AIR SPACE
ASPC's crowd-sourced blog
https://airpower.airforce.gov.au

Variath, A. (2025) *Air/Space* **4**, bp51221068
Date Published: 28/08/2025

Developing a sustainable aviation fuel transition strategy in India

Adithya Variath
Jindal Global University, India

In 2024, the 1.5°C threshold was breached for the entire year, triggering urgent decarbonisation and energy transition debates to mitigate climate change. While much is talked about fuel transitions in various sectors, a sector less talked about is Aviation. Globally, aviation accounts for 2.5% of energy-related CO_2 emissions and is responsible for 4% of global warming to date (Ritchie, 2024). While the number seems insignificant, research indicates that its total impact on climate warming could be 2-3 times the 2.5% mark due to additional non-CO_2 pollutants and the overall radiative forcing mechanism. Radiative forcing mechanisms describe how emissions and substances in the atmosphere influence the Earth's energy balance, thereby intensifying climate change beyond the direct CO_2 emissions alone.

With India projected to become the third-largest aviation market and the third-largest emitter of greenhouse gases globally, it is a crucial juncture for India's aviation industry to develop and deploy policies and technologies on sustainability. Aviation contributes 5% to India's GDP, generating over 4 million jobs. It is projected to grow substantially with more airports and increasing passenger (Jain, 2025). While aviation represents a symbol of progress, connectivity, and economic development in India, it is also important to recognise it as an identified contributor to carbon emissions.

India has committed to going Net Zero by 2070 and has already set the stage for an ambitious green future (PIB Delhi, 2023b). Decarbonisation has been on priority for the Indian Government to meet the ambitious goal of decarbonising energy to 50% and achieving 500GW of non-fossil fuel generating capacity by 2030 (Ministry of Power, 2023). With regards to aviation, these targets align with global sustainability efforts, particularly the International Civil Aviation Organisation's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) framework that aims to achieve carbon-neutral growth in international aviation (International Civil Aviation Organization, 2024).

Technological innovations, operational improvements and sustainable aviation fuels (SAF) have been at the core of the debate on carbon-neutral growth in India. SAF remains the cornerstone of ICAO's basket of measures and a key enabler of long-term sustainability in India. SAF offers an immediate and scalable solution to reduce emissions, unlike long-term technologies like hydrogen-powered aircraft or electric aviation. SAF is a liquid fuel that can be produced from a number of sources (feedstock), including waste oil and fats, green and municipal waste and non-food crops. It is predicted that it will reduce CO_2 emissions by 80%.

India holds significant potential to produce SAF from diverse feedstocks that do not compete with food crops, including municipal solid waste and agricultural residues. For instance, several projects are being explored leveraging these biomass sources, though scale-up efforts face challenges such as feedstock collection logistics and supply chain economics. India also produces oil seeds that can contribute to the Hydro-processed Esters and Fatty Acids (HEFA) pathway for SAF production. However, projects in these domains often encounter regulatory uncertainty and infrastructural bottlenecks, which limit deployment. Addressing these barriers through targeted policies and incentives will be critical to unlocking

India's SAF production potential. A landmark moment for India's sustainable aviation was the first commercial passenger flight powered by an indigenously produced SAF blend in May 2023. This flight, operated by AirAsia, flight i5-767 from Pune to Delhi, utilised SAF produced by Praj Industries Ltd and supplied by Indian Oil Corporation Ltd (Utgikar, 2023). However, the road to adoption in India is far from smooth.

The Government of India has laid out a series of ambitious targets for sustainable aviation fuel blending: 1% SAF by 2027, 2% SAF by 2028, and 5% SAF by 2030 (PIB Delhi, 2023a). India would need an annual production of approximately 140 million litres of SAF to meet its targets. Despite the ambitious targets India has set, the actual deployment of SAF remains minimal. The challenges are not only regulatory but run deeper into the systemic and infrastructural constraints from production bottlenecks, blending facilities and quality control mechanisms, high costs, and limited supply chains. Most notably, only a handful of airports in India currently have a consistent SAF supply.

SAF transition has remained challenging for our European counterparts as they also face similar challenges, ranging from limited production and the high cost of distribution and transportation to uncertainty around the role of airports in the SAF transition. A global SAF strategy is the need of the hour. In India, the fundamental problem has been to identify the most suitable biomass feedstock, one that is sustainable, does not compete with food crops, and can be scaled. It becomes more complex as it needs clear policies on land use, agriculture, and supply chain economics. There is an immediate need to incentivise investment in refineries, storage, and distribution infrastructure. Capital expenditure for SAF infrastructure is already lagging in India, especially outside major aviation hotspots.

There is a crucial role here for the regulatory ecosystem in India to create an enabling SAF transition through clear blending mandates, tax incentives and subsidies, and prioritising funding for research and development. Uncertainty and a lack of coordinated legislation have led to delays and even the cancellation of some SAF projects.

Comparing India's framework with successful regulatory models internationally reveals the importance of clear mandates, tax incentives, subsidies, and research funding to stimulate private sector investment. Learning from global best practices can help India design a robust policy ecosystem that fosters innovation and infrastructure development. India's regulatory policies can benefit by adapting successful approaches used internationally, such as blending mandates tied to carbon credits and supportive infrastructure funding. Enhancing the SAF supply chain in India involves aggregating diverse feedstocks, expanding refining and blending capacities, and improving storage and distribution logistics. SAF transition cannot happen in silos, so there is a need for the stakeholders, including regulators and legislators, as well as refinery owners, investors, fuel vendors, and airlines, to come together and develop a SAF strategy that is science-led, data-driven, and people-centred.

India also needs to think beyond national policies, as the energy transition must not be limited to a few countries or a few airports. It offers a unique opportunity for India to lead in this regard and scale a model for sustainable aviation in the Global South. It can also offer learnings for parallel industries, especially India's growing maritime industry. India is well-placed to become a global leader in sustainable fuels, and to stay ahead of the curve in global technology development, it must reconceptualise its strategies on finance, policy and behaviour for a just SAF transition. Before we think of a take-off, let us set a runway first.

References

International Civil Aviation Organization. (2024). *Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)*. Retrieved from ICAO: https://www.icao.int/carbon-offsetting-and-reduction-scheme-international-aviation-corsia

Jain, S. (2025, July 8). *Aviation Contributes $53.6 Billion to 4th Largest Economy in the World*. Retrieved from Aviation A2Z: https://aviationa2z.com/index.php/2025/07/08/indian-aviation-contributes-53-6-billion-to-gdp/

PIB Delhi. (2023a, May 19). *Sustainable Aviation Fuel (SAF) using indigenous feedstock, Make in India technology is a major step towards self-reliance and de-carbonization of the aviation sector*. Retrieved from Government of India Press Information Bureau: https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1925417

PIB Delhi. (2023b, September 28). *India is committed to achieve the Net Zero emissions target by 2070*. Retrieved from Government of India Press Information Bureau: https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1961797

Ritchie, H. (2024, April 8). *What share of global CO_2 emissions come from aviation?* Retrieved from Our World in Data: https://ourworldindata.org/global-aviation-emissions

Utgikar, R. (2023, May 19). *Making history, AirAsia India, Praj and IOCL join hands to fly first commercial flight in India powered by a blend of 'indigenous' Sustainable Aviation Fuel.* Retrieved from Air India Express - Air Asia: https://www.praj.net/wp-content/uploads/2023/05/230519-Press-Release-Praj-IOCL-AirAsia.pdf