Rhodium Group

Energy & Climate

Seeking Alternatives: How Fast Can Sustainable Aviation Fuel Scale?

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The war in the Middle East and resulting blockages of the Strait of Hormuz have disrupted regional energy shipments, with widespread impact on the availability and price of oil. The price impact has been most acute for refined products like jet fuel, which have seen prices more than double since January. Regional jet fuel shortages and skyrocketing prices have led jet fuel exporters to cut exports to prioritize domestic markets, while importers scramble to secure enough supplies, putting significant pressure on the aviation industry, which has hiked fares and cut back flights. The crisis has intensified calls to build long-term resilience for jet fuel supplies by accelerating efforts to scale sustainable aviation fuels (SAF)—a non-petroleum-based alternative to conventional jet fuel made from renewable waste and feedstocks. European militaries, for example, are accelerating steps to boost their use of alternative fuels as supply shocks from the war in Iran accentuate the risks surrounding the continent's reliance on importing fossil fuels.

Scaling SAF to levels that could sufficiently cushion the industry to shocks of the scale we are seeing today may take decades, however. While SAF production has risen significantly in the past few years, it contributed less than 1% of global jet fuel consumption in 2025. In this note, we leverage Rhodium's Clean Investment Monitor data to map out the pipeline of announced SAF production facilities across the world and estimate just how quickly global SAF production can scale up in the coming years.

Sustainable aviation fuels are taking off

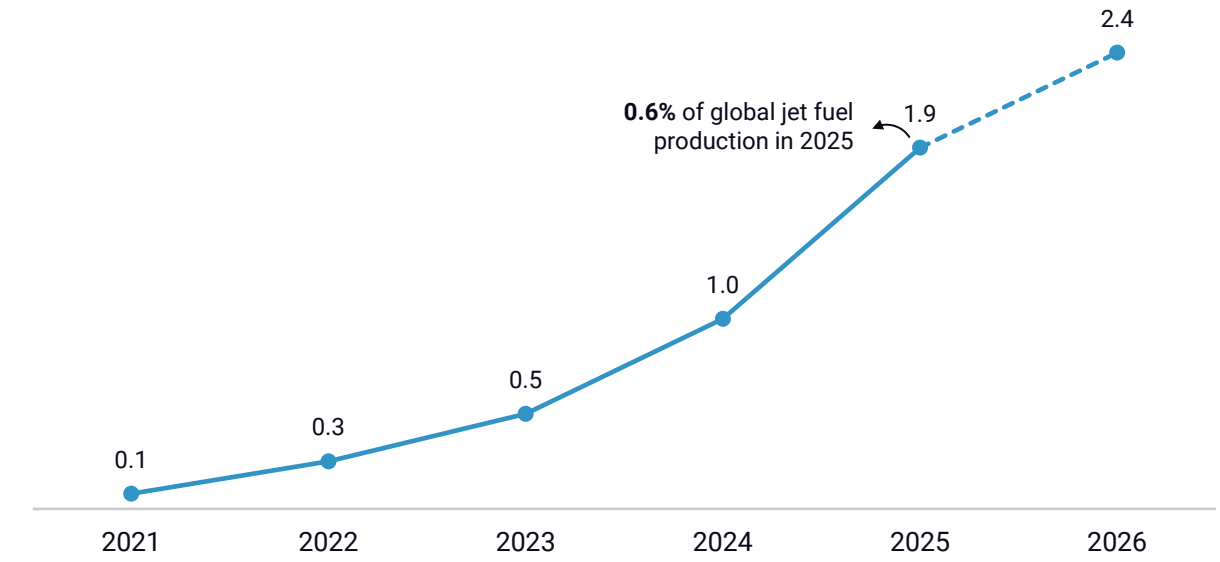
To date, the market for SAF has been relatively niche, driven by voluntary commitments by airlines and a handful of regulatory mandates in the European Union and UK (requiring jet fuel contain at least 2% SAF) and Norway (with a blend mandate of 0.5% SAF). New SAF mandates entered into force in 2026 in Switzerland (2% blend), Thailand and Singapore (1% blend), and are set to begin in 2027 in Korea (1% blend) and Brazil (requiring fuels achieve 1% reduction in GHG emissions compared to conventional jet fuel). Production support in the US has also helped scale the SAF industry with federal tax credits under the Inflation Reduction Act (IRA) and SAF crediting under California's Low Carbon Fuel Standard. Production has also taken off in China following the introduction of non-binding SAF consumption goals under its 14th Five-Year Plan, though the vast majority is exported for consumption in Europe.

