In collaboration
with Oliver Wyman

WORLD ECONOMIC FORUM

Financing The Airports Of Tomorrow:
A Green Transition Toolkit

WHITE PAPER

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Foreword

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The World Economic Forum and Airports Council International (ACI) World are co-leading the Airports of Tomorrow initiative, which seeks to address the energy, infrastructure and financing needs of the aviation industry's transition to net-zero carbon emissions by 2050. The initiative has convened executives from across the aviation ecosystem with an aim to accelerate the move towards increased sustainability and resilience.

The Airports of Tomorrow initiative comprises four pillars of work — infrastructure, sustainable aviation fuel, financing and innovation. The focus of this document is pillar 3, financing global airports' green transition.

This report presents key findings of our research in the form of a toolkit intended to help airports chart a path to net zero through decarbonization-related projects and investments. The content includes strategies to access necessary finance, guidance for strategic planning and best-in-class examples of airports today. The report also seeks to provide the broader ecosystem of stakeholders, including financial institutions and policy-makers, with greater insight into the challenges facing global airports as they work towards net zero.

The toolkit is focused on transition projects for which airports might seek funding, such as onsite airport infrastructure to facilitate the use of sustainable aviation fuel (SAF). It does not include off-campus investments, such as SAF refineries. While all elements of an airport's sustainability strategy are essential to the business, the focus of this report is on decarbonization and how the transition to net-zero greenhouse gas emissions will be financed.

This work was developed by the World Economic Forum in partnership with Oliver Wyman, ACI World and sustainable mobility and airport infrastructure company Mundys.

Executive summary

The world is facing a climate crisis and industries and countries are being asked to cut greenhouse gas (GHG) emissions to net zero by 2050. Aviation contributes about 2% of total world emissions, primarily from the burning of fossil fuel by airlines.[1] The International Civil Aviation Organization (ICAO) and its member states have agreed to a long-term aspirational goal (LTAG) for the industry to reach net zero by 2050.[2] This decarbonization undertaking will require the sector to spend an estimated $5 trillion, with airports responsible for a small percentage of that investment as well as a fraction of the industry's total emissions.[3]

Airports are a highly interconnected network of onsite and offsite stakeholders who rely on each other to serve the end customer. The majority of an airport's GHG emissions are not directly caused by the airport's own operations but are instead the product of the activities of other ecosystem participants, notably aircraft operators.[4]

Still, airports will play a key role in the sector's decarbonization efforts through the provision of low-carbon fuels and are already beginning to adopt decarbonization strategies to reduce their own carbon footprints, starting with the emissions directly under their control. This toolkit is designed to support those efforts by providing airport executives around the world with potential ways to finance their decarbonization strategies.

Airports traditionally draw financing from a variety of sources outside of their profits and capital reserves. For example, state-owned airports receive state funding, while most airports of sufficient size also look to private equity, banks and bond issues for additional financial support. When looking to fund decarbonization projects, airports can also consider alternative sources, such as sustainability-linked bonds or loans and green bonds or loans. The toolkit summarizes all known financing options that support decarbonization projects and includes case studies for how each financing tool has been used.

In addition to the financing toolkit, this report discusses the role an airport may assume as an influencer on decarbonization, potentially able to persuade other ecosystem members to move more quickly to reduce GHG emissions. It also examines the long-term nature of the decarbonization strategies that airports will need to develop.

Airports are essential elements of modern society, creating economic opportunity, serving local communities and connecting people. While the challenge they face to decarbonize is substantial, it is far from impossible. By working with other ecosystem members, accessing support from financial institutions, investors and governments, and prioritizing decarbonization projects in their strategic vision, airports can chart a path to net zero.

1 The airport ecosystem and drivers of decarbonization

Principal driving forces behind airport decarbonization are government policy and airport size, though airport ownership and public opinion also play important roles.

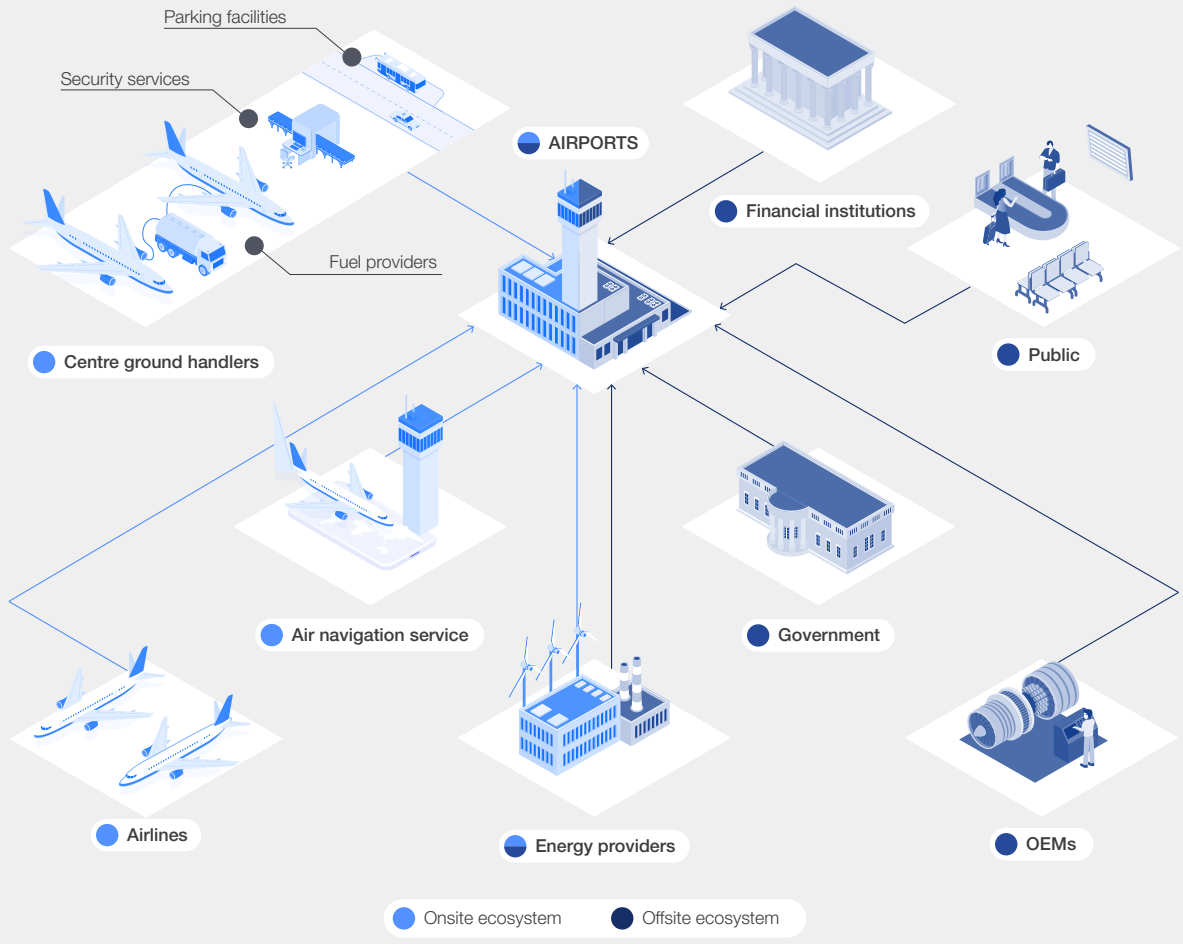
1.1 Onsite and offsite ecosystem

The airport ecosystem is a highly interconnected network of onsite and offsite stakeholders (see Figure 1). While they rely on each other to serve the end customer, they maintain very different emissions profiles.

