



Fuelling the future

Building a resilient aviation
fuel ecosystem for India



June 2026

kpmg.com/in

KPMG. Make the Difference.

Table of contents



KPMG in India foreword	04
Executive summary	05
01 India's aviation growth story is creating a fuel security paradox	06
02 Why SAF is emerging as the centrepiece of aviation's next fuel transition	09
03 Building India's SAF ecosystem: The four pillars that can define the future aviation fuel system	13
04 From policy ambition to industrial ecosystem	19
Conclusion	25
List of Abbreviations	26
Acknowledgement	27



KPMG in India foreword

India's aviation sector has arrived at a defining crossroads. It is an extraordinary growth story. The sector is poised to serve over a billion passengers annually by 2040¹, driven by a young population, an expanding middle class, and a strong push for nationwide connectivity. Yet this momentum rests almost entirely on imported crude, refined into aviation fuel through global supply chains India does not control, and **that can be disrupted without warning**.

This paper is not about sustainable aviation fuel as an environmental aspiration. It is about energy security as a national strategic imperative. The framing matters, because it changes both the urgency and the ownership of the problem. When SAF is an environmental compliance exercise, it belongs to sustainability teams and CORSIA reporting officers. When it is an energy security mission, it belongs to the Cabinet.

India has executed complex energy transitions before and executed them well. The ethanol blending programme moved from a modest 1.5 per cent blend rate in FY 2013–14 to 20 per cent in 2026², reducing crude import costs by tens of thousands of crore rupees. The solar energy mission took India from negligible installed capacity to over 90 GW in a decade³. Both were powered by the same engine:

binding targets, sustained policy support, and coordinated public-private investment. SAF can follow the same trajectory, if it is treated with the same seriousness.

What this paper offers is an architecture, not just an argument. It identifies the four structural pillars that a resilient aviation fuel ecosystem requires: domestic feedstock security, multi-pathway production capacity, hub-based industrial geography, and strategic storage and logistics and maps the policy instruments needed to build each one. It is grounded in data, referenced against global precedent, and calibrated to India's specific feedstock endowments, refinery infrastructure, and regulatory environment.

The window for first-mover advantage is narrowing. Global SAF supply chains are consolidating around early movers. The countries that build production capacity today will set prices and capture export markets tomorrow. India has every structural advantage required to be among them. The question is whether the institutional resolve matches the industrial opportunity.

We believe it does. And this paper is our contribution to making that case.



Anish De

Global Head, Energy Natural Resources & Chemicals



Vivek Rahi

Partner and National Head - Oil & Gas



Jodhbir Sachdeva

Associate Partner - Aviation

1. Air passenger traffic to grow sixfold by 2040, IBEF, accessed on 04.06.2026

2. India's Ethanol Journey is Unstoppable, PIB dated 08.08.2025

3. With 100 GW solar power achieved, India is moving towards energy independence and a greener future, PIB dated 07.02.2025

Executive summary

India's aviation sector is entering a period of unprecedented expansion. Passenger traffic is growing at a sustained 7–10 per cent annually, following a post-pandemic surge of over 20 per cent⁴ with airlines aggressively expanding fleets and airport infrastructure scaling rapidly across the country. This growth is positioning India among the world's largest aviation markets.

However, this expansion is also creating a strategic fuel challenge.

India's aviation system remains heavily dependent on imported crude oil for Aviation Turbine Fuel (ATF) production, exposing the sector to crude price volatility, geopolitical disruptions, supply chain instability, and rising external carbon regulations. As aviation demand grows, these vulnerabilities are likely to deepen unless alternative domestic fuel pathways emerge.

At the same time, global aviation is entering a structural transition toward lower-carbon fuel systems. Mechanisms such as Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) and emerging Sustainable Aviation Fuel (SAF) mandates across major aviation markets are gradually reshaping the future economics of international aviation.

This convergence of energy security pressure and decarbonisation requirements is rapidly elevating SAF from a niche sustainability initiative to a strategic aviation fuel pathway.

Globally, SAF is increasingly being viewed not only as a climate solution, but as a long-term fuel resilience mechanism capable of reducing exposure to conventional fossil fuel supply chains.

For India, this transition creates a uniquely important strategic opportunity.

Unlike many countries building SAF ecosystems on fragmented feedstock bases, India brings distinct structural strengths: a large and diverse feedstock base, an established ethanol platform, expanding refining and biofuel capacity, strong engineering capabilities, and one of the world's fastest-growing aviation markets.

This convergence creates the foundation for a distinctly Indian SAF pathway rooted not only in decarbonisation, but also in energy resilience, industrial competitiveness, and bioeconomy development.

The report highlights that the future SAF market is expected to be shaped by four structural forces: feedstock resilience, the ability to deploy multiple production pathways, the development of integrated industrial ecosystems, and robust logistics and storage

infrastructure. Countries that can align and scale these elements effectively are likely to emerge as long-term leaders in the next generation of aviation fuel markets.

India holds a strong structural advantage in scaling SAF, built on its ability to execute large, coordinated fuel transitions through policy alignment, industrial integration, and robust supply chain development. In the near term, pathways such as Hydroprocessed Esters and Fatty Acids (HEFA) co-processing and Alcohol-to-Jet (ATJ) can help meet initial blending mandates, creating a critical transition buffer. This period can be leveraged to build a resilient SAF ecosystem and pave the way for the adoption of more advanced, next-generation technologies.

Early blending requirements, while primarily introduced to meet international compliance standards, could play a vital role in fostering initial market development. Although their immediate impact may be limited, they can establish an essential foundation for long-term strategic fuel independence, enabling a gradual scale-up toward higher levels of SAF.

The report further argues that India's SAF transition should not be approached merely as a fuel blending initiative. Instead, it should evolve as a long-term industrial strategy built across three interconnected phases:

Foundation — creating market certainty and investment confidence

Scale-Up — building integrated production ecosystems and industrial capacity

Export Play — positioning India within emerging global SAF trade flows

If successfully executed, the implications could extend well beyond aviation decarbonisation. A domestic SAF ecosystem could strengthen long-term aviation fuel resilience, reduce dependence on imported fossil fuels, unlock new industrial value chains, accelerate rural industrialisation, deepen bio-refining capabilities, and position India within emerging global low-carbon fuel supply chains.

The report concludes that SAF represents more than a sustainability transition for India.

It may ultimately become an industrial transformation opportunity situated at the intersection of aviation growth, energy security, bioeconomy development, and future low-carbon industrial competitiveness.

The next phase of India's aviation story may therefore not be written only through airports and aircraft fleets, but increasingly through integrated fuel ecosystems capable of powering the future of aviation.

4. INDIAN AVIATION INDUSTRY Report, ICRA, July 2025

01

India's aviation growth story is creating a fuel security paradox



India's aviation sector is expanding at an unprecedented pace. India is already the world's fifth-largest aviation market by passenger volume and is expected to become the third-largest aviation market globally within this decade.⁵ Passenger traffic has more than doubled over the past decade, reaching nearly 239 million passengers in CY 2025, while long-term projections indicate that annual passenger volumes could exceed 1 billion by 2040.⁶

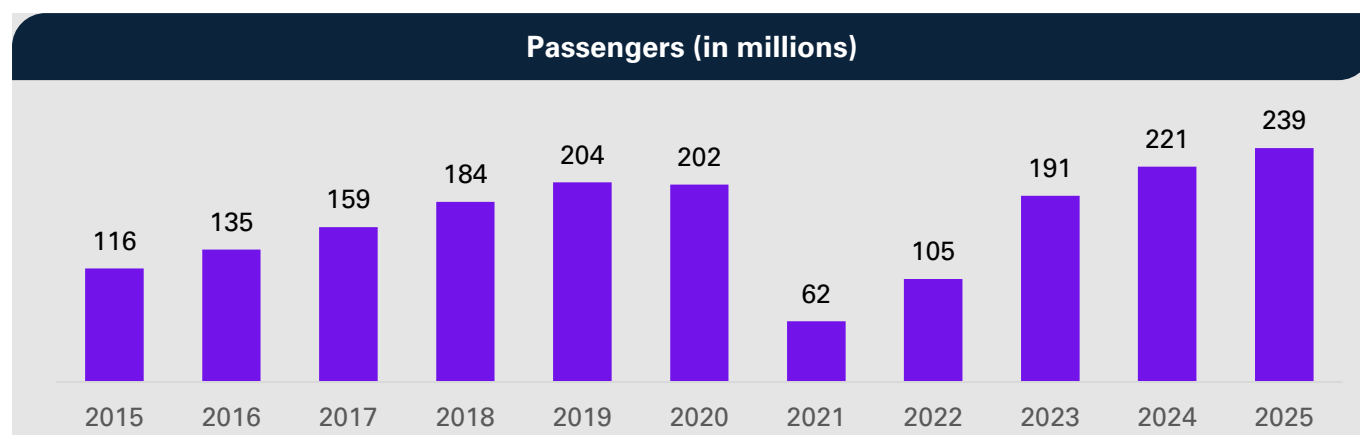


Figure 1: India's overall air passenger traffic over the past 10 years

Source: DGCA⁷

Indian airlines have collectively placed aircraft orders exceeding 1,500 aircrafts, while the Government of India plans to expand the country's airport network from approximately 163 airports today to more than 350 airports by 2047.⁸

However, this rapid growth is underpinned by a fuel supply chain that remains heavily reliant on imported crude oil. As aviation demand rises, so does India's exposure to global price volatility and geopolitical risks particularly in the Middle East, turning a growth story into a growing fuel security challenge.

Every additional aircraft, route expansion, and rise in passenger traffic directly increases demand for Airline Turbine Fuel (ATF). India's ATF consumption has already risen from ~6.3 MMTPA in FY2015–16 to nearly 9 MMTPA in FY2024–25, with demand expected to potentially double by 2040.⁹

This creates a structural vulnerability for India's aviation sector.

