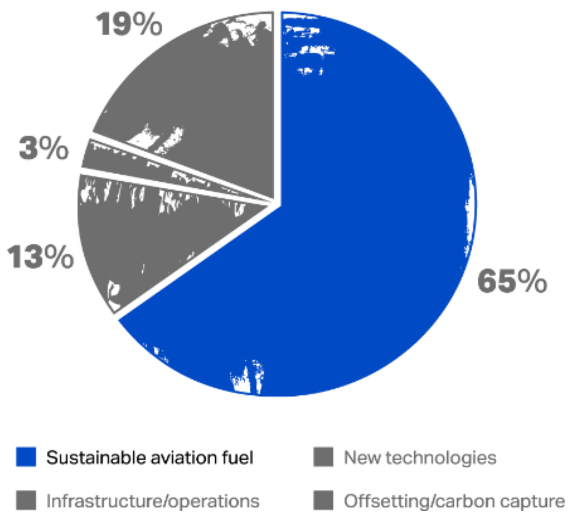
Sustainable Aviation Fuels (SAF)

Fact Sheet

Overview

The aviation industry's net zero carbon emissions by 2050 target is focused on delivering maximum reduction in emissions at source, through the use of sustainable aviation fuels (SAF), innovative new propulsion technologies, and other efficiency improvements (such as improvements to air traffic navigation). SAF is the main lever for aviation's decarbonization and is estimated to provide around 65% of emission reductions needed to reach net zero CO2 emissions by 2050.



Contribution to achieving Net Zero Carbon Emissions in 2050

What is SAF?

SAF is a non-fossil fuel for use in aircraft. It can be produced from many different sustainably sourced materials called feedstocks, such as used cooking oil, biomass waste and residues, and renewable energy and carbon. These materials can be converted using multiple technology pathways, and lifecycle carbon emission reductions vary by fuel type.

To qualify under international sustainability frameworks, SAF must meet stringent sustainability and lifecycle emissions-reduction criteria, such as those set by the International Civil Aviation Organization (ICAO) under its Carbon Offsetting & Reduction Scheme for International Aviation (CORSIA) framework. IATA estimates that Sustainable Aviation Fuel (SAF) could contribute up to 65% of the reduction in emissions needed by aviation to reach net zero CO2 emissions by 2050.

Today, most SAF production uses waste- and residue-based feedstocks through the Hydroprocessed Esters and Fatty Acids (HEFA) pathway, typically delivering lifecycle emissions reductions of around 80% compared to conventional aviation fuel. Emerging technologies and new feedstocks have the potential to increase lifecycle emissions reductions above 90%, even achieving negative emissions on a lifecycle basis.

In addition to reducing emissions, SAF can strengthen a country's energy security by diversifying the energy supply and building domestic fuel production from locally available resources. SAF can also support economic growth by driving investment in agriculture, waste management, renewable energy, and advanced fuel technologies, and create new jobs across all these new industries.

What makes SAF sustainable?

SAF is considered sustainable because it is produced from renewable or waste-based sources that can reduce lifecycle greenhouse gas (GHG) emissions significantly compared with conventional aviation fuel, while avoiding negative environmental and social impacts.

To ensure environmental integrity, SAF must meet strict sustainability criteria and certification requirements covering feedstock sourcing, land-use change, biodiversity protection, water use, and emissions accounting. International frameworks and certification schemes also require traceability and independent verification throughout the supply chain to ensure that SAF delivers genuine and credible environmental benefits.

What are the challenges with SAF?

Scaling SAF production so that the cost can come down is a key challenge for this new energy market. SAF currently represents less than 1% of global aviation fuel use, and it is several times more expensive than conventional aviation fuel because of more expensive feedstocks, still developing production technologies, lack of physical and market infrastructure, and high upfront investment needs.

As with the wind and solar energy markets when they were new, addressing these challenges will require supportive government policies, a coherent strategy across the wider energy system, and close collaboration across the aviation value chain. A strategically sequenced, energy-system-wide approach to new energy market policies can help accelerate decarbonization across sectors, including aviation.

IATA's role in supporting SAF's scale-up

IATA actively supports the scale-up of SAF through analysis, solutions, and extensive partnerships in the industry and beyond.

IATA developed the Net Zero Roadmaps 2050 that chart the path to net zero by covering aircraft technology, energy, operations, finance, and policy. Our research covers SAF feedstocks and production technologies, lifecycle emissions, non-CO2 effects, fuel supply and demand, infrastructure needs, policy frameworks, financing barriers, and the role of emerging technologies, including carbon capture.

IATA works to promote the most effective policy measures when it comes to building new energy markets. Policies must integrate operational realities as they pertain to our uniquely multi-jurisdictional industry. Harmonization, simplification, and competition-neutrality are all essential for delivering the greatest possible emissions reductions at the lowest possible cost.

IATA collaborates with governments and international bodies such as the International Civil Aviation Organization (ICAO) to this end and supports the implementation of global mechanisms such as CORSIA to accelerate SAF deployment.

IATA launched the Civil Aviation Decarbonization Organization (CADO) that operates a SAF registry to accelerate the scaling of the SAF market: the CADO SAF Registry. Without a SAF registry, the market would remain local until the infrastructure that can make the market global arrives. This global system is open to all SAF value chain stakeholders and manages the chain of custody of SAF environmental attributes, ensuring that these are transparently tracked across the value chain and can be credibly claimed under both regulatory obligations and voluntary schemes by airlines and their customers.

On the procurement side, the IATA SAF Matchmaker facilitates early-stage SAF transactions by connecting airlines with SAF producers, matching supply offers with demand and improving market visibility for early commercial engagement.