The onsite airport ecosystem includes the airport and its retailers and concessionaires, the airlines, fuel providers and ground-handling service providers. All contribute to safe, efficient and effective airport operations and are united in a common goal to serve the airport's customers. Each onsite ecosystem participant also represents a carbon footprint that must be addressed in any airport plan to decarbonize.

The offsite airport ecosystem includes the governments and policy-makers that regulate and help fund airport operations. In almost all cases, they are the driving forces behind decarbonization efforts. Other major offsite participants are the financial institutions and investors that provide funding for airport initiatives as well as institutional investors in airport operations. Finally, local economies play a vital role in this offsite ecosystem by influencing government policy and providing the market that supports airport operations.

FIGURE 1 **Airport ecosystem**



Onsite airport ecosystem:

Air navigation service providers (ANSPs)
Airlines
Airport employees (such as security services, parking facilities and maintenance)
Airports
Fuel providers
Ground-handling service providers

Offsite airport ecosystem:

Energy providers, including fuel sellers and utilities
Financial institutions and investors
Governments and policy-makers
Local economies
Original equipment manufacturers (OEMs), such as engine and aircraft manufacturers

“ $175 billion – additional annual capital expenditure needed for aviation industry to reach net zero by 2050.

Aviation as a global industry has committed to reaching net-zero emissions by 2050, in alignment with the 2015 Paris Agreement on climate. To meet this commitment, it is estimated that the industry will need to spend upwards of $5 trillion in capital investments focused on developing new propulsion technologies such as hydrogen and battery-powered aircraft and building commercial-scale production capacity for alternative fuels such as SAF (see Figure 2). This translates to an additional $175 billion in capital expenditures per year from now until 2050 – on top of business-as-usual spending. Of this total investment, a relatively small amount is apportioned to infrastructure spending on airports, aside from eventually deploying hydrogen-based propulsion infrastructure.[5]

FIGURE 2 **Global aviation capital investment for net zero ($ trillion, 2022-2050)**

The global aviation industry requires significant capital to reach net-zero emissions, but the focus of the spend is on clean energy for aircraft

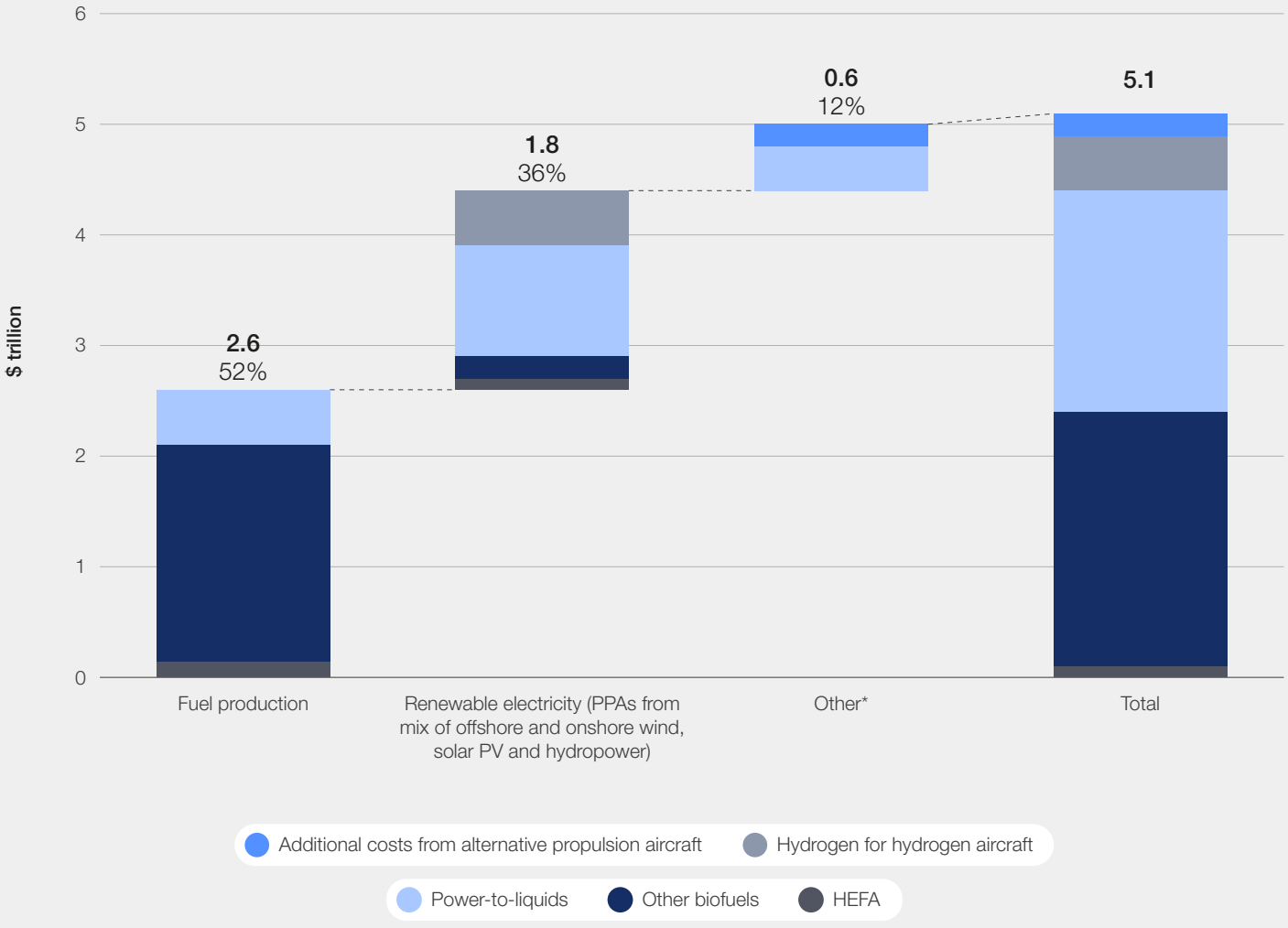
$5 trillion

Capex funding required by 2050 across aviation to reach net zero, **focused on power generation off-airport**

Which translates to an annual figure of…

$175 billion

Average annual investment required across aviation, **of which an immaterial amount is airport H2 infrastructure by 2050**



* Other = hydrogen production ($0.2 trn) + CO_2 point source capture ($0.2 trn) + additional costs of hydrogen and battery-electric aircraft ($0.2 trn) + airport hydrogen infrastructure (< $0.01 trn)

Source: Mission Possible Partnership (MPP), Making Net-zero Aviation Possible, July 2022.

All airport capital projects should be reviewed to ensure compliance with decarbonization policies and strategies.

However, aviation's decarbonization investment does not represent the full picture of capital expenditure for airports, as it does not account for the significant investment required to support new projects, infrastructure needs and ongoing maintenance. ACI North America estimates that in the US alone, at least $150 billion in funding for airport infrastructure projects will be needed between 2023 and 2027.[6] Fitch Solutions estimates that over $160 billion worth of low- and medium-risk airport infrastructure projects were begun globally in the last five years.[7] The extent to which airport spend is centred around decarbonization is dictated by multiple factors that are examined below, but all airport capital projects should be reviewed to ensure compliance with decarbonization policies and strategies moving forward.