5. "India ranks among world's fastest-growing aviation markets", International Air Transport Association, 2025

6. "Handbook on Civil Aviation Statistics 2024–25", DGCA, accessed May 2026; "India Aviation Outlook", International Air Transport Association, 2025

7. Handbook on Civil Aviation Statistics 2024–25", DGCA, accessed on 31.05.2026

8. "India's Aviation Vision 2047", Ministry of Civil Aviation, Government of India, 2025

9. Indian aviation industry outlook", ICRA, September 2025



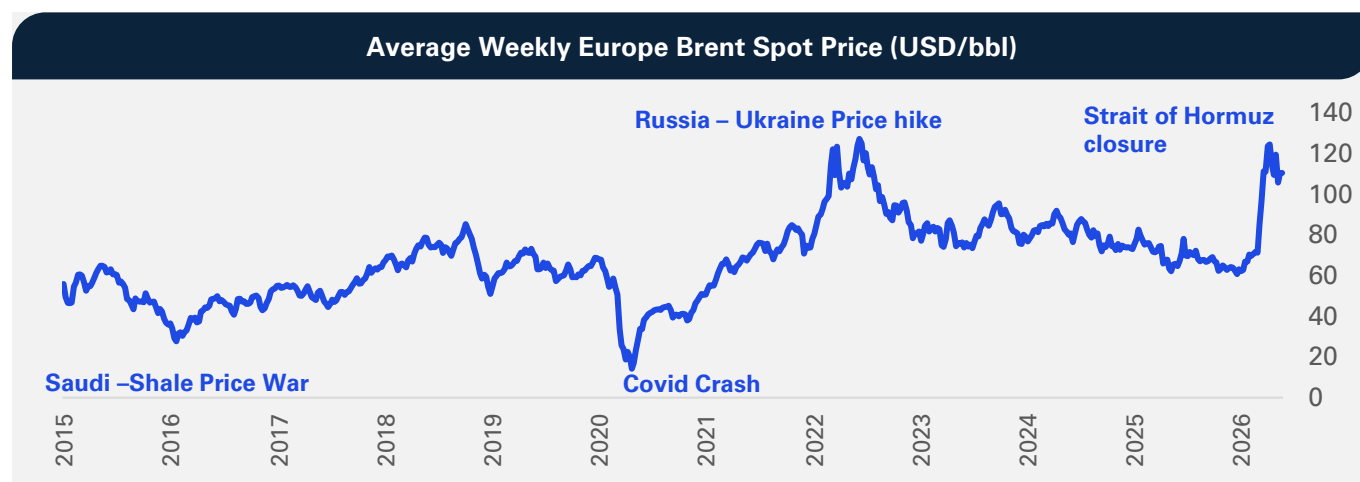


Figure 2: Brent Crude Price volatility (2015 to Present)

Source: U.S. Energy Information Administration¹⁰

India imports nearly 89 per cent of its crude oil requirements¹¹, with a significant share sourced from the Middle East, one of the world's most geopolitically sensitive energy regions. As a result, India's aviation sector remains directly exposed to global crude oil price volatility and geopolitical disruptions.

For airlines, the exposure is particularly severe because fuel typically accounts for nearly 30 per cent of operating costs.¹² Even modest increases in crude prices can quickly drive-up ATF costs, leading to higher fares, and financial strain across the aviation ecosystem.

Recent events have reinforced the scale of this risk. The Russia–Ukraine conflict, Red Sea disruptions, and recurring tensions in the Middle East have repeatedly triggered volatility in global oil markets. These are no longer isolated disruptions; **they reflect a structurally uncertain energy environment.**

Unlike several other sectors, aviation currently has limited alternatives to liquid hydrocarbon fuels at commercial scale. This makes India's aviation growth increasingly dependent on the stability, affordability, and availability of imported crude oil.

The challenge is no longer limited to fuel affordability and crude price volatility alone.

Global aviation is also entering a period of accelerating carbon regulation

Mechanisms such as International Civil Aviation Organization (ICAO's) CORSIA framework and the European Union's ReFuelEU Aviation mandate are steadily pushing airlines toward lower carbon aviation fuels and mandatory SAF adoption.¹³ For Indian carriers, this creates a second layer of exposure alongside crude import dependence.

Without access to scalable domestic SAF supply, Indian aviation could increasingly face rising carbon compliance costs and potential competitiveness pressures on international routes.

As a result, India's aviation sector is now confronting a dual structural challenge, exposure to volatile imported crude on one side, and rising global decarbonisation pressure on the other.

These two issues are no longer separate. They are beginning to converge into a single aviation fuel security challenge.

This is where SAF moves beyond a climate discussion and becomes an energy security and strategic industrial issue.

Indian energy economy remains exposed to global price volatility and supply disruptions, but unlike other sectors aviation has far fewer options. For airlines, SAF is not just a transition pathway, it is essential to securing long-term viability.

India has a unique opportunity to leverage its agricultural base, waste streams, and emerging biofuel capabilities to position SAF as a domestically anchored fuel alternative. If developed strategically, SAF could reduce import dependence, stabilise long-term fuel costs and insulate the aviation sector from external shocks.

The pace at which India moves could determine whether it remains reactive to global shocks or positions itself as proactive leader in shaping next phase of aviation ecosystem.

India's next aviation transition may therefore not be defined only by airport expansion or fleet growth, but increasingly by the ability to build a resilient domestic aviation fuel ecosystem. The convergence of energy security concerns and decarbonization imperatives effectively elevates SAF from an operational cost to a national strategic priority.

10. US Energy Information Administration, accessed on 03.06.2023

11. Import/Export of Crude oil and Petroleum Products, PPAC accessed on 04.06.2026

12. Unveiling the biggest airline costs, IATA accessed on 04.06.2026

13. ReFuelEU Aviation initiative", European Commission, accessed May 2026; "CORSIA overview", International Civil Aviation Organization, accessed on 32.05.2026

02

Why SAF is emerging as the centrepiece of aviation's next fuel transition



Aviation is among the hardest sectors to decarbonise.

Unlike road transport, which is steadily electrifying, or power systems that can diversify across renewable sources, commercial aviation remains heavily dependent on high-energy density liquid fuels. Battery electric aircraft continue to face payload and range limitations, while hydrogen aviation technologies remain years away from large-scale commercial deployment.

As a result, the global aviation transition is increasingly converging around one near-term solution: **Sustainable Aviation Fuel (SAF)**.

SAF is not a new engine technology or a separate aircraft platform. It is a drop in fuel pathway capable of working within existing aviation infrastructure while significantly reducing lifecycle greenhouse gas emissions compared to conventional jet fuel.

Depending on the feedstock and production pathway, SAF can reduce lifecycle emissions by nearly 60–90 per cent relative to fossil-derived ATF.

Lifecycle GHG Emission by SAF and Jet Fuel (gCO₂e/MJ)

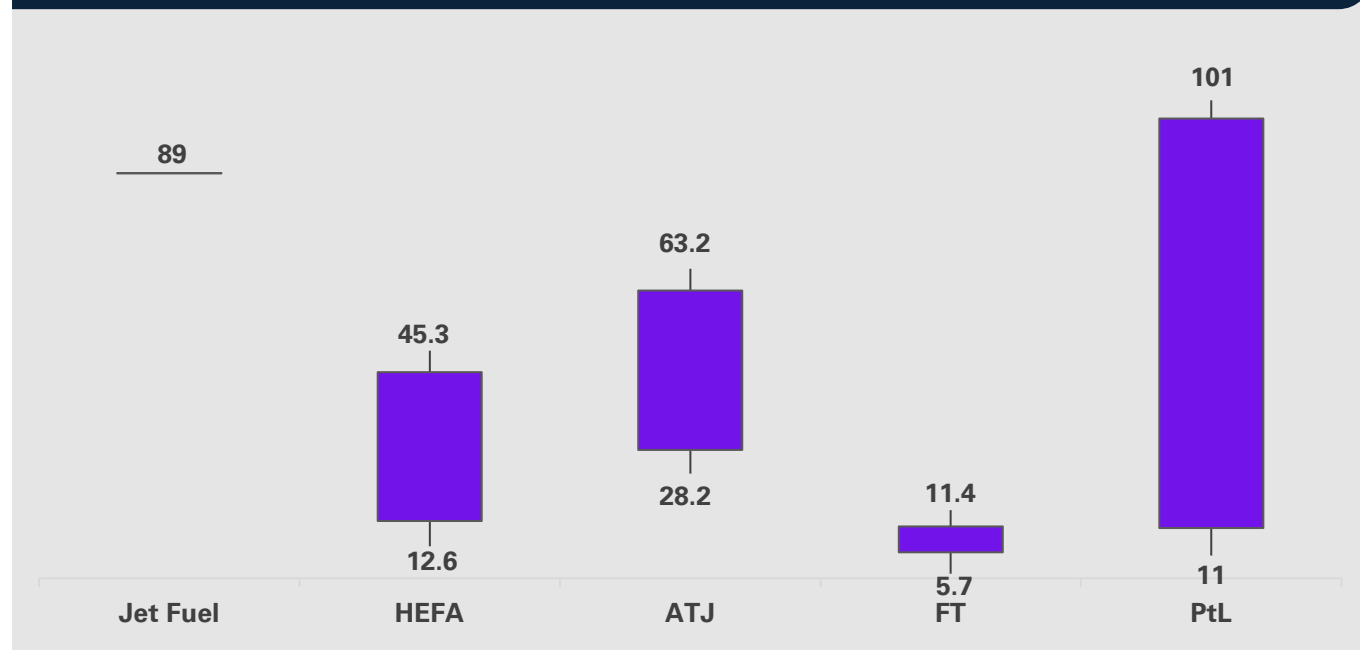


Figure 3: Lifecycle emissions across major SAF pathways vs conventional jet fuel

Source: Argonne¹⁴

The International Air Transport Association (IATA) projects that SAF could contribute approximately 65 per cent of the emissions reduction required for aviation to achieve net-zero emissions by 2050.¹⁵ This is why SAF is rapidly moving from a voluntary sustainability initiative to a strategic aviation fuel transition.