As a result, SAF production levels have risen considerably over the past five years, with production more than doubling over the past three years (Figure 1). Despite its rapid rise, however, SAF contributed only 0.6% of global jet fuel production in 2025. The International Air Transport Association (IATA) warned that growth in SAF production is set to slow in 2026, reaching 2.4 million tons (approximately 18.9 million barrels), representing 0.8% of global jet fuel production under pre-war projections.

FIGURE 1

SAF production has risen steadily but contributes less than 1% of global jet fuel

Global sustainable aviation fuel production, million tons



Source: IATA

To put those figures in context, analysts estimate that the volume of jet fuel supply taken off the global market from the closing of the Strait of Hormuz is about 320,000 tons/day. Projected annual SAF production in 2026 would be sufficient to replace only about 7.5 days of the jet fuel disruptions that resulted from the closing of the Strait (which does not

take into account the long-term disruption to jet fuel supplies from damage inflicted on Middle East refineries).

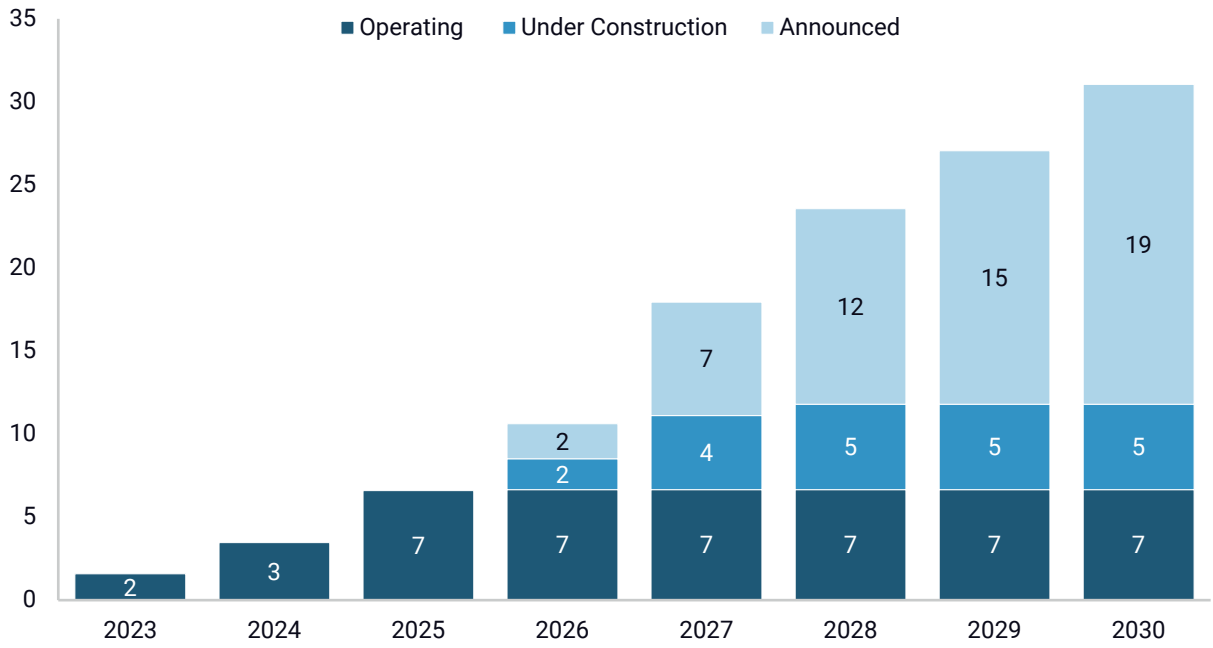
A strong SAF production project pipeline suggests future production could grow considerably

