by 2035 (5%), 34% by 2040 (10%), 42% by 2045 (15%) and 70% by 2050 (35%)	Approved by EU Parliament in Sep 2023; approval by each EU Member State needed before passing into law
France	<b>1% by 2022</b> , 2% by 2025, 5% by 2030	In force today
Germany	0.5% from 2026, 1% from 2028, 2% from 2030 (synthetic fuel)	Approved
India	1% by 2027, 2% by 2028, 5% by 2030 (for international flights only)	Under consideration
Japan	10% by 2030	Under consideration
Norway	<b>0.5% in 2020</b> , 30% in 2030	In force today
Sweden	<b>1% in 2021</b>	In force today
United Kingdom	10% by 2030	Published under UK Jet Zero Strategy; pending approval

# Airline SAF Commitments

Airlines	SAF Uptake Level
<b>Association of Asia Pacific Airlines (AAPA)</b> (Air Astana, Air India, All Nippon Airways, Bangkok Airways, Cathay Pacific, China Airlines, Eva Air, Garuda Indonesia, Japan Airlines, Malaysia Airlines, Philippine Airlines, Royal Brunei Airlines, Singapore Airlines, Thai Airways, Vietnam Airlines)	Collective ambition to strive for SAF utilisation target of 5% by 2030
<b>Oneworld Alliance</b> (Alaska Airlines, American Airlines, British Airways, Cathay Pacific, Fiji Airways, FinnAir, Iberia, Japan Airlines, Malaysia Airlines, Oman Air, Qantas, Qatar Airways, Royal Air Maroc, Royal Jordanian, SriLankan Airlines)	10% by 2030
Air France-KLM Group	10% by 2030
All Nippon Airways	10% by 2030
Cathay Pacific	10% by 2030
Delta Airlines	10% by 2030, 35% by 2035, and at least 95% by 2050
Japan Airlines	10% by 2030
Qantas	10% by 2030, and approximately 60% by 2050
Singapore Airlines Group (Singapore Airlines and Scoot)	Target to use SAF for 5% of total fuel requirements by 2030
United Airlines	100% green (CO2 reductions) by 2050, including SAF



THANK YOU