Governments are introducing blending mandates. Airlines are signing long-term offtake agreements. Refiners are evaluating conversion pathways. Global aviation systems are beginning to treat SAF not only as a climate solution, but as a future fuel security mechanism.

Global SAF capacity announcements now exceed 26 billion litres across upcoming projects, driven

largely by strong policy support in the U.S. (IRA incentives) and the EU (blending mandates). Leading players such as Neste and Phillips 66 are commissioning large-scale facilities in the 2–6 MMTPA range, while majors like Eni are actively retrofitting existing refining assets for SAF production.¹⁶

In Asia-Pacific, Singapore has emerged as a regional hub with Neste's 2.6 MMTPA facility, and Japan is accelerating domestic supply through METI-backed consortia targeting 10 per cent SAF adoption by 2030.¹⁷ Together, these developments are rapidly creating a globally distributed SAF supply base—shaped by regulation, feedstock access, and national industrial strategy.

14. Life Cycle Analysis of Greenhouse Gas Emissions of Clean Fuels with the R&D GREET 2024 Model, accessed on 03.06.2026

15. "Net zero roadmap", International Air Transport Association, accessed on 31.05.2026

16. SAF Production Facilities, ICAO, accessed on 04.06.2026

17. Charting the path: SAF Ecosystem in Japan, ICF, dated 09.04.2024

At the centre of this transition are multiple SAF technology pathways, each differing in feedstock requirements, maturity levels, and scalability potential

The most commercially established pathway today is HEFA, which primarily uses used cooking oil, waste lipids, and animal fats. With relatively low capital requirements, proven scalability, and a clear supply base of used cooking oil and fats, it is the natural choice for near-term deployment. A critical head start for SAF lies in HEFA co-processing at existing refineries taking advantage of India's refining capacity of ~249 MMTPA¹⁸ enabling the country to meet its 2 per cent SAF blending mandate by 2028.¹⁹

ATJ offers India a unique advantage, leveraging the ethanol surplus and existing biofuel infrastructure. While scalability is tempered by competing ethanol demand in the transport sector, ATJ can balance

ethanol's demand-supply gap thereby providing pricing stability.

Fischer-Tropsch (FT) technologies, though capital-intensive, align well with India's waste management priorities and abundant agricultural residue, offering long-term potential once yields improve.

Power-to-Liquids (PtL), though strategically aligned with India's National Green Hydrogen Mission, is currently the one of the most cost prohibitive pathway and better suited for longer-term development. A phased approach - HEFA and ATJ first, FT as a second wave, and PtL for the long horizon offers India a practical route to balance near-term feasibility with long-term innovation.

Parameter	Co-processing	HEFA	AtJ	FT	PtL
CAPEX ²⁰	Low	Low	Medium	High	Very High
OPEX ²¹	Low	Medium	Low	High	Medium
Technology Readiness ²²	9	9	7-8	7-8	6-7

Figure 4: Technology Pathways for SAF Production

Source : KPMG in India's analysis 2026 based on SAF blending mandate and technology readiness levels²³

The strategic importance of ATJ pathways is increasing because they can leverage existing ethanol infrastructure, feedstock systems, and biofuel supply chains. As global SAF demand accelerates, future competitiveness may increasingly depend not only on refining technology, but on access to scalable and resilient feedstock ecosystems.

This is where India's position becomes strategically significant.

18. Refinery Capacity, Ministry of Petroleum & Natural Gas, accessed on 01.06.2026

19. PRODUCTION OF SUSTAINABLE AVIATION FUEL, Ministry of Civil Aviation, Lok Sabha Questions, dated 27.03.2025

20. SAF Rules of Thumb, ICAO, accessed on 31.10.2025

21. Sustainable aviation fuel pathways: Emissions, costs and uncertainty, ScienceDirect, dated 14.01.2025

22. FEASIBILITY STUDY ON THE USE OF SUSTAINABLE AVIATION FUELS, ICAO, dated Sep 2025

23. Feasibility Study on the use of Sustainable Aviation Fuels, ICAO, dated September 2025

HEFA and ATJ can anchor India's early SAF scale-up while enabling a broader SAF ecosystem

India's near-term SAF transition will likely be anchored by two pathways, HEFA and ATJ.

HEFA is currently the most commercially mature SAF pathway globally and offers India the fastest route toward early SAF deployment. By utilising feedstocks such as used cooking oil and waste lipids through existing hydro-processing systems, HEFA can enable relatively faster integration into the country's refining ecosystem and support initial blending scale-up without requiring entirely new fuel infrastructure.

Its importance lies in its deployability. India already possesses significant refining and downstream processing capability, allowing early SAF production to build upon existing industrial systems rather than developing from scratch.

At the same time, ATJ pathways are likely to become increasingly important as India moves beyond initial deployment. Unlike HEFA, which faces long-term feedstock constraints globally, ATJ offers broader feedstock flexibility and stronger scalability potential. This makes it strategically important for diversifying India's future SAF base and reducing dependence on any single pathway.

Together, HEFA and ATJ can play complementary roles within India's early SAF transition. While HEFA can accelerate near-term deployment and support initial blending requirements, ATJ can provide a pathway for medium term scale up and long-term feedstock diversification.

This combination could help India progressively move toward its 5 per cent blending ambition while simultaneously building operational capability across refining integration, certification systems, storage infrastructure, airport fuel handling, blending operations, and long-term commercial offtake systems.

While early blending levels such as 2-5 per cent are critical to initiate market development, their direct impact on India's aviation fuel dependency remains limited. From a strategic perspective, these levels

represent transition milestones rather than end-state outcomes.

In this context, **HEFA and ATJ should not be viewed as standalone end-state solutions.** Their larger strategic value lies in creating the industrial and operational foundation required for a broader integrated SAF ecosystem.

A material shift in aviation fuel security would require progressive scale-up toward significantly higher levels of domestic SAF integration over time. Penetration levels in the range of 15–25 per cent and beyond would begin to meaningfully reduce exposure to imported crude and enhance resilience against geopolitical and supply-side disruptions.

The future aviation fuel market is unlikely to be dominated by a single technology pathway. Over time, future SAF systems may likely evolve across multiple routes including FT pathways, biomass gasification, and synthetic e-fuels. Each pathway carries different implications for feedstock availability, lifecycle emissions, scalability, and infrastructure integration.

The long-term ambition should therefore extend beyond blending compliance to the creation of a parallel, resilient, and domestically anchored aviation fuel system capable of acting as a buffer during periods of external shock.

For India, this makes pathway diversification strategically critical. Long-term resilience might depend not only on fuel production itself, but on the ability to integrate feedstocks, refining systems, logistics infrastructure, certification capability, and industrial scale into a coordinated ecosystem.

The larger opportunity therefore extends beyond achieving blending targets alone. India can use early HEFA and ATJ deployment as a bridge toward building a diversified, resilient, and globally competitive SAF ecosystem capable of supporting the next generation of aviation fuel technologies.

The next phase of India's aviation growth may therefore depend not only on airports and aircraft, but increasingly on the ability to build a resilient domestic aviation fuel ecosystem rooted in its broader bioeconomy.



03

Building India's SAF ecosystem: The four pillars that can define the future aviation fuel system



The future of SAF cannot be determined by a single technology breakthrough. Nor could it be driven only by blending mandates or airline commitments.

Globally, the countries likely to lead the SAF transition will be capable of building resilient fuel ecosystems by integrating feedstock security, production flexibility, industrial clustering, and logistics resilience into a single coordinated system.

This is particularly important for India.

India is building one of the world's fastest-growing aviation markets, even as it remains dependent on imported crude and increasingly vulnerable to tightening global carbon regulations.

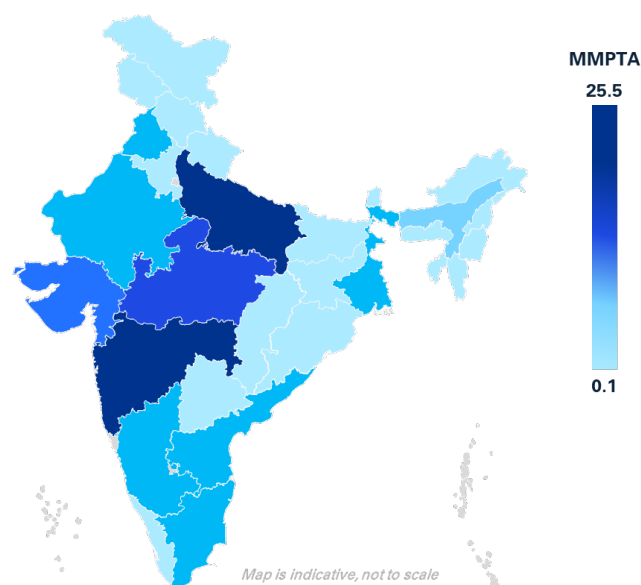
In this environment, fragmented pilot projects or isolated SAF plants may not be sufficient. India's aviation fuel transition will require a domestically anchored SAF ecosystem built around four strategic pillars.

Pillar 1: Feedstock resilience will determine long-term scalability



The global SAF race is increasingly becoming a competition for feedstock access.

Current SAF production is concentrated around HEFA pathways using used cooking oil, waste lipids, and animal fats. While these pathways enabled early commercial deployment, their long-term scalability remains constrained by limited global feedstock availability.



However, long-term competitiveness may depend not only on the availability of biomass, but on the ability to industrialise the entire feedstock ecosystem.

