

WHY SUSTAINABLE AVIATION FUELS?

Sustainable Aviation Fuel: Pathways to Meet Growing Demand

In October 2021, the commercial aviation industry adopted a goal to achieve net-zero carbon for air transport by 2050. Sustainable aviation fuel (SAF) could contribute to 65% of the emissions reductions needed to reach this goal.

Currently, SAF represents only 0.2% of global jet fuel supply. However, governments around the world are implementing legislation that will spur enormous growth in SAF demand over the next two decades—presenting opportunities and challenges.

ENERGY EFFICIENCY PROGRESS

✈️ Annual Growth:

Air traffic is increasing by 5% each year.

✈️ Fuel Efficiency Gains:

- New aircraft generations are 20% more fuel-efficient than their predecessors.
- Overall, fuel efficiency has improved by over 80% since the 1950s.

✈️ Key Improvements:

Enhanced aerodynamics, advanced engine performance, and better operational practices across airlines and airports.

✈️ Future Outlook:

Despite ongoing efficiency improvements, the growing number of passengers is expected to drive overall emissions higher.

12%

Human-induced emissions produced from the transportation sector's 900 million metric tons/year.

4%

Accounts for global warming from greenhouse gas emissions, contrails, and other pollutants.

Fuel efficiency gains and technological advances have helped to reduced emissions, but they alone can't offset the growth in air traffic. SAF is essential to meeting the aviation sector's CO2 reduction goals.

KEY BENEFITS OF SAF

ENVIRONMENTAL BENEFITS

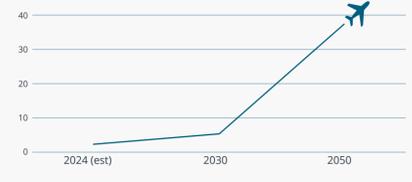
- Reduced CO₂ Emissions**
Up to 80% fewer CO₂ emissions over its lifecycle compared to conventional jet fuel.
- Lower Particulate Emissions**
Emits fewer particulates and soot, resulting in less persistent contrails.
- Waste Diversion**
Diverts waste from landfills and minimizes environmental discharge.
- Renewable Sources**
Made from renewable materials, unlike traditional non-renewable fossil fuels.

ECONOMIC AND SOCIAL

- Job Creation**
Production and distribution of SAF can create new jobs in agriculture, manufacturing, and transportation sectors.
- Investment Opportunities**
The shift to SAF presents investment opportunities in renewable energy technologies, infrastructure development, and production facilities.
- Public Health Improvement**
Lower pollutant emissions can improve public health by reducing air quality issues associated with conventional aviation fuels.

LEGISLATION DRIVING MARKET GROWTH

US SAF TRAJECTORY (Spot to Grand Challenge Targets, bn gal)



EU SAF MANDATE (% blends under ReFuel EU Aviation)

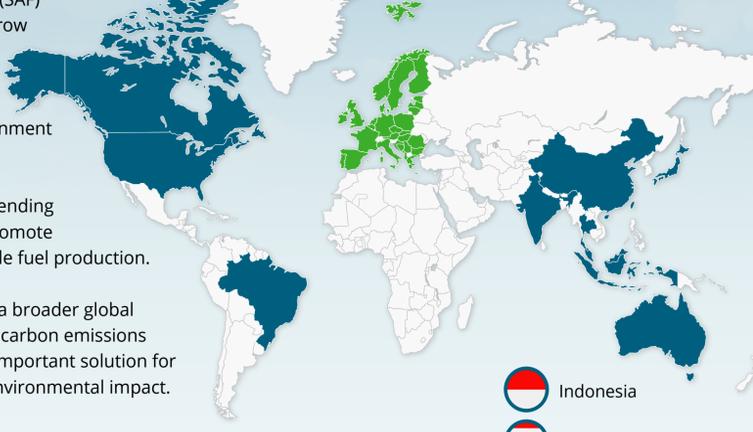


SAF Legislation Around the World Driving Market Growth

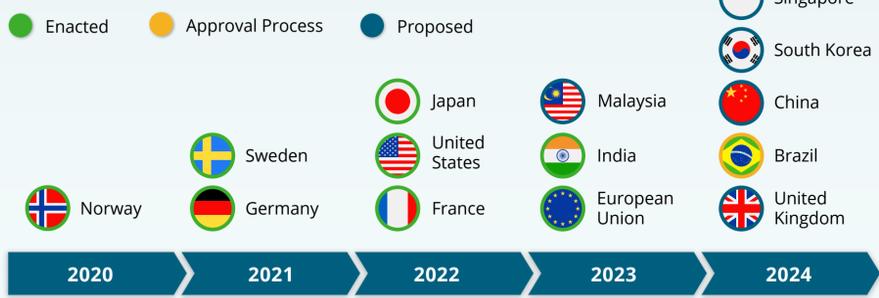
Sustainable aviation fuel (SAF) demand is expected to grow substantially over the next two decades. This surge in demand is largely driven by government initiatives, including:

Mandates that set SAF blending targets incentives that promote investments in sustainable fuel production.

These efforts are part of a broader global push to achieve net-zero carbon emissions by 2050, making SAF an important solution for reducing the aviation's environmental impact.



SAF Blending Target Timeline



MEETING DEMAND WITH PRODUCTION

How Will We Meet the Growing Demand for SAF?

DIVERSE FEEDSTOCKS

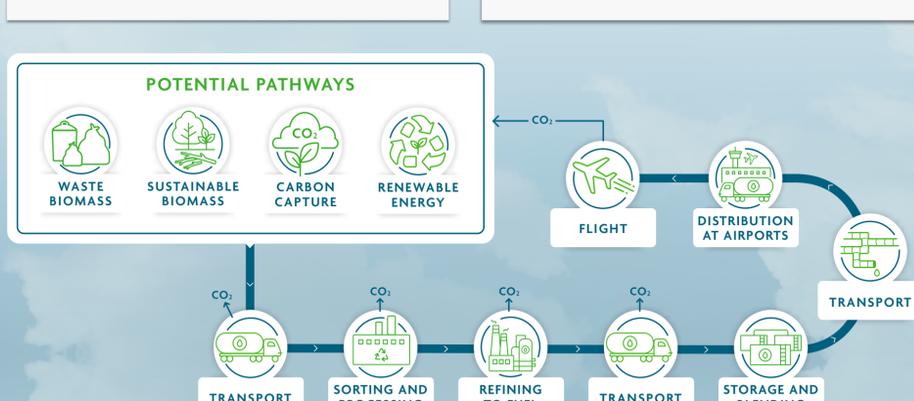
New and diverse feedstocks are needed to create enough supply.

- ENERGY CROPS
- MUNICIPAL SOLID WASTE
- AGRICULTURAL WASTE
- WOODY BIOMASS
- BIOGENIC CO₂
- GREEN HYDROGEN

TECHNOLOGICAL INNOVATIONS

Of the approved SAF production pathways, Hydroprocessed Esters and Fatty Acids (HEFA) is the predominant technology used currently. However, stress on fungible, high-quality HEFA supply is a risk. HEFA feedstocks, waste fats and oils, are limited by availability.

Fischer-Tropsch, Alcohol-to-Jet, and pyrolysis present promising routes for converting biomass into aviation fuel.



GUIDING YOUR STRATEGY WITH ACCURATE MARKET INSIGHTS

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