The buyers' club encourages potential early adopters of sustainable air travel, such as government organisations or large corporates that have higher sustainability ambitions at present, to take collective action. For Singapore, as a global business and logistics hub, there is an opportunity to tap on business travellers and air cargo users and encourage them to become first movers in joining the corporate buyers' club. After government organisations and large corporates in Singapore have come on board as the initial members, the buyers' club can then be expanded to attract small and medium enterprises, and even beyond Singapore to large companies in the Asia-Pacific region.

A corporate buyers' club can create value for both SAF buyers and producers. By aggregating demand, the buyers' club provides demand certainty for SAF suppliers, encouraging them to invest and scale up their SAF production. At the same time, demand aggregation avails high volumes of SAF at competitive prices to the SAF buyers. It enables corporates to reduce their environmental footprint from business travel or cargo transportation.

The key enablers for this recommendation would include the development of SAF production and trading capabilities in the industry. Digital infrastructure is also required to facilitate the aggregation of group purchases and delivery of either physical or virtual SAF. It would also be necessary to have robust frameworks to ensure that high-integrity SAF is purchased through the buyers' club. Additionally, a transparent accounting approach would prevent double counting. Eventually, regional cooperation would also be required to extend the buyers' club outside of Singapore.

c. Sustainable Aviation Fuel — Design and introduce a structural offtake mechanism and create demand signals for secured long-term, lower-cost SAF supply

The IAP's next recommendation to create long-term, predictable SAF demand is to design and introduce a structural SAF offtake mechanism at Changi Airport. It is unlikely that voluntary demand alone can scale SAF use beyond certain levels or provide sufficient and sustained demand certainty to enable capital-intensive investments in SAF production facilities. Thus, such a structural mechanism aims to catalyse a self-sustaining ecosystem and flow of funds for SAF in Singapore to encourage greater adoption of SAF at Changi Airport. In turn, this provides the necessary demand signals for SAF suppliers to ramp up their production to drive down the price of SAF.

As a vibrant air hub, Singapore needs to take a proactive stance in adopting offtake mechanisms to promote the use of SAF. That said, aviation is a global business and policy harmonisation is important to reduce market distortions among airports. While Singapore considers a SAF offtake mechanism for Changi Airport, it should also engage the region to advocate the need for a regional approach towards SAF. In the long run, there is a need to take a regional or even global view in implementing such policies.

Different offtake models are being explored or implemented around the world. Some airlines, such as Air France–KLM, have introduced intrinsic surcharges to ticket prices to fund the extra cost of using SAF. Others like Lufthansa have introduced voluntary carbon offset programmes for customers to pay extra to compensate for their CO_2 emissions. Some countries have introduced or are planning to introduce mandates at the air hub level. For example, Norway has started with a 0.5% advanced biofuels blend in 2020, and is targeting to increase this to 30% in 2030.[38] Sweden[39] and France[40] have also started with mandates of 0.8% GHG reduction for aviation fuels from 2021 and 1% SAF blend from 2022 respectively. The European Parliament has recently adopted its position to propose that the EU adopt a 2% SAF blend mandate by 2025, followed by a 37% mandate by 2040 and 85% mandate by 2050.[41] On the other hand, the United States has implemented financial incentives for SAF on both the demand and supply side.[42]

A non-exhaustive list of the key design options for a SAF offtake mechanism is presented below. Beyond these broad options, there is also a need to define second-order details, such as further breaking down each option (e.g., defining Origin-Destination (OD) versus T&T passengers) and introducing initiatives in a phased and progressive manner.