The real challenge is not production potential alone. It is the ability to aggregate fragmented biomass, establish traceable supply chains, integrate multimodal logistics, reduce seasonal variability, and create refinery-linked feedstock corridors capable of operating at aviation scale.

This is where the global SAF race is likely to be decided.

Countries that successfully integrate feedstock collection, logistics infrastructure, refining

India's opportunity is structurally different.

The country already possesses a strong foundation for SAF, with a large and diverse feedstock base, significant production potential, expanding ethanol capacity, and a steadily developing biomass processing ecosystem. This creates the foundation for a diversified SAF feedstock ecosystem rather than dependence on a single fuel source.



Figure 5: Total Feedstock production from Agri Residue + MSW + UCO

Source: KPMG in India's analysis 2026 based on feedstock assessment²⁴

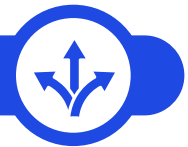
capability, certification systems, and airport connectivity into a coordinated industrial ecosystem may ultimately emerge as long-term SAF leaders.

For India, the opportunity is particularly significant because the country possesses diversity across multiple feedstock streams. This creates the potential to build a multi-pathway SAF ecosystem rather than a single-feedstock model vulnerable to future supply constraints.

The countries that solve this integration challenge early may not just achieve domestic energy resilience but could also shape future global SAF supply chains.

24. FEASIBILITY STUDY ON THE USE OF SUSTAINABLE AVIATION FUELS, ICAO, dated Sep 2025

Pillar 2: Multi-pathway fuel systems may improve long-term energy security



The future SAF market is unlikely to be dominated by a single technology route. While HEFA currently leads commercial deployment, long-term aviation decarbonisation may likely evolve across multiple pathways including ATJ, FT, MSW conversion, biomass gasification, and eventually synthetic e-fuels.

Each pathway carries different implications for feedstock availability, scalability, infrastructure intensity, and lifecycle emissions. This makes diversification strategically critical.

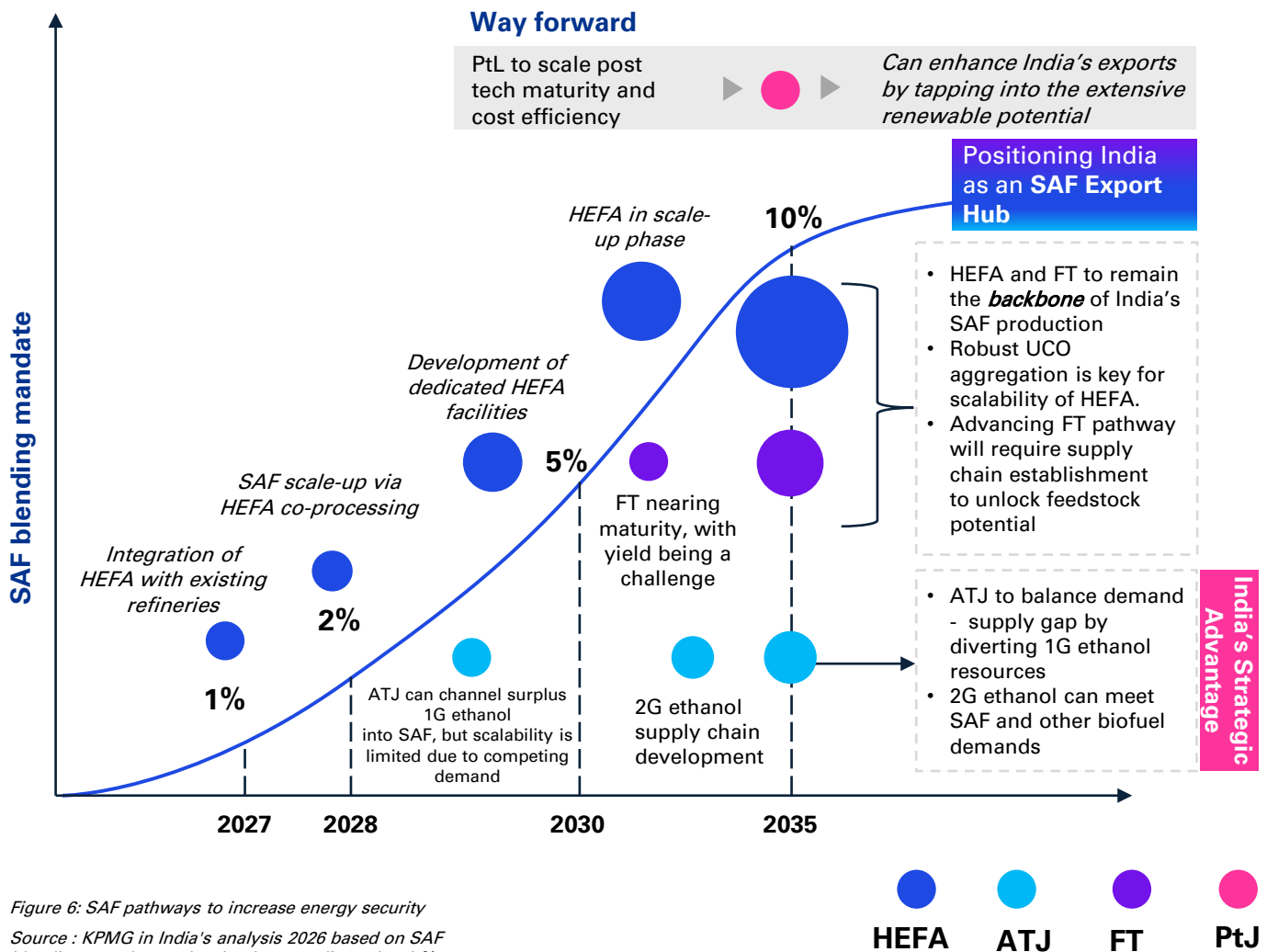


Figure 6: SAF pathways to increase energy security

Source : KPMG in India's analysis 2026 based on SAF blending mandate and technology readiness levels²⁴

HEFA offers near-term deployability but faces long-term feedstock limitations linked to constrained global waste oil availability. ATJ pathways provide greater scalability and feedstock flexibility. FT and waste-to-fuel pathways can unlock large-scale utilisation of agricultural residue and municipal waste streams, while synthetic fuels may emerge as part of future green hydrogen ecosystems.

The global SAF race is therefore becoming less about fuel conversion alone and more about ecosystem integration.

Pillar 3: Integrated SAF clusters could become India's strongest structural advantage



Future SAF competitiveness may depend as much on ecosystem integration as on fuel technology itself.

Globally, many SAF projects remain fragmented, often constrained by high feedstock transportation costs, duplicated infrastructure, weak logistics integration, and higher lifecycle emissions. As SAF markets scale, competitive advantage is increasingly shifting from standalone production assets toward integrated industrial ecosystems capable of connecting feedstocks, refining systems, storage infrastructure, and airport fuel networks efficiently.

Several components of the future SAF value chain already coexist geographically across major industrial and refining regions in India, including Maharashtra, Gujarat, Karnataka, Tamil Nadu, and Uttar Pradesh. These regions combine refining infrastructure, biofuel processing capability, industrial logistics networks, and proximity to major aviation demand centres.

This creates the possibility of developing integrated regional SAF clusters where production, blending, storage, and airport fuel supply operate within interconnected industrial corridors.

Globally, SAF business models are also evolving rapidly.

Airlines are increasingly anchoring SAF markets through long-term offtake agreements with producers to create demand visibility and support

project financing. The next phase of the market may increasingly move beyond bilateral agreements toward integrated partnerships involving airlines, refiners, airports, logistics providers, and fuel producers simultaneously.

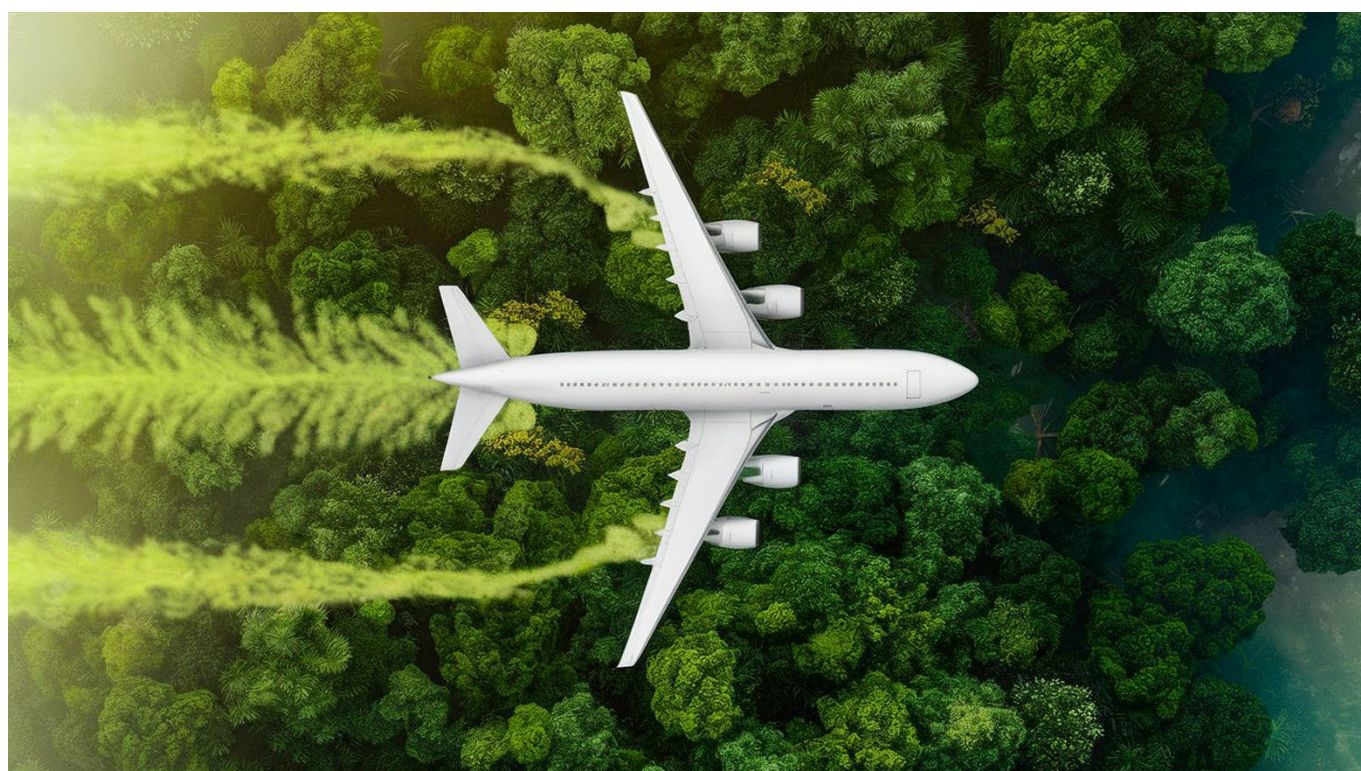
Integrated SAF supply chains are already beginning to emerge around major global aviation hubs.