Like other business and governmental operations, the emissions profile of an airport is segmented into Scope 1, Scope 2 and Scope 3 emissions (see Figure 3). Scope 1 emissions are those from airport-controlled sources, such as airport-owned power plants and conventional airport-owned vehicles. Scope 2 emissions relate to production of energy consumed by the airport, such as the carbon emissions from the electricity purchased from utilities. Scope 3 emissions are caused not by the airport but by other ecosystem participants, such as airlines and their operations related to flights to and from the airport. These emissions, which are out of the control of the airport, make up some 97% of an airport's emissions profile.

Thus, airlines play a significant role in dictating the timetable and ambition of decarbonization efforts at airports. As the largest contributors to overall airport GHG emissions, airlines must be involved in airport decarbonization strategies.[8] For instance, airports will not be able to significantly reduce their Scope 3 emissions without the widespread adoption of SAF by airlines and the eventual commercial development of propulsion technology not dependent on fossil fuels. In both these cases, airports will not be able to dictate the speed of adoption.

FIGURE 3 **Airports' Scope 1, 2 and 3 emissions**

Source: Oliver Wyman

1.2 Drivers of airport decarbonization strategy

Six factors were examined to identify the biggest drivers of airport decarbonization strategy implementation and financing (see Figure 4):

FIGURE 4 **Six drivers of an airport's decarbonization strategy, implementation and financing**

Factor 1
Government policy

Government policy, maturity of decarbonization focus and availability of decarbonization funding

Factor 2
Airport ownership

Airport ownership, maturity of decarbonization focus, location of airport owner and implications for sources of funding

Factor 3
Airport size

Airport size and access to financial institutions, based on credit-worthiness and strength of relationships

Factor 4
Financial institutions and investors

Financial institutions and investors and degree of focus on decarbonization

Factor 5
Public opinion

Public opinion and degree of focus on decarbonization

Factor 6
Airport archetype

Airport archetype and considerations for future strategic differentiation, based on key identifying features

Government policy is a huge force behind most funding and decarbonization efforts.

Government policy

Government policy is a huge force behind most funding and decarbonization efforts. In geographies where policies incentivize or require decarbonization, airports are more likely to have more ambitious environmental strategies — regardless of whether they are publicly or privately owned. In addition, in such localities, financial institutions tend to be more focused on supporting decarbonization-orientated projects. In geographies with little or no decarbonization-focused policy, the size of the airport and priorities of the airport owner will play a larger role in the progress achieved on decarbonization strategies.

The three geographies with the most favourable policy environments towards decarbonization projects are the US, the European Union (EU) and the United Kingdom. In the US, two recent policies are expected to play a pivotal role in decarbonization: the 2022 Inflation Reduction Act (IRA) and the 2021 Infrastructure Investment and Jobs Act (IIJA).

The IRA directs federal spending towards reducing carbon emissions through research and development (R&D) grants in carbon-reduction and low-carbon technologies, and tax credits for low-emission fuels, including SAF and loan guarantees. In total, the IRA has allocated nearly $400 billion towards clean energy.[9]

The IIJA represents the largest investment in US infrastructure in decades. Out of the roughly $100 billion in the legislation, $25 billion was set aside specifically for airports and aviation infrastructure.[10] The influx of funding from both these new laws has catalysed low-carbon technology investment and R&D and generated a raft of new projects in the US. This approach contrasts with those used more often by the EU and United Kingdom, which are typically less focused on opt-in incentives and tend towards mandates that set specific targets and deadlines for companies.

Further encouraging decarbonization, the US government's Environmental Protection Agency (EPA) has instituted requirements that may use GHG emission reductions as a criterion to secure approvals for future projects. Decarbonization may also become a factor in future Federal Aviation Administration grant-making decisions, but there are no definite plans currently to make this change.

In Europe, one important decarbonization-related policy is the EU taxonomy, which is considered a cornerstone of the region's sustainable finance framework. It is a market transparency tool that provides common definitions and standards for industrial and financial activities aligned with the EU's net-zero goal. This common playbook can drive or limit access to funding for sustainable activities included within the taxonomy.

Currently, the EU taxonomy covers airport terminal buildings and all non-aeronautical activities within them, such as construction, modernization, operation of infrastructure required for zero-tailpipe CO_2 operations, electrified ground power units and preconditioned air to stationary aircraft on airport premises.[11]

The EU taxonomy may also be used as a tool to judge the sustainability-alignment of capital expenditures (capex). Specifically, if an airport's strategic capex spending is aligned with the EU taxonomy, then financial institutions and investors are able to provide funding without fear of greenwashing. A non-aviation industry example of this is Enel, an Italian utility, which issued a sustainability-linked bond aligned to the EU taxonomy as well as the Sustainable Development Goals (SDGs) of the United Nations (UN). It included a commitment that at least 80% of capex spending would be aligned to three key performance indicators (KPIs): the EU taxonomy, Scope 1 and 3 emission intensity targets and absolute Scope 3 GHG reductions.[12] European banks have cited this issuance as a benchmark that may be used to assess an airport's commitment to decarbonization.

The United Kingdom's taxonomy (an offshoot of the EU taxonomy) has not yet been finalized, but is likely to include potentially stricter aviation-specific screening criteria. This could make access to finance more difficult in the United Kingdom compared with the EU.

Airport ownership

Beyond policy, airport ownership is a factor to consider for decarbonization strategy and funding sources. Airports that are government-owned or largely government-funded will have decarbonization strategies in line with the ambition of government policy (see Figure 5).

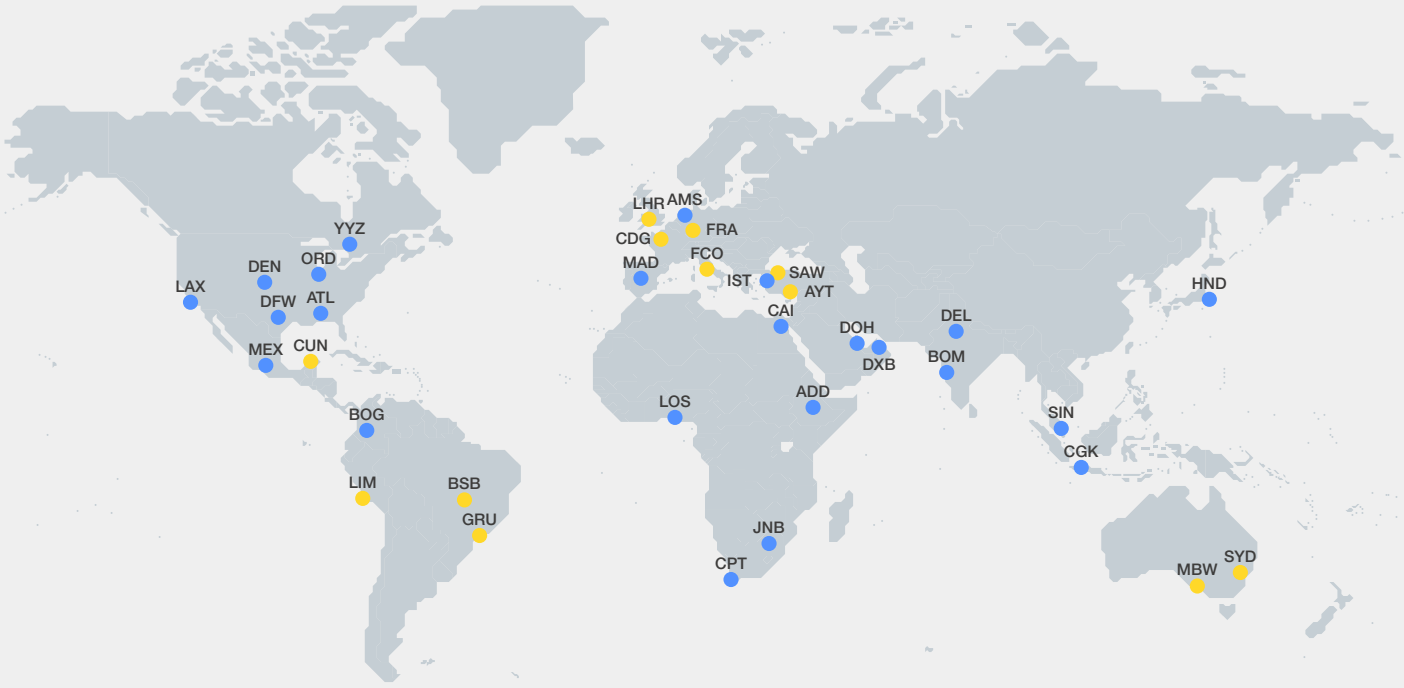
Airports in the Middle East are generally government-owned, so the degree of decarbonization focus is dependent on government policy and would be restricted or enabled based on funding available. For example, Dubai Airports is entirely government-owned and government-funded. In line with the UAE's drive towards decarbonization, Dubai Airports recently built the Middle East's largest airport solar power plant and is also retrofitting its lighting to use light-emitting diodes (LEDs) throughout its facilities. While it has traditionally relied on public finance, Dubai Airports chose instead to use a form of PPP financing through a partnership with energy service company (ESCO) Etihad to install the solar energy system.

