# Southeast Asia

What is the outlook for aviation through 2050?

Learn about Cascade

**4.8%**

Boeing's 2023 Commercial Market Outlook (CMO) projects 4.8% annual growth in Southeast Asia between 2019-2050.[1]

**4x**

The region's $CO_2$ emissions in 2050 could quadruple to 347 $MtCO_2$-eq without improvements in aircraft, operations, and use of renewable energy.

**12%**

Southeast Asia has enough bio-based feedstock resources to produce 45.7 million tonnes of SAF, which could meet approximately 12% of global SAF demand by 2050.[2]

## Turn Insights into Action

Southeast Asia has diverse SAF feedstock availability, sufficient to meet 100% of its own jet fuel needs* with potential for export. Investment in SAF refinery infrastructure is needed to unlock this potential.

**For international departures only*

## Benefits of Action

Fully capitalizing on available biomass resources would produce

**59** billion L of SAF

However, this would require:

**14x** Increase needed for SAF production from 2024 announced production baseline

**Significant investment and economic opportunity:** By producing fuel locally in the SEA region, this scenario could unlock an economic advantage ranging from $36 - $43 billion US dollars of fuel by 2050.[13]

**Taking advantage of waste:** 75% of potential SAF feedstock can be produced from post-consumer and agricultural waste.[2]

**Increased energy security:** Converting locally sourced biomass into SAF reduces dependence on imported fossil fuels and ensures a stable, renewable energy supply.

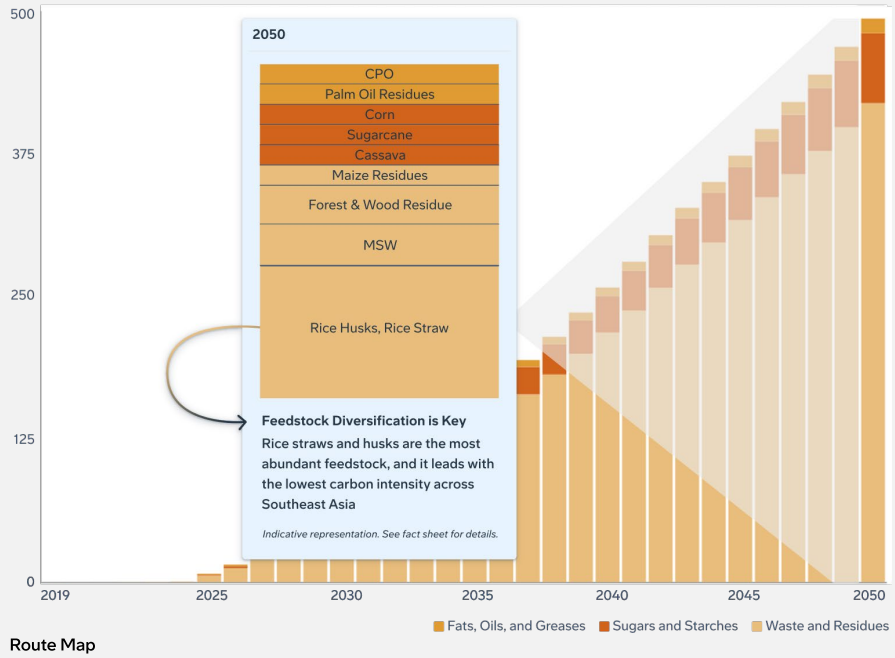
## Visualize in Cascade

Click here to start

Explore the Boeing-Roundtable on Sustainable Biomaterials (RSB) SAF feedstock assessment to evaluate how much SAF will be required in Southeast Asia, then adjust assumptions to build your own forecast.

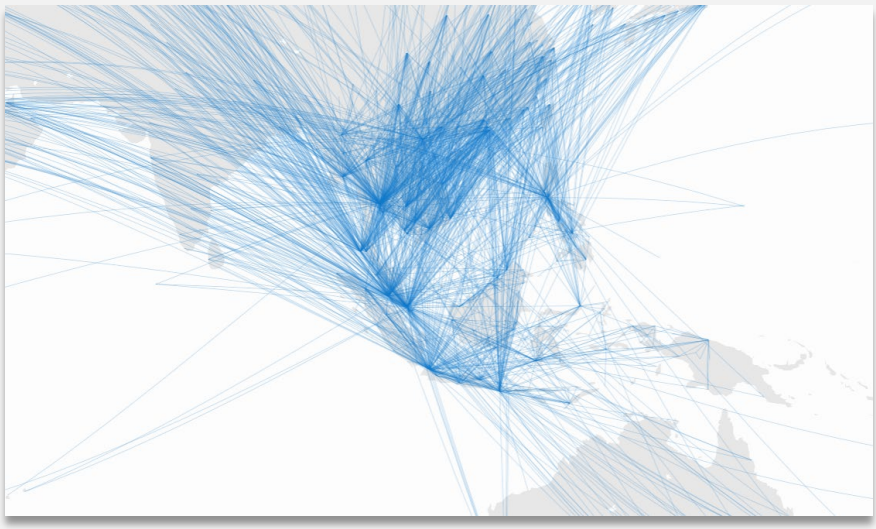
**Biomass Demand for Sustainable Aviation Fuel** (Mt)