Neste's SAF ecosystem at Singapore Changi Airport demonstrates how production, blending, storage, and airport delivery can be integrated into a seamless fuel supply system. Such integration improves operational reliability, reduces logistical friction, lowers lifecycle emissions, and strengthens long-term commercial viability.

India's major aviation hubs may be particularly well positioned for similar models.

Airports such as Delhi, Mumbai, Bengaluru, and Chennai already operate in proximity to major refining and industrial infrastructure. This creates the potential for refinery-linked SAF corridors capable of integrating production, storage, blending, and airport fuel supply within connected industrial ecosystems.

Integrated SAF clusters can improve logistics efficiency, optimise infrastructure utilisation, strengthen supply reliability, reduce lifecycle emissions, and improve long-term project economics simultaneously.



Pillar 4: Logistics and storage resilience could define reliability at scale



Aviation fuel systems are built on uninterrupted reliability.

As SAF deployment scales globally, logistics, storage, blending, and certification infrastructure may become as strategically important as fuel production itself. The next phase of the SAF transition may not be determined only by who can produce fuel, but by who can move, certify, store, blend, and deliver it efficiently at aviation scale.

In India, aviation demand is expanding simultaneously across metro hubs, regional airports, cargo corridors, and emerging industrial centres. Unlike conventional fossil fuels, SAF pathways are significantly more sensitive to transportation economics, storage integration, and feedstock movement. Poor logistics coordination can increase both lifecycle emissions and delivered fuel costs, weakening long-term competitiveness.

As a result, scalable SAF deployment may require far more than production capacity alone.

It may require integrated blending infrastructure, multimodal transport connectivity, strategically located storage systems, digitally traceable supply chains, and certification frameworks capable of supporting reliability, quality assurance, and export readiness simultaneously.

Unlike many emerging SAF markets, India already operates a mature aviation fuel logistics and quality control ecosystem governed through established Bureau of Indian Standards (BIS) and Directorate General of Civil Aviation (DGCA) standards. Existing ATF supply chains already connect refineries, terminals, pipelines, depots, and airports across the country, creating a strong operational foundation for future SAF integration.

Global best practices increasingly favour blending SAF at refineries and distributing blended fuel through existing ATF infrastructure rather than developing parallel supply systems. India is particularly well positioned to adopt this model because much of the downstream fuel distribution architecture already exists.

With a large operational airport network and major aviation hubs located near refining and industrial centres, SAF integration may require relatively limited infrastructure modification at the point of use. This significantly lowers transition complexity during the early scale-up phase.

India is also beginning to build the institutional foundations required for long-term SAF market development.

The emergence of domestic SAF certification capability under internationally recognised frameworks represents an important step toward establishing traceability, quality assurance, and global market acceptance. The next strategic requirement should be the development of a unified national SAF certification, testing, and compliance ecosystem capable of accelerating deployment while supporting export competitiveness.

Geography further strengthens this advantage.

Several Indian refineries and coastal industrial hubs operate in proximity to major international aviation and shipping corridors. This creates the possibility of integrating domestic SAF production with future regional supply opportunities across Singapore, Japan, the European Union, and Middle Eastern aviation markets where blending mandates and carbon intensity requirements are steadily increasing.

The countries that build integrated logistics, blending, storage, and certification ecosystems early may ultimately emerge as the reliable SAF suppliers within future global aviation fuel markets.

For India, this creates an opportunity not only to support domestic aviation decarbonisation, but to position itself as a regional SAF supply and export hub.



The SAF ecosystem is a complex web of interdependent actors, each facing distinct but interconnected challenges.

The challenges facing India's SAF ecosystem are not isolated operational gaps. They are structural constraints that cut across the entire value chain from feedstock aggregation and fuel production to financing, certification, logistics, and long-term demand visibility.

As SAF markets evolve globally, incremental interventions alone are unlikely to be sufficient. The transition will require coordinated ecosystem development across multiple stakeholders including airlines, refiners, fuel producers, airports, logistics providers, certification agencies, and policymakers.

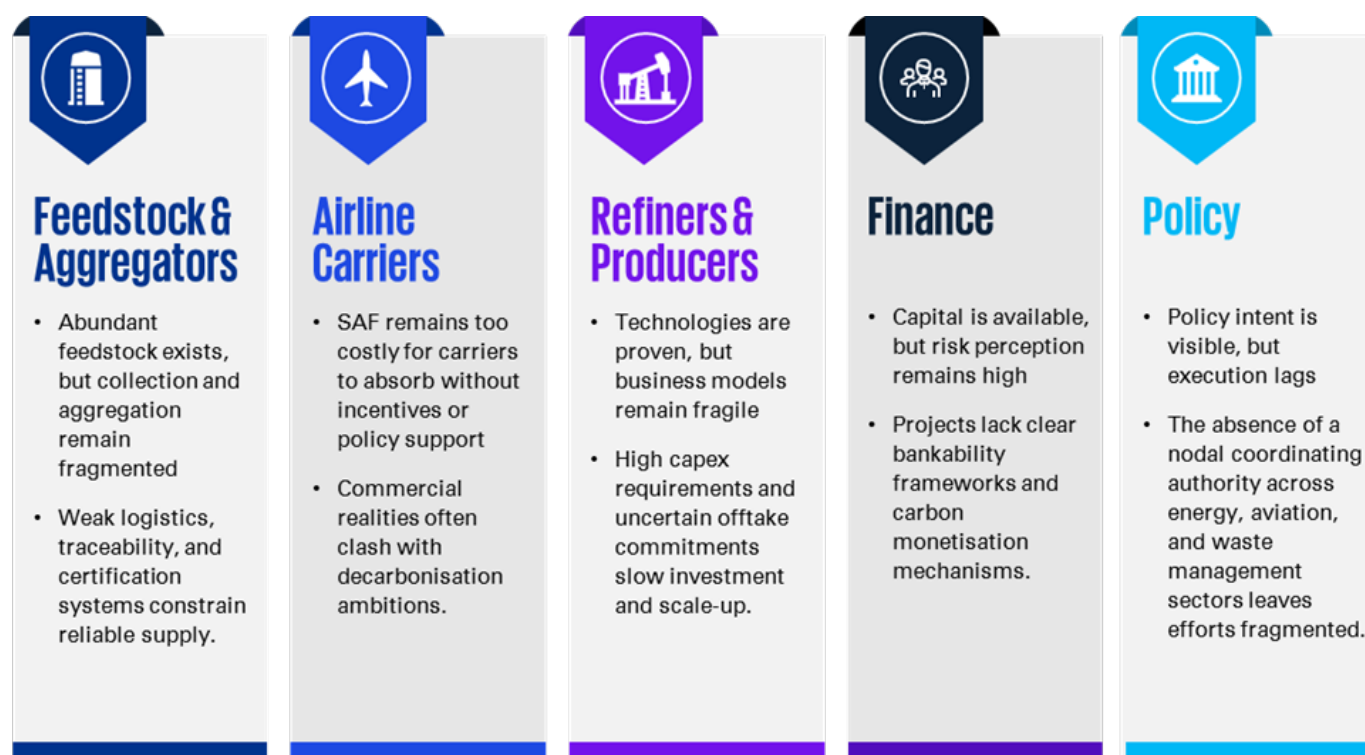


Figure 7: Challenges voiced across the value chain

Overcoming these barriers will require a decisive shift, **from isolated pilots to integrated industrial strategy**, and from policy intent to execution at ecosystem scale.

The countries that successfully align policy frameworks, industrial capability, financing structures, logistics infrastructure, and market demand may ultimately emerge as long-term leaders in the global SAF economy.

For India, building a resilient and future-ready SAF ecosystem will depend not only on technological progress, but on the ability to integrate the entire value chain into a coordinated national aviation fuel architecture.



04

From policy ambition to industrial ecosystem



The question is no longer whether SAF will emerge as part of the future aviation system. The question is which countries might build the industrial ecosystems capable of producing SAF reliably, competitively, and at scale. This is where the global transition enters a fundamentally different phase. The early SAF market was shaped by pilot projects, voluntary commitments, and policy signalling. The next phase will be determined by industrial execution.