Dubai Airports recently funded the Middle East's largest airport solar power plant and is retrofitting its lighting to use LEDs.

US airports are generally owned by a local, municipal or state jurisdiction and receive public funding, although large airports in the US also have access to private funding to supplement public finance when it comes to large projects. This would give them an advantage with major decarbonization projects, such as large-scale installation of solar panels.

That said, there are currently no decarbonization mandates for airports or green use-case requirements for federal funding in the US. Because of this, smaller US airports that rely entirely on federal funding for their projects may have a harder time decarbonizing.

FIGURE 5 **Airport ownership and carbon accreditation**



North America

YYZ	◕
ORD	—
DEN	—
LAX	◑
ATL	◔
DFW	●
CUN	◔
MEX	—

South America

BOG	◕
LIM	◔
BSB	◔
GRU	—

Bogota and Lima airports have European operators, which may contribute to their ACA ratings

Europe

AMS	●
LHR	●
FRA	◑
CDG	◑
FCO	●
MAD	◑

Africa

CAI	—
ADD	—
LOS	—
JNB	◔
CPT	◔

Middle East

SAW	—
IST	◑
AYT	◑
DOH	◑
DXB	◑

The operator of Antalya Airport is Fraport, a Europe-based company that also owns and operates Frankfurt International Airport, Delhi Airport and Lima Airport

Asia / Australia

HND	—
DEL*	●
BOM*	●
SIN	◑
CGK	◔
SYD	◑
MBW	◑

ACA Accreditation ratings

◔ Mapping ◔ Reduction ◑ Optimization ◑ Neutrality ◕ Transformation ● Transition

Airport ownership

● Private ownership ● State ownership

*Delhi and Mumbai airports are joint ventures with the Indian government and privately owned operating companies that hold majority stakes in the airports
Note: not exhaustive, and was chosen based on number of passengers per year
Source: Oliver Wyman, ACI's Airport Carbon Accreditation (ACA) programme.

Privately owned airports can determine their own decarbonization strategies and this can enable some airports to move ahead of regional competitors. This is especially likely when the private airport owner is located in a more mature decarbonization market than the airport itself. For example, Frankfurt Airport Services Worldwide, commonly known as Fraport, has an ownership stake in Antalya Airport in Turkey, Indira Gandhi International Airport in Delhi and Jorge Chavez International Airport in Lima. The Germany-based Fraport is working to ensure that each airport qualifies for ACI's voluntary Airport Carbon Accreditation (ACA) despite the fact that these airports are located in countries with less stringent decarbonization regulation.[13]

Airport size

The size of an airport will also significantly affect its ability to access finance. Large airports with strong balance sheets often represent lower-risk investments for financial institutions than smaller airports and will also have wider networks to access these funds. This statement has two caveats. First, there are cases where small airports with less intensive capital needs and strong balance sheets have more flexibility to pursue decarbonization projects. But these are the exception, not the norm. Second, smaller airports with larger airport owners or operators may be able to leverage their parents' relationships, risk diffusion and balance sheets to attract more sources of funding.

Public opinion and attitudes of financial institutions

Local public opinion is another key driver of airports' environmental strategies. If decarbonization and environmental concerns are important to the public, then policy-makers are more likely to prioritize decarbonization. Similarly, financial institutions may be more focused on decarbonization if there is pressure from their local investor communities. Public opinion can also have a direct impact on airports themselves, as they recognize the potential branding and PR advantages that ambitious decarbonization goals might afford them if they reflect the sustainability aspirations of their neighbour communities.

In markets with the most advanced decarbonization policies, like the US and EU, public polls show that a majority of citizens favour investing in alternative energy sources to protect the environment. Some recent polls include the following:

- 2023 Eurobarometer survey on climate change: 77% of Europeans said they thought that climate change is a "very serious problem at this moment."[14]
- 2023 Euromonitor International report: 80% of travellers were willing to pay at least 10% more for sustainable travel, while 40% were willing to pay more than 30% extra for sustainable eco-tourism.[15]
- 2022 study by the Pew Research Center in the US: 69% of Americans believed the nation should prioritize developing alternative energy sources and favoured the US taking steps to become carbon neutral by 2050.[16]
- 2021 Eurobarometer survey of European attitudes towards travel and tourism: 82% of respondents said they were prepared to change at least some of their travel and tourism habits to be more sustainable and over one-third (35%) said they were willing to pay more for tourism to protect the environment.[17]

However, findings from a 2022 observational field study of actual bookings made with a European airline call into question such self-reported, hypothetical assessments in surveys. Out of over 63,000 bookings, the median willingness-to-pay voluntarily to offset a tonne of carbon dioxide was zero, with the mean around the equivalent of one euro.[18] So while passengers tell surveys they prefer lower-carbon travel methods, they may prioritize low-cost travel over the environment. More research is underway, but the dichotomy could suggest that consumers, like companies, may only be counted on to respond to mandates.

The self-reinforcing influence of public opinion, government policy and the priorities of financial institutions dictate the local approach of airports and the degree of importance that decarbonization takes in their strategies.