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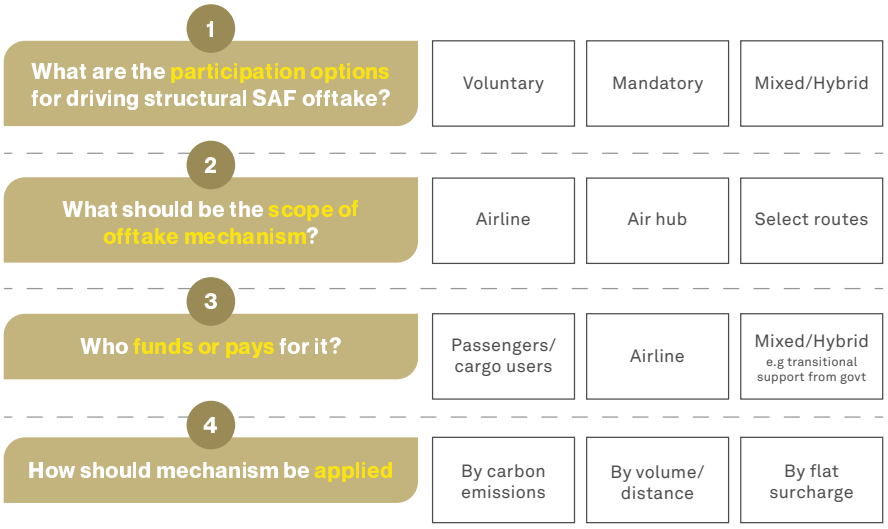
38 Reuters, "Airlines get ready for jet biofuel take-off in Norway", https://www.reuters.com/article/us-norway-airplane-biofuels-idUSKBN1XV1TQ.

39 Neste, "Sweden becomes a frontrunner in sustainable aviation", https://www.neste.com/releases-and-news/aviation/neste-sweden-becomes-frontrunner-sustainable-aviation.

40 ExxonMobil, "ExxonMobil and Neste to Supply Sustainable Aviation Fuel in France", https://www.exxonmobil.com/en/aviation/knowledge-library/resources/sustainable-aviation-fuel-france.

41 European Parliament, "Texts adopted - Sustainable aviation fuels (ReFuelEU Aviation Initiative)", https://www.europarl.europa.eu/doceo/document/TA-9-2022-0297_EN.html.

42 United States Department of Transportation, Federal Aviation Administration, "U.S. Releases First-Ever Comprehensive Aviation Climate Action Plan to Achieve Net-Zero Emissions by 2050".



Source: BCG

Assessing the design of the SAF offtake mechanism would require careful consideration based on each country's unique context. The sustainability benefits must be balanced with the potential economic impact on passengers, airlines and the air hub.

One of the fundamental design features of a SAF offtake mechanism is whether participation is voluntary (e.g., paying extra for green flights and incentives) or mandatory (e.g., SAF blend mandate). An example of a voluntary option is to offer incentives for the use of SAF. However, such incentives are usually transitional to assist companies in tiding over the initial high-cost barriers of adopting SAF. These incentives could be expensive and challenging to sustain in the long run. On the other hand, SAF mandates could provide long-term demand certainty since fuel suppliers would be obligated to purchase a certain amount of SAF for their sales to airlines to meet the targets. The blend ratio could also be adjusted to chart out a progressive adoption of SAF over time. Nonetheless, mandates could distort competition with other airports with less ambitious or even no mandates, resulting in an uneven playing field. That said, these options are not binary, and a combination of these could be utilised to achieve optimal benefits.

There is a need to carefully assess the scope of the offtake mechanism based on the unique context and characteristics of the air hub, its airlines and passengers. An airline-level offtake mechanism could be limited in impact while compromising the airline's competitiveness. A route level mechanism or "green corridor", which could arise from direct government-to-government or airline-to-airline arrangements, would likewise have limited impact due to its reduced scale. Comparatively, an airport-level mechanism has the highest potential for reducing carbon emissions while ensuring a level playing field among all airlines operating at that airport.

Given the high cost of SAF at present, determining the source of funding for the offtake mechanism would be a key consideration. Broadly, three main groups of stakeholders could contribute: passengers (through higher ticket prices or SAF offsets), airlines (in the form of higher operating costs), and the government (through possible incentives or other transitional funding support). All stakeholders would likely have to co-share the cost of adopting SAF, considering the current substantive price difference between SAF and fossil jet fuel. There is also the possibility of differentiating between passenger groups. For Changi Airport, its competitiveness is closely linked to its status as a transfer hub. Therefore, imposing a lower share of cost on transfer passengers could help to moderate the impact on competitiveness.