India's SAF transition may evolve across three strategic phases

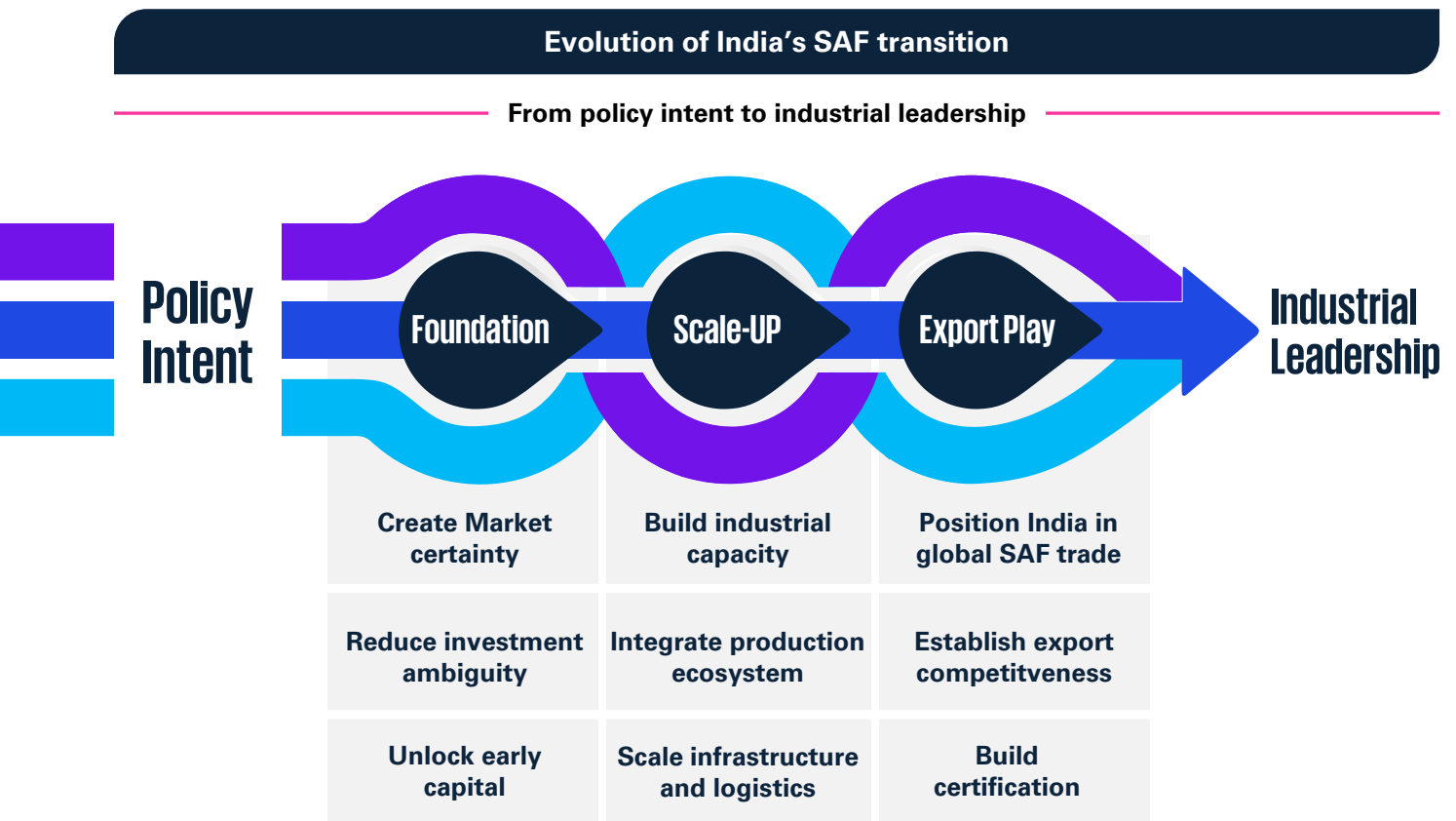


Figure 8: India's SAF transition pathways

Each phase addresses a different structural requirement within the ecosystem.



Phase 1

Foundation — Market Certainty to Unlock Early Investment

The first challenge is not technology. It is investment confidence.

Financing remains the single largest constraint in scaling SAF. Capital costs range between USD 1,500–3,000 per tonne of annual capacity, depending on technology²⁶. In the absence of predictable demand and with a steep price premium over conventional ATF, early projects may not advance without risk-sharing mechanisms. Building market confidence and scale requires financial innovation as much as technological readiness.

Producer might not commit long-duration capital without demand visibility. Airline may not enter large-scale procurement agreements without regulatory clarity. Financial institution might not underwrite first-generation SAF assets without policy certainty.

The Foundation phase is therefore about reducing ecosystem ambiguity.

Its objective is simple: **Create a credible market environment capable of unlocking industrial participation.**

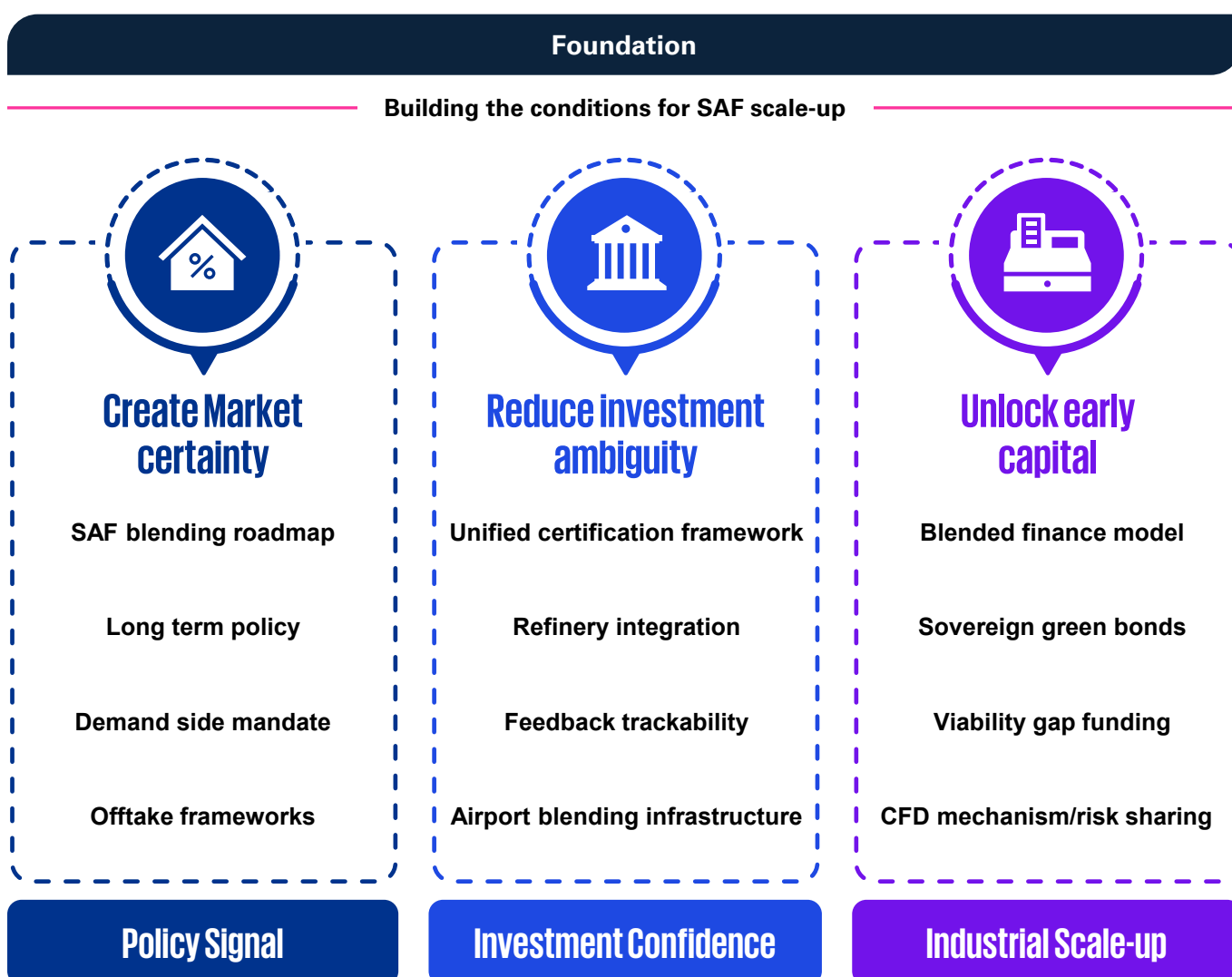


Figure 9: Foundation Phase: Building the conditions for SAF scale up

Ultimately, the Foundation phase is about creating the conditions required for SAF to move from policy ambition to an investable industrial opportunity. The countries that establish regulatory clarity, financing confidence, certification credibility, and long-term market visibility early may accelerate ecosystem formation significantly faster than those relying on fragmented pilot-led approaches. For India, building this foundation effectively could determine not only the pace of SAF deployment, but the country's ability to position itself within the future global aviation fuel economy.

26. Sustainable Aviation Fuel (SAF) Manufacturing Plant Project Report 2026: Cost Analysis, ROI, and Feasibility Insights, CLAIGHT accessed on 04.06.2026

Phase 2

Scale-Up — Scaling Industrial Capacity and Enabling Integrated Infrastructure

Once market certainty begins to emerge, the strategic challenge shifts from policy signalling to industrial execution. This phase could determine whether India merely participates in the SAF market or builds long-term structural competitiveness within it.

The Scale-Up phase is fundamentally about ecosystem industrialisation.

Several components of the future SAF value chain already coexist geographically across major industrial, refining, and aviation corridors in India. This creates the possibility of developing integrated SAF clusters where production, blending, storage, certification, and airport fuel supply operate within interconnected industrial networks rather than fragmented standalone assets.