> **Out of over 63,000 bookings, the median willingness-to-pay voluntarily to offset a tonne of carbon dioxide was zero, with the mean around the equivalent of one euro.**
>
> Global Environmental Change, field study, 2022

Airport archetype

Another factor analysed as a potential driver of airport decarbonization is the airport's archetype. A previous report by Oliver Wyman and ACI World identified the following four major airport archetypes:[19]

- **City airport:** Serves major urban centres as a gateway for business, leisure and family travel; may be viewed as an intermodal point to other means of transportation; often land-constrained. Key priorities are: noise and other forms of pollution.
- **Global hub connector:** Serves both transit passengers and travellers within a wide local catchment area of the airport. Key priorities are: intermodal transportation to large population centres, high-quality customer experience and operational efficiency.
- **Cargo champion:** Dual service priorities for cargo handling and passenger transport. Technological innovation and data-sharing are crucial for cargo champions to meet fast delivery expectations from e-commerce. They strive to support their cargo clients.
- **Leisure gateway:** Serves common vacation destinations and is often integrated into the destination it serves as part of the holiday experience. Passenger demand may fluctuate with holiday and travel seasons, creating irregularity in revenue for leisure gateways. They anticipate further integration with destination cities and seek to leverage authenticity and local culture to welcome visitors.

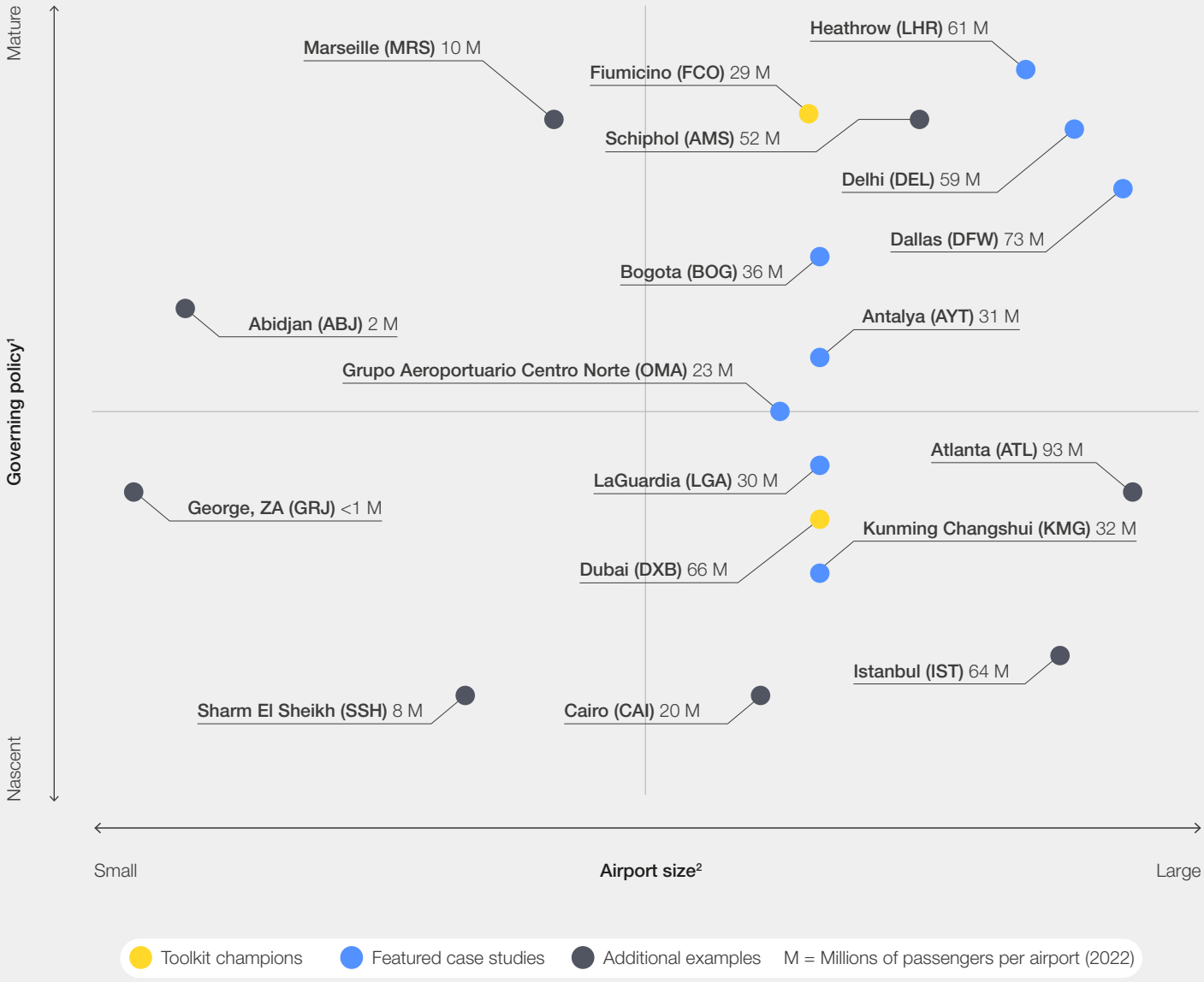
The airport archetype is currently not a primary driver of airport decarbonization strategies, but this could change in the future.

1.3 Airport driver matrix

The airport driver matrix has been developed through in-depth discussions with more than 30-plus airports and financial institutions working within the industry (see Figure 6). It is the synthesis of the two most important drivers for airports when it comes to developing, adopting and implementing decarbonization strategies — government policy and airport size.

Government policy was found to have the biggest impact on an airport's decarbonization strategy and its resulting access to finance. The second biggest driver was found to be the airport's size. Defined by the number of passengers it serves, an airport's size directly impacts its revenue, risk profile as a borrower and access to financial institutions and investors. It is important to note that some small airports may enjoy the same access to finance of larger airports, especially if they are owned or operated by larger global groups

FIGURE 6 **Airport driver matrix – government policy and airport size**



Notes:
[1]This is a blend of the local government policies in both the airport geography and the airport owner's geography. The more mature jurisdiction will be the driver.
[2]Airport size generally refers to the number of passengers served but may also refer to the size of an airport's operator, given the capacity of larger operators to reduce risks, gain greater access to funding and build relationships with financial institutions and investors.

2 The airport decarbonization roadmap

This chapter charts a decarbonization journey that starts with a science-based strategy, followed by actions that airports can take to tackle Scope 1, 2 and 3 emissions.

2.1 Decarbonization roadmap overview

Currently, SAF production capacity is substantially below what it must be to increase usage to 15% of the fuel mix by 2030.

While the path to net zero will require all elements of the aviation ecosystem working to decarbonize, this report focuses on the actions that airports can take. Today, the largest airports in the world's most climate-ambitious geographies are charting out a roadmap to environmental sustainability. But sooner or later, smaller airports in places without much regulation or support for decarbonization are going to have to follow the same path. This journey is only just beginning. Today it seems long, complex and expensive but, over time, it is likely to become more efficient and less taxing. This report aims to offer some guidance on the concrete steps that airports can take now, to reach near-term, mid-term and long-term goals.

Near-term actions focus on establishing a decarbonization strategy based on each airport's current carbon footprint, creating a science-based transition plan and identifying key targets along that path. Mid-term actions build on the foundations laid down in the near-term and include carbon reduction, addressing first the Scope 1 and 2 emissions that are directly under an airport's control.

On Scope 3 emissions, the role of airports in the near- to mid-term phase will be more of an influencer and facilitator of decarbonization solutions. In this phase, for example, the top priority should be to support the construction of more SAF production capacity and encourage the adoption of SAF usage. Currently, SAF production capacity is substantially below what it must be to increase usage to 15% of the fuel mix by 2030.[20] That jump in capacity and consumption would help airlines to begin reducing emissions.