Given the small scale of current SAF production, ramping up SAF production to levels sufficient to cushion the aviation industry in times of severe jet fuel shortages will take significant time. Projects can take several years to go from initial investment announcements to production, so the current pipeline of SAF projects can tell us just how much additional SAF production is likely to be operational in the next three to five years. Based on new data from the Clean Investment Monitor, announced projects in the pipeline today could deliver approximately 19 million tons of SAF by 2030—tripling global SAF capacity in just five years (Figure 2).

FIGURE 2

SAF production expected to continue growth this decade with a strong pipeline of announced projects

Cumulative potential global sustainable aviation fuel capacity by current status, million tons



Source: Clean Investment Monitor, Rhodium Group
Note: Assumes 40% production of SAF from flexible HEFA facilities, where the split between SAF and renewable diesel or other clean fuels is not specified. Nameplate capacity, not adjusted for capacity factor or production ramps by year. Excludes speculative/intended facilities, feasibility studies, and facilities that are explicitly canceled or have missed their original entry-to-service date with no updated timeline provided.

Global SAF capacity far exceeded actual production and consumption in 2025 (by a factor of three), in part due to the ramp-up of new facilities with a total of 3.1 million tons of total capacity that came online in 2025 and likely need time to get to full production volumes. In addition, the vast majority of current SAF production is of fuels made from Hydrotreated

Esters and Fatty Acids (HEFA), which faces stiff competition from a rapidly growing market for renewable diesel. SAF from HEFA both competes with renewable diesel for feedstocks (from waste oils, fats, and grease), and many facilities are capable of producing both SAF and renewable diesel, and volumes of each fuel may vary each year depending on the market and price structures for both fuels.

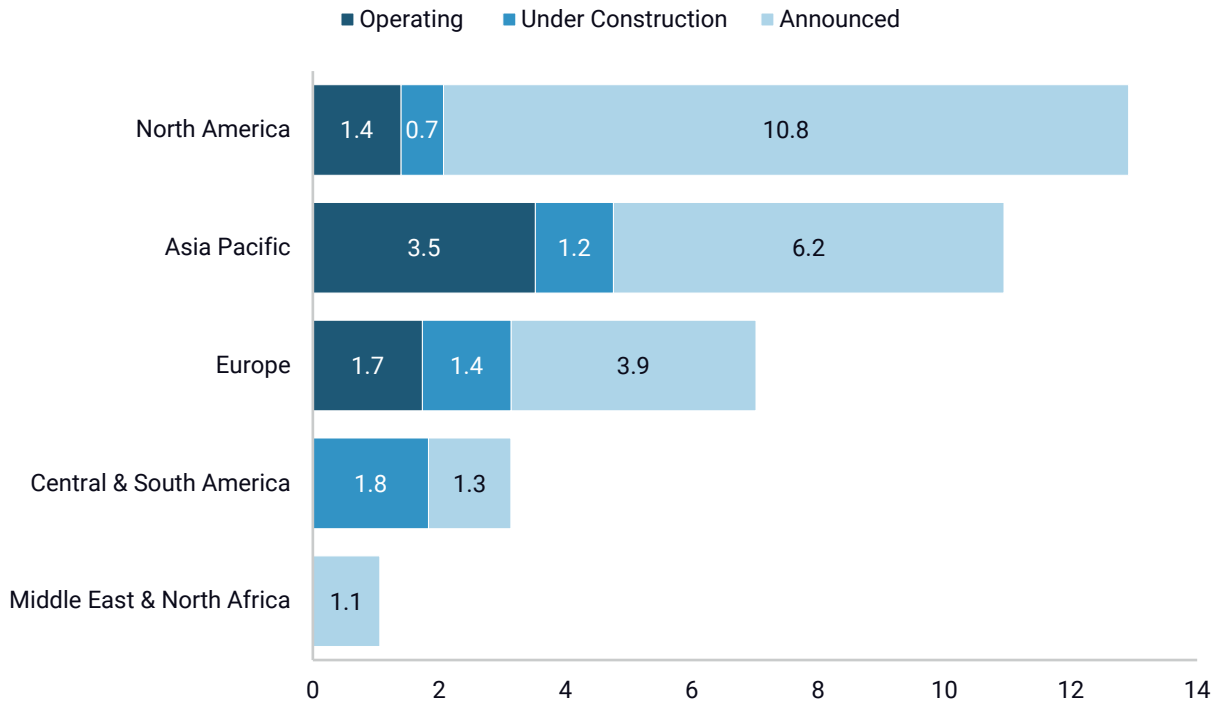
SAF production reflects more regional diversity than petroleum-based jet fuel