Scale Up

Scaling industrial capacity and enabling integrated infrastructure

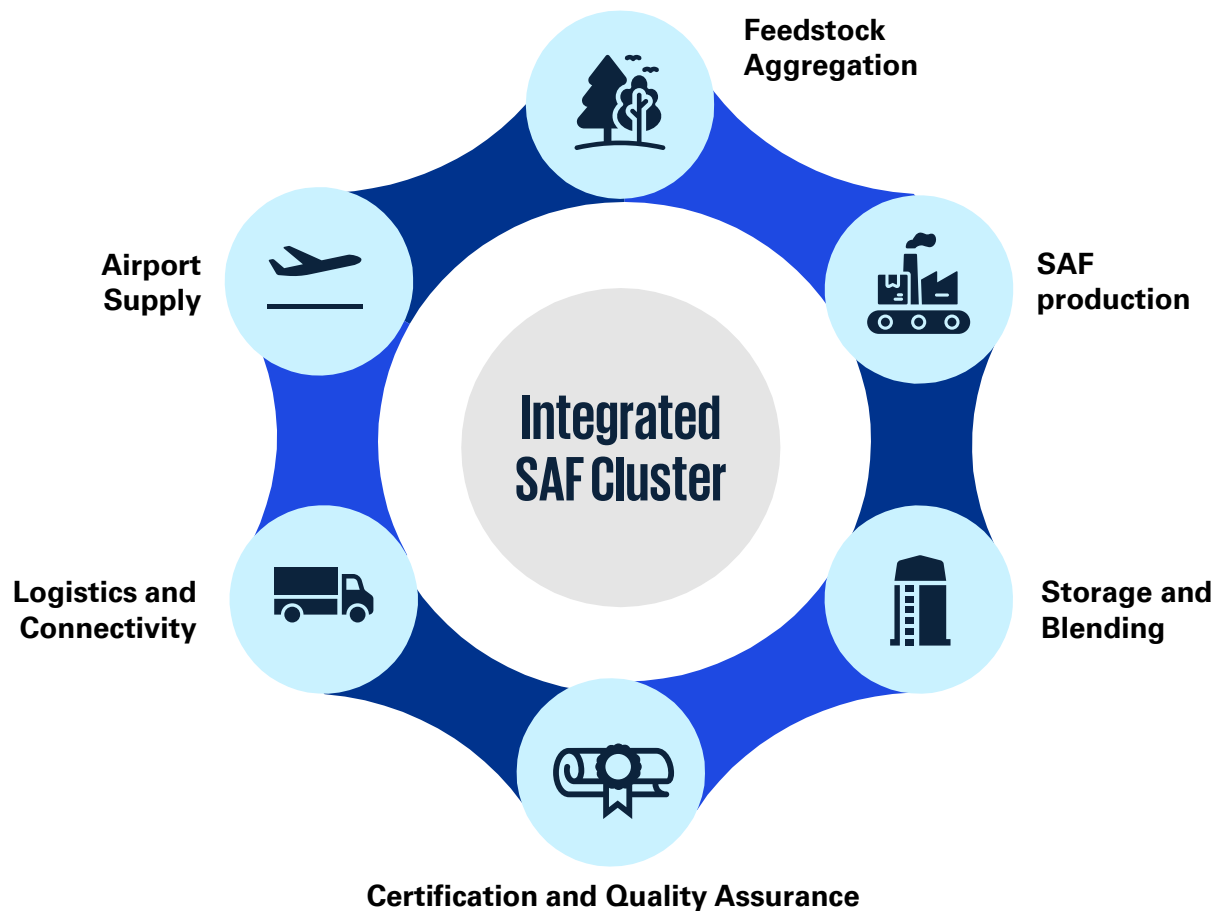


Figure 10: Scale up phase

Infrastructure readiness might become a defining factor during this phase.

Globally, SAF producers are increasingly co-locating production assets near existing refining infrastructure to leverage shared hydrogen systems, utilities, storage capacity, blending facilities, and established fuel logistics networks. Such integration significantly lowers infrastructure duplication, improves operational efficiency, and reduces overall project costs.

In India, industrial corridors such as Panipat–Mathura in the north and Kochi–Mangaluru in the south already combine refining infrastructure, industrial processing capability, logistics connectivity, and proximity to major aviation hubs including Delhi and Bengaluru. These regions create the foundation for future integrated SAF production corridors linked directly with airport fuel demand.

Airport infrastructure readiness will also become increasingly important.

As SAF deployment scales, major aviation hubs will require compatible blending systems, upgraded storage infrastructure, hydrant integration, quality assurance systems, and certification alignment capable of supporting seamless SAF integration within existing ATF supply chains.

At the same time, regional SAF logistics networks might need to evolve beyond conventional fuel transportation systems.

Future competitiveness may increasingly depend on the ability to establish multimodal SAF corridors integrating feedstock aggregation, rail and port connectivity, refinery integration, storage terminals, and digitally traceable supply chains into one coordinated logistics architecture.

Technology scale-up will become equally important.

The next phase of India's SAF transition might require simultaneous expansion across multiple pathways rather than dependence on a single technology route. While HEFA and ATJ pathways

may support early commercial deployment, long-term scale-up will also require investment in Fischer–Tropsch pathways, biomass gasification, waste-to-fuel systems, and future synthetic fuel technologies.

This transition might require stronger collaboration between refiners, technology providers, airports, fuel producers, research institutions, and global certification agencies.

International partnerships may also become strategically important for accelerating technology transfer, certification alignment, regulatory harmonisation, and commercial deployment timelines.

The larger challenge during the Scale-Up phase is therefore not only increasing production capacity. It is building a fully integrated SAF ecosystem capable of delivering fuel reliably, competitively, and at industrial scale.

The countries that industrialise fastest may ultimately dominate future SAF supply chains.

Phase 3

Export Play — Positioning India within the future SAF economy

The long-term SAF opportunity extends well beyond domestic aviation demand. A structural supply gap is emerging globally as major aviation markets face tightening SAF mandates without sufficient domestic feedstock or production capacity.

Europe, parts of Asia-Pacific, and several international aviation hubs are likely to remain dependent on imported SAF to meet future compliance requirements. This is creating the foundation for a new global low-carbon fuel trade system.

As SAF markets mature, competitive advantage may increasingly depend not only on production scale, but on the ability to deliver certified, traceable, and cost-competitive fuel reliably into international aviation supply chains.

India possesses several structural advantages including diversified feedstock availability, large refining capacity, integrated fuel logistics infrastructure, industrial scale, and strategic access to major global aviation corridors connecting Europe, the Middle East, and Asia-Pacific markets.

The next phase of India's SAF transition could therefore evolve beyond domestic blending into

the development of export-oriented SAF corridors integrated with refineries, ports, storage infrastructure, and international fuel logistics networks.

Market access will become equally important.

As global airlines move toward long-term SAF procurement agreements, early engagement with international carriers, airport hubs, and fuel suppliers may become critical for securing long-duration offtake partnerships and premium market positioning.

Certification credibility will also become a defining differentiator.

Future SAF markets are likely to reward suppliers capable of demonstrating traceability, lifecycle emissions transparency, and compliance with evolving international carbon frameworks. This creates an opportunity for India to develop a globally recognised SAF assurance ecosystem built around certification integrity, carbon intensity verification, and supply reliability.

Countries capable of combining scale, certification credibility, logistics efficiency, and supply reliability may acquire significant long-term advantages.

India at the center of future trade flows

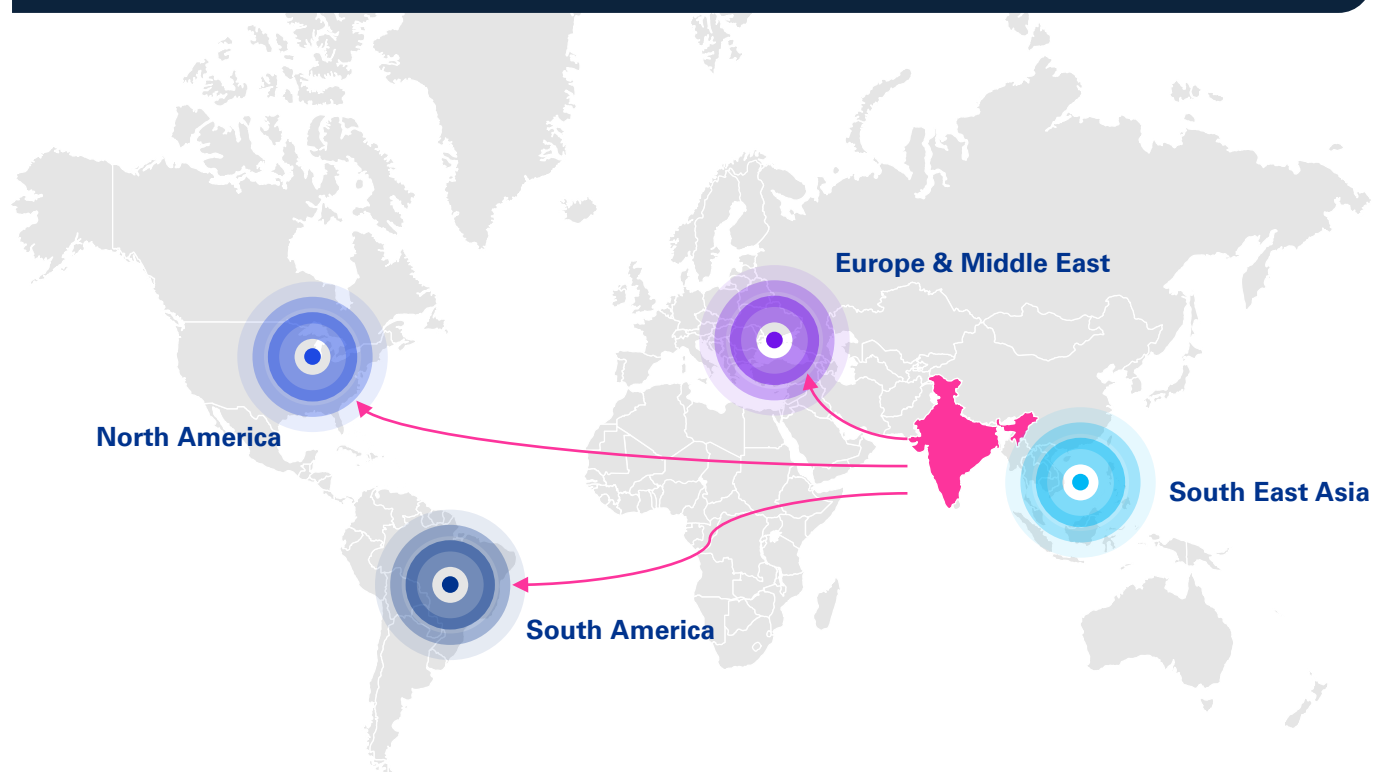


Figure 11: India at the centre of SAF trade flows

India's SAF transition is ultimately an industrial strategy

The next phase of India's aviation transition may not be defined only by airport expansion or fleet growth. It may increasingly be defined by whether India can build a resilient domestic aviation fuel ecosystem. This is no longer only a sustainability discussion.