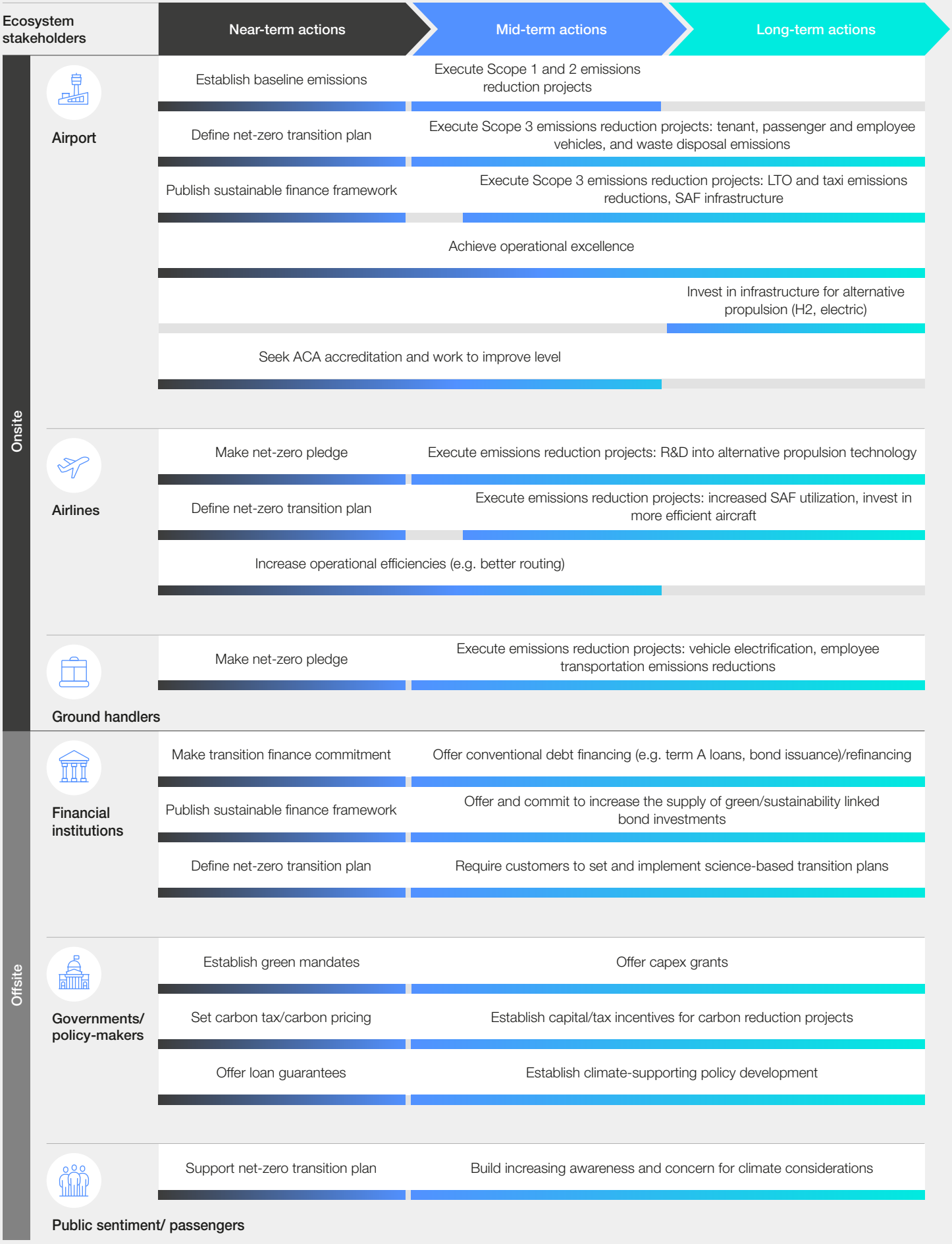
By 2025, the EU will require aircraft taking off from European airports to use at least 2% SAF in their fuel mix. That percentage will rise steadily, reaching 70% in 2050. The EU is also requiring aircraft to carry only the fuel they need to get to their destinations, to avoid emissions related to extra weight and carbon leakage. SAF will be a major decarbonization lever right through 2050 and beyond.

Over the longer-term, airports will be in a race with technology to reduce Scope 3 emissions. Low-carbon propulsion technologies like hydrogen and electric-powered flight are a decade or two from commercial scale and three decades away from large-scale use in commercial airliners. However, it is important to remember that capital markets – namely commercial banks, institutional investors and private equity – are beginning to expect airports to include Scope 3 emissions from aircraft in long-term decarbonization strategies and to plan on addressing them as part of their GHG emissions profiles.

This chapter details the key actions in each phase of the airport decarbonization roadmap, supported by illustrative case studies. These actions are summarized in Figure 7 and below:

- Near-term: Create a credible, science-based strategy
- Mid-term: Reduce Scope 1 and 2 emissions
- Long-term: Tackle Scope 3 emissions

FIGURE 7 | **Airport decarbonization roadmap**



2.2 Near term: Create a credible, science-based strategy

In climate-ambitious markets, it is now essential for airports to measure their baseline emissions profile and set a decarbonization strategy with challenging but realistic targets and associated KPIs. The strategies and targets that airports set will vary based on their size, baseline emissions profile and government policy, but they should seek to align as closely as possible to the goal of the International Civil Aviation Organization (ICAO) to reach net zero by 2050. Airport strategies and KPIs should also reflect the 2015 Paris Agreement as well as aligning with science-based climate transition scenarios, such as the Science-Based Targets initiative (SBTi). The SBTi provides guidance on Scope 3 reductions required from conventional aircraft according to the GHG Protocol Corporate Accounting Standard or the International Energy Agency's net-zero emissions scenario (NZE).[21] These scenarios should be leveraged as helpful inputs to any decarbonization strategy.

Additionally, airports are recommended to participate in the ACA programme, which is the only global standard for airport carbon management. Achieving level 4 and above of this accreditation scheme demonstrates that the airport's carbon management strategy is aligned with global decarbonization goals aimed at absolute emissions reductions and may be used as a KPI in the airport's decarbonization strategy.[22]

Airports should include elements in their environmental strategies to meet the priorities of local communities. For example, airports in arid locations may need to address water conservation, while city airports may need to ensure new projects do not increase their noise profile. Long-term strategies should consider scenarios and assessments of possible decarbonization technologies not yet developed, including hydrogen-powered aircraft, so that airports can prepare better for future operations. Airports should also engage with relevant stakeholders at appropriate steps in the planning process and incorporate infrastructure investments into strategic funding plans.

2.3 Mid-term: Reduce Scope 1 and 2 emissions

Airports have more control over their Scope 1 and 2 emissions and they have begun to mitigate them through a variety of projects and changes in business practice, financed through their usual banks and sources of project finance. Examples of Scope 1 projects include the transition of airport-owned or controlled resources to renewable or zero-emission energy sources, such as the electrification of an airport's vehicle fleet, onsite renewable power generation infrastructure and the electrification of airport-owned ground support equipment (GSE).

Scope 2 emissions reduction projects target indirect emissions from the consumption of purchased energy by the airport and can be addressed through an airport's electricity purchases and heating and cooling mechanisms. Examples of Scope 2 emissions reduction projects include switching to solar power generation, implementing energy efficiency mechanisms (e.g. more efficient baggage claim carousels), funding sustainable or high-efficiency construction projects and working towards sustainable heating and cooling for airport buildings.