Together, these solutions reduce transaction complexity, build market confidence, and support the development of a more scalable global SAF market.

SAF production tracker

Year	SAF production	Notes
2020	**0.04Mt** (~40 million liters)	Only small-scale HEFA production; pandemic suppressed output
2021	**0.08Mt** (~100 million L)	First clear uptick; still <0.05% of jet fuel
2022	**0.25Mt** (~300 million L)	Production tripled vs 2021
2023	**0.5Mt** (~600 million L)	Production tripled again; ~0.2% of jet fuel
2024	**~1.0 Mt** (≈1.3 bn L)	Doubled vs 2023; ~0.3% share

2025 (est.)	**~1.9 Mt** (2.4 billion L)	~0.6% of global jet fuel
2026 (proj.)	**~2.4 Mt** (3 billion L)	Growth slows; ~0.8% share

Main milestones so far:

- **2008:** The first test flight with biojet fuel was performed by Virgin Atlantic.
- **2011:** SAF approved for use in aircraft operations
- **2011–2015:** 22 airlines performed over 2,500 commercial passenger flights with blends of up to 50% biojet fuel from feedstock including used cooking oil, jatropha, camelina, and algae.
- **January 2016:** Regular sustainable fuel supply through the common hydrant system started at Oslo Airport.
- **March 2016:** United became the first airline to introduce SAF into normal business operations by commencing daily flights from LAX.
- **June 2017:** At the 73rd IATA AGM in Cancun, IATA members unanimously agreed a resolution on the deployment of SAF.
- **November 2019:** Commercial SAF flights exceed 250,000 and 45 + airlines gain experience using SAF.
- **June 2020:** Two new technical SAF certifications are approved by ASTM increasing the approved technical pathways for SAF production to seven.
- **October 2021:** The 77th IATA AGM in Boston approved a resolution for the global air transport industry to reach net-zero carbon emissions by 2050. This commitment aligns with the Paris Agreement temperature goal.
- **October 2022:** adoption of a Long Term Aspirational Goal (LTAG) to achieve net zero CO2 emissions by 2050 at the 41st ICAO Assembly.
- **In 2022,** SAF production tripled to 300 million liters from 100 million liters in 2021.
- **In June 2023,** IATA released a series of strategic roadmaps to reach net zero by 2050, including SAF.
- **In October 2023,** the EU adopted ReFuelEU Aviation which completed the 'Fit for 55' legislation. Aviation fuel suppliers will have to blend increasing amounts of SAF with kerosene, starting with a 2% minimum blend in 2025, and rising to 70% in 2050.
- **In November 2023**, The ICAO CAAF/3 agreed a global framework to promote SAF production for international aviation to be 5% less carbon intensive by 2030, through the use of SAF.
- November 2023, Virgin Atlantic operated the world's first transatlantic flight flown on 100% SAF by a commercial airline.
- **In 2023,** SAF production tripled to 600 million liters vs 2022, representing 0.2% of global jet fuel use.
- **In 2024**, SAF production doubled to 1Mt vs 2023 or 0.3% of global jet fuel use. 11 SAF pathways are certified.
- **In 2025,** SAF production reached 1.9Mt or 0.6% of global jet fuel use. EU and UK SAF mandates kicked in and have failed to accelerate SAF production and adoption, instead creating significant unintended consequences. The EU released its Strategic Transport Investment Plan (STIP) to address some of these issues, but still fell short of industry expectations.
- **In 2026,** SAF production growth is projected to slow down and reach 2.4 Mt.

Role of governments in scaling SAF

Governments play a critical role in scaling SAF, particularly in creating the policy and investment conditions needed to accelerate production, reduce costs, and support market development. Given that SAF production technologies and supply chains are still at very early stages of development, supportive government policies are essential to help bridge the price gap between SAF and conventional aviation fuel and provide long-term certainty for investors and producers.

Key measures may include production incentives, grants, loan guarantees, supportive regulatory frameworks, research and innovation support, and policies that facilitate access to feedstocks and infrastructure.

Governments also play an important role in promoting internationally harmonized sustainability and certification frameworks to support the development of a global SAF market. Governments should also support the development and recognition of global SAF book-and-claim systems, consistent with the purchase-based claiming approach allowed under CORSIA, to help create a more efficient, transparent, and globally connected SAF market. IATA has developed the Net Zero Policy Roadmaps to support governments in this effort, providing a menu of policy options and practical measures that can help aviation achieve its decarbonization goals, including the scale-up of SAF production and deployment. Governments must also work through international bodies such as ICAO and mechanisms such as CORSIA to help ensure globally harmonized approaches to aviation decarbonization and the scale-up of SAF.

Importantly, governments should also consider policy sequencing as part of the broader energy transition. As highlighted in the IATA Energy Transition and System Transformation publication, effective sequencing of policies and investments is essential to avoid supply bottlenecks, infrastructure mismatches, and unintended market distortions. This includes aligning energy, industrial, transport, and climate policies to ensure that enabling conditions such as renewable energy availability, infrastructure development, technology readiness, workforce capabilities, and financing mechanisms evolve in a coordinated manner. A sequenced and systems-based policy approach can help accelerate SAF deployment while maintaining energy security, affordability, and competitiveness. Any SAF mandates should therefore be introduced only where the necessary market conditions, production capacity, infrastructure readiness, and supportive policy measures are sufficiently in place, in order to avoid unintended economic impacts, supply constraints, or disproportionate cost burdens on the aviation sector and consumers.