It is simultaneously about:

- energy resilience
- industrial competitiveness
- low-carbon manufacturing
- rural industrialisation
- and strategic positioning within future aviation fuel markets

India already possesses many of the foundational elements required for this transition.

The strategic challenge now is execution at ecosystem scale.



Conclusion

India's aviation sector is entering a defining transition.

The challenge is no longer limited to expanding airports, adding aircraft, or increasing passenger traffic. The deeper strategic question is whether India can build a resilient aviation fuel ecosystem capable of supporting long-term growth in an increasingly volatile energy and carbon environment.

This transition is unfolding at the intersection of rising aviation fuel demand, growing exposure to imported crude and geopolitical volatility, and accelerating global carbon regulation.

Sustainable Aviation Fuel sits at the centre of this convergence.

Globally, SAF is rapidly evolving from a niche sustainability initiative into a strategic aviation fuel pathway, and the countries that move early to build integrated SAF ecosystems may ultimately shape the future architecture of aviation fuel supply chains.

For India, this creates a strategically significant opportunity. Few countries simultaneously possess diversified feedstock availability, large refining capacity, expanding industrial infrastructure, established fuel logistics systems, and one of the world's fastest-growing aviation markets.

Together, these advantages create the foundation for a multi-pathway SAF ecosystem capable of supporting not only aviation decarbonisation,

but also long-term energy resilience, industrial competitiveness, and participation in future global low-carbon fuel markets.

The implications are considerably broader.

A domestic SAF ecosystem could strengthen energy resilience, reduce long-term aviation fuel vulnerability, create new industrial value chains, accelerate rural industrialisation, and position India within emerging low-carbon fuel trade systems.

However, the strategic impact of SAF could ultimately depend on the scale of deployment, as incremental blending alone is unlikely to materially reduce exposure to imported crude or supply disruptions. Sustained scale-up will be essential for SAF to evolve into a meaningful component of India's aviation fuel security framework.

More importantly, it could fundamentally reshape the role of India's bioenergy economy within the future industrial landscape.

The transition ahead, however, might not be automatic.

SAF competitiveness could ultimately depend on execution at ecosystem scale — integrating feedstock systems, refining infrastructure, logistics networks, financing structures, certification systems, and long-term policy alignment into a coordinated industrial platform.

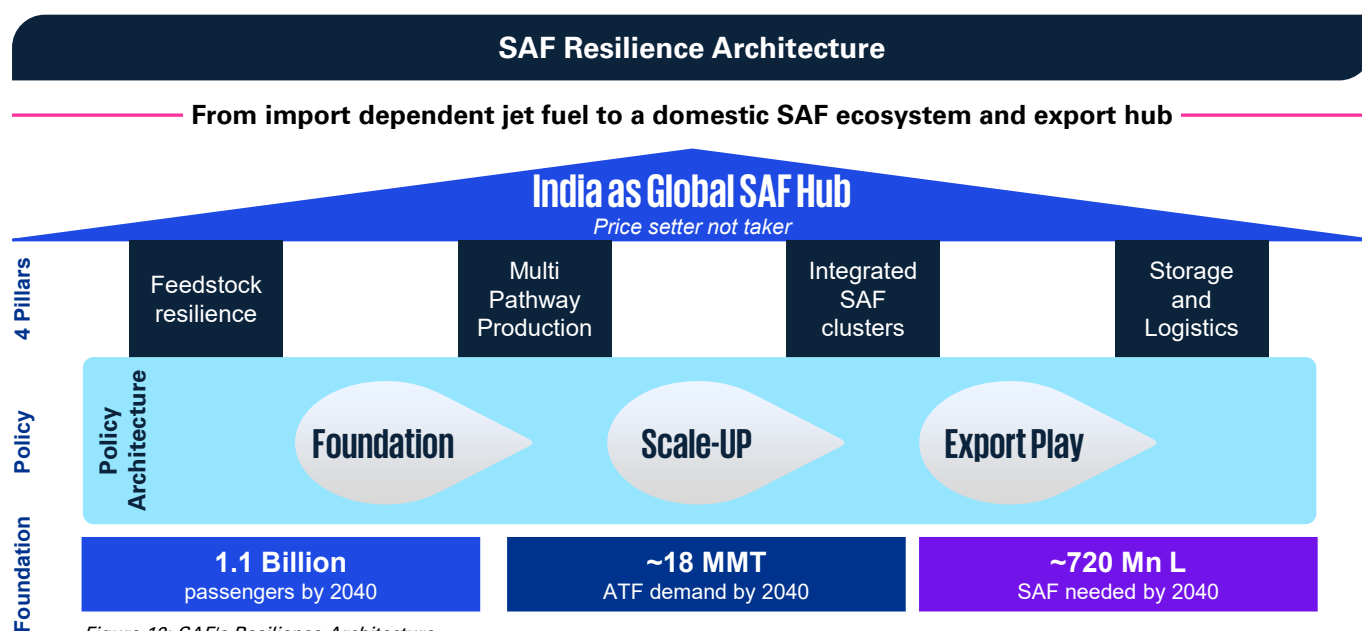


Figure 12: SAF's Resilience Architecture

India's aviation future can no longer be defined only by airports and aircraft, but by the rise of bio-refineries, rural industrial corridors, technological breakthroughs, and next-generation low-carbon fuel ecosystems.

India has already demonstrated that it can execute large-scale fuel transitions when policy, industry, and infrastructure move together. The SAF transition may become the next and most strategically significant evolution of that capability.

List of Abbreviations

Acronym	Full Form
AAI	Airports Authority of India
ATF	Aviation Turbine Fuel
AtJ	Alcohol-to-Jet
BIS	Bureau of Indian Standards
bbI	Barrel
CFD	Contract for Difference
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CY	Calendar Year
DGCA	Directorate General of Civil Aviation (India)
FT	Fischer–Tropsch
FY	Financial Year
gCO₂e/MJ	Grams of CO ₂ equivalent per megajoule
GW	Gigawatt
HEFA	Hydroprocessed Esters and Fatty Acids
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IRA	Inflation Reduction Act (U.S.)
LTAG	Long-Term Aspirational Goal
MMPA	Million Metric Tonnes Per Annum
MSW	Municipal Solid Waste
PtL	Power-to-Liquids
SAF	Sustainable Aviation Fuel
UCO	Used Cooking Oil
USD	U.S. Dollar

Acknowledgement

This report, *Fuelling the Future: Building a Resilient Aviation Fuel Ecosystem for India*, reflects the collective contributions of individuals at KPMG in India, whose expertise and collaborative efforts were instrumental throughout its development.

The report benefited from extensive collaboration across energy, aviation, infrastructure, and sustainability domains, enabling a multidimensional perspective on the evolving SAF landscape and India's long-term aviation fuel transition. From research and market analysis to strategic framing and editorial refinement, each contribution played an important role in strengthening the depth and direction of the paper.

The final report stands as a reflection of shared thinking, collaborative effort, and a common commitment toward supporting the development of resilient and future-ready aviation fuel systems for India.

Vipul Goyal

Associate Director – Oil & Gas

Vidhi Shah

Manager – Oil & Gas

Vaibhav Mishra

Senior Consultant – Oil & Gas

Nisha Fernandes

Associate Director – Markets

Arun Choudhary

Assistant Manager – Markets



KPMG in India contacts:

Akhilesh Tuteja

Head – Clients & Markets

E: atuteja@kpmg.com

Anish De

Global Head, Energy Natural

Resources & Chemicals

E: anishde@kpmg.com

Vivek Rahi

Partner and National Head –

Oil and Gas

E: vivekrahi@kpmg.com

Jodhbir Sachdeva

Associate Partner – Aviation

E: jodhbir@kpmg.com

kpmg.com/in



Access our latest insights
on KPMG Insights Edge

Follow us on:

kpmg.com/in/socialmedia



The information contained herein is of a general nature and is not intended to address the circumstances of any particular individual or entity. Although we endeavor to provide accurate and timely information, there can be no guarantee that such information is accurate as of the date it is received or that it will continue to be accurate in the future. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation.

KPMG Assurance and Consulting Services LLP, Lodha Excelus, Apollo Mills Compound, NM Joshi Marg, Mahalaxmi, Mumbai – 400 011 Phone: +91 22 3989 6000, Fax: +91 22 3983 6000.

© 2026 KPMG Assurance and Consulting Services LLP, an Indian Limited Liability Partnership and a member firm of the KPMG global organization of independent member firms affiliated with KPMG International Limited, a private English company limited by guarantee. All rights reserved.

The KPMG name and logo are trademarks used under license by the independent member firms of the KPMG global organization.

Some images in this report have been created using artificial intelligence technology.

This document is for e-communication only. (TL_0626_AC)