While Scope 1 and 2 emissions reduction projects do pose challenges, especially for smaller airports with more funding constraints, many airports, both large and small across mature and nascent governing policy regions, are beginning to address Scope 1 and 2 emissions. Such projects are generally straightforward to execute and do not usually account for more than 10-15% of an airport's capital investment plans over a 10-year timeframe. The financing and strategy required to address Scope 1 and 2 emissions do not compare to the scale of the challenge presented by Scope 3, which is the primary focus of the solutions and suggestions in this report.

CASE STUDY

Rome-Fiumicino International Airport

Rome-Fiumicino International Airport (FCO) is a privately owned city airport that can serve over 40 million passengers annually. It is owned and operated by Aeroporti di Roma (ADR), which has been a pioneer in sustainable financial instruments. ACI Europe gave Rome-Fiumicino its Best Airport Award in 2022 and 2023.

Two years ago, Aeroporti di Roma became the first worldwide airport owner to publish a sustainability-linked financing framework, in alignment with the International Capital Market Association's sustainability-linked bond principles. These are voluntary guidelines that allow borrowers and lenders to easily align on terms and targets for sustainability-linked financing, as well as to advertise the borrower's decarbonization project plans. In May 2021, ADR issued the first ever sustainability-linked bond (SLB) for an airport, which included Scope 1 and 2 targets through a KPI-linked financing format. A second bond was issued in July 2023 with near-term Scope 3 targets validated by the SBTi. ADR also issued a green bond and a first-of-its-kind revolving credit line in 2020.

Aeroporti di Roma's financing framework details its emissions reduction plans, including Scope 1 and 2 reductions through:

- two large multi-megawatt photovoltaic plants for clean energy production
- investments in electric charging stations for airport-owned vehicles
- use of biomethane and investment in low-carbon transport infrastructure
- commitment to remain at ACA level 4+ certification

ADR's Scope 3 target centres on passengers' accessibility to and from Rome-Fiumicino, which received a score of "strong" in an official third-party opinion. ADR promotes the following to tackle Scope 3 emissions:

- rail access to the airport in partnership with the national rail operator
- intermodality initiatives, such as tying train to plane
- investing in clean mobility by installing 500 landside and airside electric vehicle-charging stations by 2025
- substituting its light duty vehicle fleet with electric vehicles
- providing incentives to decarbonize heavy duty vehicles and emergency generators by using 100% hydrotreated vegetable oil (HVO) supplied by Eni
- construction of a cycle lane for employees and the airport community

ADR has also committed to providing SAF to airlines to help tackle Scope 3 emissions, through an offtake agreement for SAF produced at Eni's Taranto refinery. This agreement made Rome-Fiumicino the first airport in Italy to make SAF available to airlines.

ADR's most recent SLB issuance was well-received by investors (nearly five times oversubscribed), including "dark-green" and "light-green" investors (respectively, investors with sustainable investment as their primary goal, or those who have sustainable criteria for investments). As of July 2023, ADR had not explicitly included CO_2 emissions from aviation sources but is planning to monitor the industry as it evolves to remain on the leading edge of the SLB market. It is committed to Scope 3 reductions from aircraft involved in maintaining its ACA 4+ transition level.

2.4 Long-term: tackle the challenge of Scope 3 emissions

> Private equity funds in climate-mature regions have begun to request full Scope 1, 2 and 3 emissions disclosures, as well as emissions reduction targets.

Whilst comprising some 97% of an airport's carbon profile, Scope 3 emissions – such as those caused by aircraft landing, take-off (LTO) and taxi – are generally outside the airport's sphere of control. Scope 3 emissions also include those caused by passenger vehicles, tenants and waste disposal. Some airports are trying to address them for ground transportation, where they have more influence, through projects like electric passenger car-charging stations and increased connectivity to public transport. But none of the airports interviewed for this report have begun to fund major infrastructure projects that will support alternative propulsion methods such as hydrogen, because there is no clarity around this technology's commercial viability or adoption by airlines.

However, Scope 3 emissions have begun to move into focus for policy-makers, financial institutions, investors and the general public in more climate-mature geographies. Airport expansion projects, unless financially justified because of economic benefit to a developing market, are becoming harder to fund in markets with mature governance, because they result in a net increase in Scope 3 emissions. Until there is a decarbonization solution to aircraft emissions as a whole, airports could face additional challenges during expansion projects.

If airports do not take action to understand and address Scope 3 emissions in addition to Scope 1 and 2, financial institutions believe that access to financing could eventually become more limited for airports that rely on non-government funding. Private equity funds in climate-mature regions have begun to request full Scope 1, 2 and 3 emissions disclosures, as well as emissions reduction targets. Outside of private capital, the largest banking players in sustainable finance are members of the Net Zero Banking Alliance (NZBA), which requires them to align their financing activities to 2050 net-zero targets with no or low-overshoot transition pathways as specified by credible, science-based climate scenarios. This poses a challenge for both banks and airports to address the emissions profile holistically, including Scope 3 emissions from aircraft, as financial institutions will not be able to reconcile airports' emissions profiles with their own overall portfolio decarbonization goals.

So, what can airports do to support the reduction of their Scope 3 emissions? Some solutions emerge around airports' ability to influence airlines, ground handlers, passengers and the wider value chain.

> London Heathrow's differential landing charges, based on emissions and noise pollution, are funnelled into a fund to subsidize SAF for airlines.

Influence airlines

As the drivers of the vast majority of an airport's GHG emissions profile, airlines are crucial stakeholders to engage in addressing decarbonization strategy goals. Airports may have a number of potential ways to work with airlines to decarbonize, detailed below.

Differential landing charges based on NOx, carbon or noise

Under ICAO's policies on airport charges, airports in many geographies[23] are able to levy landing charges related to local air quality (LAQ) due to emissions, similar to levies that aircraft face for noise pollution. ICAO, which is the UN's international governing body for aviation, has detailed guidelines for the implementation of LAQ-related charges for airports and governments to reference, including guidance around applicability, process, cost basis and any additional special considerations.

One example of this being implemented comes from London Heathrow, whose differential landing charges based on emissions and noise pollution are funnelled into a fund to subsidize SAF for airlines. This approach incorporates two incentives: a negative incentive around emissions (because landing charges increase with emissions) and a positive incentive to purchase SAF from the airport's fund, because it reduces the price and overall emissions, thus reducing the charges as well. However, differential landing charges are not allowed in all geographies.

Incentives for new aircraft propulsion and energy systems, fleet renewal and retrofit of in-service aircraft

Similar to charges levied for air pollution caused by aircraft operations, airports in jurisdictions where differential landing charges are legally viable may be able to reduce landing charges for next generation planes that produce lower emissions. LAQ charges are meant to compensate airports for the costs that airports could incur when addressing any LAQ-related problem caused by aircraft.

Next-gen hydrogen, electric or largely SAF-fuelled aircraft (alongside conventionally-powered aircraft that provide a step-change reduction in emissions) may therefore be able to receive special consideration for landing charges commensurate with the reduction in LAQ-related liabilities that airports could face with higher-emissions aircraft.

Hong Kong International Airport requires ground-handling service providers to use electric vehicles.

Electrification of ground support equipment

One airport-owned project that could impact both Scope 1 and Scope 3 emissions is the installation of electric ground power units (GPU) and preconditioned air for aircraft to use instead either jet-fuelled auxiliary power units (APUs) or diesel fuelled GPUs. Airports that provide aircraft with electric GPUs powered by renewable or lower-carbon electricity sources could reduce their Scope 3 emissions during the turnaround, servicing and boarding phases.

