Chapter 3
Fueling the Future With SAF:
How Airlines Are Reshaping Value Chains for a Decarbonized Aviation

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ABSTRACT

The race to decarbonize aviation is no longer a distant ambition, it is an immediate necessity. Among the limited options available, Sustainable Aviation Fuel (SAF) has emerged as the only scalable lever capable of reshaping the industry's carbon trajectory. Yet SAF is more than a new fuel: it overturns decades of reliance on a uniform, fossil based Jet A 1 system, replacing it with costly, scarce, and traceable alternatives. This shift forces airlines to abandon their traditional role as passive fuel buyers and instead act as strategic players—securing supply through long term commitments, partnerships, and vertical integration to safeguard their future in a low carbon world.

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I) DECARBONIZING AIR TRANSPORT AND THE ROLE OF SUSTAINABLE AVIATION FUELS

I.a) The Decarbonization of Air Transport: an Urgent Priority

Although it is not the largest emitter in absolute terms, air transport remains one of the most greenhouse gas-intensive modes of travel per passenger-kilometer. An average flight generates between 80 and over 120 grams of CO_2 per passenger-kilometer, compared to around 10 to 30 grams for electric rail or 30 to 50 grams for intercity buses (International Council on Clean Transportation (ICCT), 2022; Lee et al., 2021). According to the International Energy Agency (IEA, 2020), aviation accounted for approximately 2.5% of global direct CO_2 emissions and around 13% of transport-related emissions (Environmental Protection Agency, 2022 ; International Transport Forum, 2019). Already concerning, these figures actually underestimate the aviation sector's true climate impact. The additional radiative forcing caused by contrails (Ansel, 2023), induced cirrus clouds, nitrogen oxide (NOx) emissions, and fine particulate matter amplifies the warming effect by a factor of two to three compared to CO_2 emissions alone (Nakano et al., 2022). When these non-CO_2 effects are taken into account, aviation may contribute up to 5% of total anthropogenic climate impact (Lee et al., 2021). This situation is all the more critical given that the sector remains heavily reliant on liquid fossil fuels, with average consumption estimated at nearly 350 million tonnes of oil equivalent (Mtoe) per year before the COVID-19 crisis (IEA, 2020), and around 320 Mtoe in 2023 (International Air Transport Association (IATA), 2024).