Unlike petroleum-based jet fuel, where production of the primary input (crude oil) is concentrated in a few key regions—with more than half of the world's crude produced by just five countries and around three-quarters of production from North America, the Middle East, and Russia—the outlook for regional distribution of SAF production is somewhat more diversified (Figure 3).

FIGURE 3

Asia dominates SAF production capacity today, but announced projects in North America, Europe, and Latin America could diversify supplies if projects proceed

Potential SAF production capacity by region and project status, million tons



Source: Clean Investment Monitor, Rhodium Group
Note: Assumes 40% production of SAF from flexible HEFA facilities, where the split between SAF and renewable diesel or other clean fuels is not specified. Nameplate capacity, not adjusted for capacity factor or production ramps by year. Excludes speculative/intended facilities, feasibility studies, and facilities that are explicitly canceled.

A large share of current capacity (53%) comes from Asia, with China producing 27%, Singapore 15%, Thailand 4.4%, Malaysia 4.0%, Korea 1.5%, and Japan 0.4%. Europe has the second-largest SAF production capacity (26%), which is concentrated in the

Netherlands (12%), Italy (6%), France (2.4%), and Finland (1.5%). The remainder of current SAF production capacity is based in the US (21%).

New SAF production capacity totaling 5.1 million tons is expected to come online in the coming years from projects that have commenced construction as of Q4 2025. Latin America has the largest share of projects under construction, with a 1.1 million ton project in Panama and one large project totaling 595,000 tons in Brazil. Europe has 1.4 million tons currently under construction, with 700,000 tons from a single project in the Netherlands and smaller projects in France, Germany, Portugal, and Spain. Asia has 1.2 million tons of new capacity under construction, nearly half of which is expected from four projects in China totaling 884,000 tons, and the remainder from smaller projects in Malaysia and Korea. An additional 672,000 tons are expected from five projects currently under construction in the US.

The geographic distribution of announced SAF production facilities gives an indication of where enthusiasm for SAF production has run high in the last couple of years, though there remains significant uncertainty whether these projects will actually break ground in the years ahead. The US is home to 9.2 million tons of announced SAF projects, representing 40% of all announced projects. Canada adds another 1.6 million tons, bringing North America's share of announced projects to just under half, making it the region with the largest SAF production potential if all projects proceed as planned.

Announced projects in Asia total 6.2 million tons, with China home to 3.5 million tons of announced projects (15% of the global total of announced capacity), with Japan contributing another 810,000 tons, 550,000 tons from Malaysia, 520,000 tons from Indonesia, 170,000 tons from Pakistan, and 120,000 tons from India. Europe is home to 3.9 million tons of announced capacity, spread across 12 countries, with the majority of new capacity concentrated in Sweden, the UK, the Netherlands, Italy, and Spain. In Latin America, Brazil is home to four announced SAF projects with an estimated capacity of 1.3 million tons. Announced projects in the UAE, Morocco, and Egypt totaling 1.1 million tons would mark the first SAF facilities in the Middle East and North Africa. For more details on the pipeline of SAF projects, including project size and status, visit the Clean Investment Monitor.