*Total biomass required to fulfill SAF demand for aviation by feedstock type*




**Route Map**

*Southeast Asia flight routes served in 2019*



# Boeing's SAF Ecosystem Approach in Southeast Asia

## Advocacy

- Advocating SAF policy harmonization at the ASEAN Air Transport Ministers Meetings and ASEAN Air Transport Working Group.
- Supporting federal policy action for SAF uptake through policy dialogues and papers.
- Initiating thinking on SAF as a sovereign energy resilience and risk mitigation measure.

## Collaboration

- Partnering with local governments, ASEAN secretariat, and industry experts in driving SAF value chain development through research and policy dialogues.
- Hosting multi-sector capacity building events on topics ranging from SAF feedstocks to product logistics, life cycle assessments, technoeconomic, and effective policy mechanisms.
- Donating $22 Million in charitable contributions, with a focus on STEM education, nurturing aerospace talents, environmental conservation, and empowering rural entrepreneurs.

## Thought Leadership

- Developing regional SAF studies in collaboration with RSB and GHD Advisory on a Southeast Asia SAF Feedstock study and ASEAN Agriculture Waste to SAF Technoeconomic Assessment.
- Engaging financiers through regional SAF financing roundtables.


## Scenario Assumptions

- Domestic and international departures from Southeast Asia (Cascade's Southeast Asia region filter), including the following countries: Brunei, Burma (Myanmar), Cambodia, Timor-Leste, Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand and Vietnam.
- Traffic growth is assumed to be an annual 4.8% growth rate based on Boeing's Commercial Market Outlook 2025–2044.[1] For this scenario, this traffic growth rate is assumed to be valid out to 2050.
- Well-to-wake emissions scope. Revenue Mass for unit of measurement for payload.
- The ambition level for fleet renewal in this scenario has been set to 'Moderate'. The average fleet age in Southeast Asia is relatively low, 12.7 years,[16] so this scenario assumes a moderate phase out time of 25 years.
- This scenario focuses on SAF as a driving force in Southeast Asia's decarbonization efforts. Assuming no introduction of hydrogen or electric aircraft in this region, and a 'Moderately High' ambition level for the introduction of advanced conventional aircraft. More information on the particulars of the ambition levels for advanced conventional aircraft can be found here.
- The ambition level for hydrogen as a renewable energy source is set to 'Moderately High'. Indonesia,[5] Malaysia,[6] Singapore,[7] and Vietnam[8] have all released national hydrogen strategies aimed at identifying low-carbon hydrogen use. The associated market shares for this ambition level can be found here.
- The ambition level for electricity improvements as a renewable energy source has been set in line with the International Energy Agency (IEA) Announced Pledges scenario. This assumption was based off the ASEAN Vision 2020 pledge,[11] as well as requirements based on projected population and traffic growth in the region.
- Improvements to Operations, particularly fleet and airport operations, and flight and traffic management is assumed to be high. This is in line with ICAO's ASEAN ATM Master Plan,[9] which recognizes the high forecasted growth rate in the region and the associated need for improved ATM.
- CORSIA has been enabled for this scenario. Seven of the eleven Southeast Asia countries are CORSIA Participating States for 2023.[10]
- The market shares for SAF feedstocks have been derived from two key sources: the RSB report on SAF Production in Southeast Asia (Table 13)[2] and GHD's Techno-Economic Assessment Report on Promoting the Production of SAF from Agricultural Waste in the ASEAN Region.[12] In this scenario, market shares were calculated by first estimating the total SAF derived from biomass to be 45.7 million tonnes in 2050.[2] Subsequently, the allocation of feedstocks within this projection was determined using Table 13 from the RSB report.[2] Although eFuels were not explicitly mentioned as a SAF source in the two reports due to the biomass-focused nature of the analysis, this scenario assumes a nominal 3% market share for eFuels by 2050, providing a more generalized picture of the SAF market in 2050. The Civil Aviation Authority of Singapore's (CAAS) SAF factsheet refers to the development of PtL technology[15]. *Note: Novel Energy Crops are excluded from this assessment, as the feedstock evaluation did not specify these types. The modelling assumptions in Cascade identify Novel Energy Crops as miscanthus, switchgrass, poplar, willow, and eucalyptus.*