Lastly, the metrics used to determine the offtake mechanism could also differ. This could include measuring by the amount of carbon emissions (i.e., direct carbon pricing) or by volume. Using carbon emissions could be more direct and incentivise higher reductions but it is more challenging to implement and verify. A volume-based mechanism would be more straightforward to implement as it is measurable and easily understood by the public and stakeholders.

A preliminary analysis of the implications of different combinations of offtake options for Singapore is presented below. This is by no means exhaustive and serves to present a possible matrix for assessing the different options.

		Airline		Air hub		Select routes
		Intrinsic pricing (Embedded SAF premium)	**Voluntary option** (Pay extra for green flights)	**Mandatory** (For all airlines)	**Voluntary** (Usually linked to incentives)	**Mandatory**
Competitiveness	Impact on airline	Could impact price competitiveness, esp for short haul, price sensitive segments	No impact on profitability of airlines	Similar impact across all airlines flying into hub	Similar options/benefits for all airlines	Similar impact on the same route
Competitiveness	Impact on air hub	Could impact the hub carrier	No impact to air hub	Impact can be moderated if T&T[1] passengers are excluded	Enhance attractiveness as SAF air hub	Limited impact on direct flights
Competitiveness	Impact on SG as destination	Limited impact, as other airline options	No impact to Singapore's tourism	SG is already a higher cost destination. Higher cost could have neutral or limited negative impact	Minimal impact to Singapore's tourism	Limited impact on direct flights
Sust. Impact	Impact on sustainability outcomes	SAF uptake linked to airline commitments	Depends on uptake rate from customers	Higher SAF uptake, lower emissions	Depends on uptake rate from airlines	SAF uptake only on selected routes
	Effectiveness *In ensuring level playing field and driving impact*	**Low:** Intrinsic pricing might impact airline competitiveness, and limited impact on outcomes from voluntary options		**High:** Mandatory interventions at air hub level can potentially level playing field — can also be further supported with voluntary measures		**Moderate:** Impacts only selected routes, requires bilateral effort

Legend: Relatively Good/High; Relatively Moderate; Relatively Poor

1. Transfer & Transit

Source: BCG

The IAP recommends that CAAS work with stakeholders to design and introduce a SAF offtake mechanism, considering all the above factors and incorporating feedback from affected stakeholders. This would build on the existing efforts by Singapore in promoting SAF adoption, such as the SAF pilot at Changi Airport and the corresponding selling of SAF credits.

The key enablers for this recommendation would include the development of policy and regulations for the SAF offtake mechanism, as well as the involvement of the entire industry (e.g., governments, SAF producers, airport stakeholders, corporates and individual travellers), which is crucial for the mechanism to work. Regional cooperation would also be key in promoting common approaches at the regional and global levels.

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d. Carbon offsetting — Innovate to build deep aviation industry vertical offerings in carbon markets, develop a support ecosystem for aviation carbon offsets solutions and encourage uptake among corporates and consumers

Beyond in-sector measures, the ATAG Waypoint 2050 report projected that carbon offsets are necessary for the aviation sector to achieve net-zero emissions by 2050. As the carbon offset market is still nascent, there is scope to build up such a market for aviation carbon offsets in Singapore to support the decarbonisation of the aviation sector. There are opportunities for innovation to address the availability, quality and pricing of offsets. Moreover, the demand for offsets in the aviation industry is expected to increase over the coming years, fuelled by CORSIA and other regulatory requirements. Several challenges exist in the carbon offset market, such as inconsistent standards and criteria for defining carbon offset quality across registries, a lack of transparency in the pricing of carbon offsets, and a limited supply of high-quality carbon offset projects. At the same time, the uptake of voluntary carbon offset by corporates and individual passengers for air travel can also be improved.