Challenges ahead for scaling SAF

In the months ahead, the world may have more clarity on the near- and long-term severity of the impact of the current conflict on oil supply disruption—whether from continued transit blockages or from further damage to Middle East refining capacity. What is clear, however, is that jet fuel supplies will remain tight and costly for many months, even if Iran reopens the Strait of Hormuz. Whether this translates into an accelerated long-term commitment to scaling fossil alternatives like SAF remains uncertain.

One particular challenge is the spate of delays and cancellations of announced projects that have been endemic to the industry to date. Across the 195 projects tracked by the Clean Investment Monitor since 2018, 17 projects that would have produced 2.9 million tons of SAF have been canceled (three of which were operational but retired early, including the World Energy facility at the Paramount Refinery in Southern California). Eight additional projects with an estimated capacity of 2.6 million tons were announced but have been placed on hold. Many of the 23.2 million tons of announced projects in the current pipeline are at considerable risk of languishing, with nearly one in five (totaling 3.7

million tons of potential capacity) lacking any recent activity, many of which have missed planned construction timelines.

Another challenge for SAF production volumes is the direct competition with renewable diesel, both in terms of competition for limited bio-based feedstocks and from flexible fuel facilities that are incentivized to prioritize renewable diesel production over SAF.

Taking all this into account, the outlook for SAF production in the coming five years is highly uncertain. We estimate that, given the current pipeline for SAF projects, production capacity in 2030 could be anywhere from 20 to 36 million tons. Output at the lower end of this range reflects the continued impact of the challenges outlined above, with only half of announced projects reaching completion on their expected timelines, and steep competition from renewable diesel that leads to dual fuel facilities shifting to prioritize renewable diesel production, and with only 20% SAF share of liquid outputs. A sunnier future for SAF production (resulting in 36 million tons in 2030) could materialize if all announced projects come online as planned and dual fuel facilities prioritize SAF.

Will the world double down on SAF in the years ahead?

Maximizing the potential for SAF to scale to levels that would cement it as a long-term alternative to petroleum-based jet fuel will require consistent demand signals in the coming years. Many regions have plans to increase their regulatory SAF blending mandates in the years ahead, with ReFuel EU ramping up to 6% by 2030, UK Jet Zero to 10%, and Brazil's mandate of 1% GHG reduction from jet fuels rising to 10% by 2037. We estimate these existing mandates could deliver 5 million tons of demand by 2030 (up from 2 million tons in 2025). Other countries have proposed SAF mandates that could deliver another 4.9 million tons of SAF consumption by 2030 as well, including Japan with a 10% target, China with 2-5% on the table, and mandates ranging from 1-5% in India, Malaysia, and Indonesia. Voluntary airlines and corporate SAF commitments—which help drive the market but offer much less certainty to producers—could deliver significant additional demand by 2030.

Post-2030, SAF demand from existing mandates alone would continue to scale the market, reaching approximately 21 million tons by 2040, with the EU driving the vast majority of that demand, followed by the UK and Brazil. If proposed mandates in Asia ramp up at similar levels over the coming 15 years, the global market would expand considerably.

Providing certainty to SAF producers will be critical to scale the SAF industry in the coming years, but that will be challenging in the current geopolitical environment. A leading indicator of how successful policy and market signals are to scale SAF will be whether current project proposals reach final investment decisions and begin to break ground. In the coming months and years, the Clean Investment Monitor will be tracking the evolving status of the current pipeline of announced and under-construction projects across the world on a quarterly basis to keep a close watch on whether market signals are sufficient to nudge SAF toward the necessary scale to cement it as a commercial alternative to conventional jet fuel in the long term.

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