| Selected Feedstocks | Contribution of each feedstock to total feedstock availability[2] | | Cascade Feedstock Category | Market Share in 2050 (Cascade scenario) *See above assumptions for how these market shares were calculated.* |
|---|---|---|---|---|
| Rice husks, rice straw | 37% | 58% | Waste and Residues | 50% |
| Municipal Solid Waste (MSW) | 9% | | | |
| Forest and wood industry residues | 8% | | | |
| Maize residues (cob/husk/stover/straw) | 4% | | | |
| Cassava (root starch) | 9% | 22% | Sugar and Starches | 18% |
| Sugarcane bagasse, tops and leaves | 6% | | | |
| Cassava pulp | 3% | | | |
| Sugarcane | 2% | | | |
| Corn | 2% | | | |
| Crude palm oil (CPO) | 8% *(allocated an extra 5% on top of projected figure in RSB report here based on feedstock availability derived from GHD's feedstock feasibility technoeconomic report)* | 20% | Fats, Oils and Greases | 17% |
| Palm oil residues | 12% | | | |
| | | | eFuels | 3% |
| | | | Conventional Jet Fuel | 12% |

1.Boeing Commercial Market Outlook. https://cmo.boeing.com/. This scenario uses 2023 Boeing CMO data, not 2025.
2.Roundtable on Sustainable Biomaterials, Sustainable Feedstock Assessment for SAF in Southeast Asia, 2024. https://rsb.org/wp-content/uploads/2024/09/rsb-sustainable-feedstock-assessment-saf-in-southeast-asia.pdf
3.MOSTI Policy Documents. https://www.mosti.gov.my/dasar/#flipbook-df_69947/7/
4.IATA Economic Report: Chart of the Week, 8 Sep 2023. https://www.iata.org/en/iata-repository/publications/economic-reports/chart-of-the-week-8-sep/
5.IESR Report on Indonesia's Green Hydrogen Initiative, 2023. https://iesr.or.id/en/indonesias-steps-towards-green-hydrogen-for-decarbonization/
6.Hydrogen Economy & Technology Roadmap by MOSTI. https://mastic.mosti.gov.my/publication/hydrogen-economy-technology-roadmap/
7.Singapore's National Hydrogen Strategy. https://www.mti.gov.sg/Industries/Hydrogen
8.Vietnam's Hydrogen Energy Strategy for Energy Transition, 2023. https://www.vietnam-briefing.com/news/vietnam-adopts-hydrogen-energy-strategy-to-boost-energy-transition.html/
9.ASEAN ATM Master Plan by ICAO, 2018. https://www.icao.int/APAC/Meetings/2018%20ATMSG6/IP03%20ASEAN%20ATM%20Master%20Plan.pdf
10.ICAO CORSIA Participating States. https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA_participating_States.aspx
11.ASEAN Power Grid Overview. https://aseanenergy.org/apaec/asean-power-grid/
12.ASEAN Techno-Economic Assessment Final Report, 2025. https://asean.org/wp-content/uploads/2025/04/12634962-RPT-6-Techno-Economic-Assessment-Final-Report_April-2025.pdf#SAF
13. Fueling Net Zero, An ICF Report for ATAG Waypoint 2050 https://aviationbenefits.org/media/167495/fueling-net-zero_september-2021.pdf. The $36-43 billion figure was calculated for the assumption of cost of $760-900 per tonne of SAF in 2050
14.International Air Transport Association (IATA). "Financing the Energy Transition: A Roadmap to 2024." https://www.iata.org/en/programs/sustainability/reports/financeroadmap2024/
15.Civil Aviation Authority of Singapore (CAAS). "Sustainable Aviation Fuel (SAF) Factsheet." https://www.caas.gov.sg/docs/default-source/default-document-library/annex-2---saf-factsheet.pdf
16.Internal Boeing (BCA) data and Cirium