Once airports are able to make lower-carbon GPUs available to aircraft, airports may then be able to disincentivize aircraft from utilizing their APUs when low-carbon GPUs are present. This option is valid where GPU provision is owned by the airport. However, if not, this would have to be negotiated with ground-handling service providers.

Facilitate localized airline SAF community

Airports may play a role in uniting their local airline community around common decarbonization goals through the creation and direction of local airline SAF communities. In particular, airports without a home-based airline could encourage SAF communities to buy SAF from a single provider, facilitated through the airport. The creation of these communities could allow airports to influence SAF purchased at a local level and solidify demand for SAF production facilities to de-risk local investment in increased production.

Influence ground-handling service providers

Emissions from tenant's airside vehicles make up the next largest portion of airside Scope 3 emissions. Airports are able to create both incentives and penalties for ground-handling service providers to ensure they operate with lower emissions.

Contractual requirements and incentives

Airports can place conditions upon the granting or renewal of the handler licences, by mandating all-electric ground-service equipment. For example, Hong Kong International Airport has an airside vehicle electrification programme that requires ground-handling service providers to use electric vehicles. Coupled with such requirements, airports could look to part-fund incentives for ground handlers to electrify vehicles or switch to lower-carbon ways of operating.

Many of the larger, more climate-mature airports have already begun to work with ground-handling service providers and their fleets to pursue electric power trains or, as in the case of Dallas Forth Worth airport's ground-handling service providers, switching from compressed natural gas (CNG) to renewable natural gas (RNG) to power their vehicles. Incentives may be a valuable option for airports in between contract renewal periods.

Provide infrastructure

Airports can enable ground-handling service providers to pursue lower emissions operations by providing the necessary infrastructure. Provision of such infrastructure should be accompanied by the expectation or contractual requirement of lower emissions for GSE. This may include the installation of charge stations for electric GSE, provision of SAF, or stocking of low-carbon biofuels like HVO at airport fuelling stations in place of diesel fuel.

Monitoring and reporting

In order to create an accountability system for lower-emissions operations, as well as to track any reductions in emissions, airports can require regular reporting of carbon emissions from ground-handling service providers. This will encourage adherence to lower-carbon methods of operating and give the airport a clearer picture of progress towards its decarbonization targets.

Influence passengers

Landside transportation incentives

The primary way airports can exert influence on their passengers to reduce carbon emissions is through incentives for low-carbon landside transportation, such as mass transit and electric vehicles. Airports can reduce parking charges for passengers arriving in electric vehicles (EVs), subsidize passengers' fares for public transport or offer other benefits such as discounts at retail outlets.

Transportation infrastructure investments

To ensure passenger incentive programmes are effective, airports must prioritize infrastructure investments for EV-charging and other alternative fuels, such as renewable diesel and hydrogen. In addition, terminal infrastructure projects should consider ways to integrate more seamlessly with public transportation to reduce the barrier to use by passengers.

Passenger education

Airports can play an educational role with the passengers they serve by explaining the decarbonization trajectory that aviation is following, introducing passengers to SAF and alternative propulsion methods and informing them of the impact that lower emissions jet fuels can have on their carbon footprint.

> Certain airports are lobbying their governments to mandate a higher percentage of SAF requirement by 2030.

Waste reduction initiatives

Airports can also explore passenger-focused initiatives to reduce emissions by implementing waste-reduction programmes. This may include the provision of clearly marked waste containers that differentiate between trash and recycling, or waste reduction infrastructure for passengers, such as water refilling stations to reduce the use of single-use plastic bottles. As public opinion shifts towards favouring lower-carbon lifestyle choices and public education programmes are implemented, passengers will expect airports to help them reduce their carbon footprints, with waste reduction as one avenue to that goal.

Value chain influence and lobbying

Airports can adapt the techniques above to influence the behaviour of the wider value chain, including retail concessionaires, tenants, taxi and car-sharing operators, city transport, fuelling companies and others. In addition, airports can leverage their position in broader society to sway governments and policy-makers in favour of technologies, funding mechanisms, behavioural changes and policies that will result in lower carbon operations for airports.

One example of this is lobbying for mandates and incentives through grants and tax credits for the increased production and use of SAF. Certain airports are lobbying their governments to mandate a higher percentage of SAF requirement by 2030 and to support the production and use of SAF by creating a SAF contracts for difference (CfD) market,[24] which will incentivize increased production and use. While aircraft can only legally blend up to 50% SAF with A1 jet fuel, a minimum SAF mandate would remove some of the burden of aircraft emissions from airports and place some of the pressure for adoption on government entities, as opposed to the airports themselves.

While the airport decarbonization roadmap is common to all, an airport's starting point and speed of execution will depend on its size, the maturity of its governing policy and the sources of funding available to it based on those two factors.

CASE STUDY

London Heathrow

London Heathrow is a privately owned global hub connector that served over 61 million passengers in 2022. The ACA has awarded LHR with the highest decarbonization accreditation of 4+. For some time, Heathrow has charged a higher landing fee for planes with significant nitrous oxide (NOx) emissions. But in 2023, Heathrow announced that the charges collected for NOx emissions would be funnelled back to airlines as an incentive to use SAF. Airlines who deliver SAF to Heathrow for use in their aircraft will have funds redistributed from the landing charges to reduce the premium price gap between kerosene-based jet fuel and SAF.

There has not yet been broad adoption of differential landing charges by airports and not all jurisdictions permit them. As of October 2022, only 43 airports had emissions-based charges for airlines. Attempts to broaden the use of differential landing charges have met with resistance from airlines and have often resulted in prolonged legal battles. However, implementation of landing charges for noise, local air pollution and NOx are legal under ICAO, which provides specific guidelines on how charges may be installed and used. While following ICAO's guidelines, Heathrow's NOx emissions charge redistribution to airlines is a novel approach to incentivize the use of lower-carbon fuel and reduce Scope 3 emissions.

The reduction of Scope 3 emissions from aircraft is a ground-breaking KPI included in Heathrow's innovative sustainability-linked bond framework. The framework, published in June 2023, is novel in that it includes decarbonization targets that address Heathrow's entire emissions profile, in line with the UK's national emissions reduction targets. The airport has committed to a 15% reduction on "in the air" carbon emissions (including LTO, taxi and cruise for departing flights) by 2030 and a 46% reduction in "on the ground" emissions by 2030, including Scope 1, 2 and 3 emissions. This KPI was validated by the SBTi – the first time an airport has published a validated SBTi trajectory.

The issuance of this framework and subsequent SLB made waves in the airport community, causing investors to ask for a similar approach within other leading decarbonization frameworks. These commitments were made possible for Heathrow in part by the governing policy in which the airport operates. The United Kingdom government has published ambitious targets for aviation by 2030, including a 10% target on SAF, as well as an ambitious zero emission vehicle (ZEV) mandate requiring 80% of new cars to be ZEV by 2030.[25]

These policies, not reflected in other jurisdictions such as the EU and US, also allow for the implementation of differential landing charges.

3 Airport financing toolkit

Financing options include commercial or government loans, corporate or sustainability bonds, green finance, private capital or development bank finance.

The toolkit presented in this chapter provides guidance for airports across the world that are studying financing options for decarbonization projects. Airports traditionally draw financing from a variety of sources outside their own retained profits and capital reserves. State-owned airports receive state funding and most airports of sufficient size look to financial markets, private capital or regional banks for financial support.

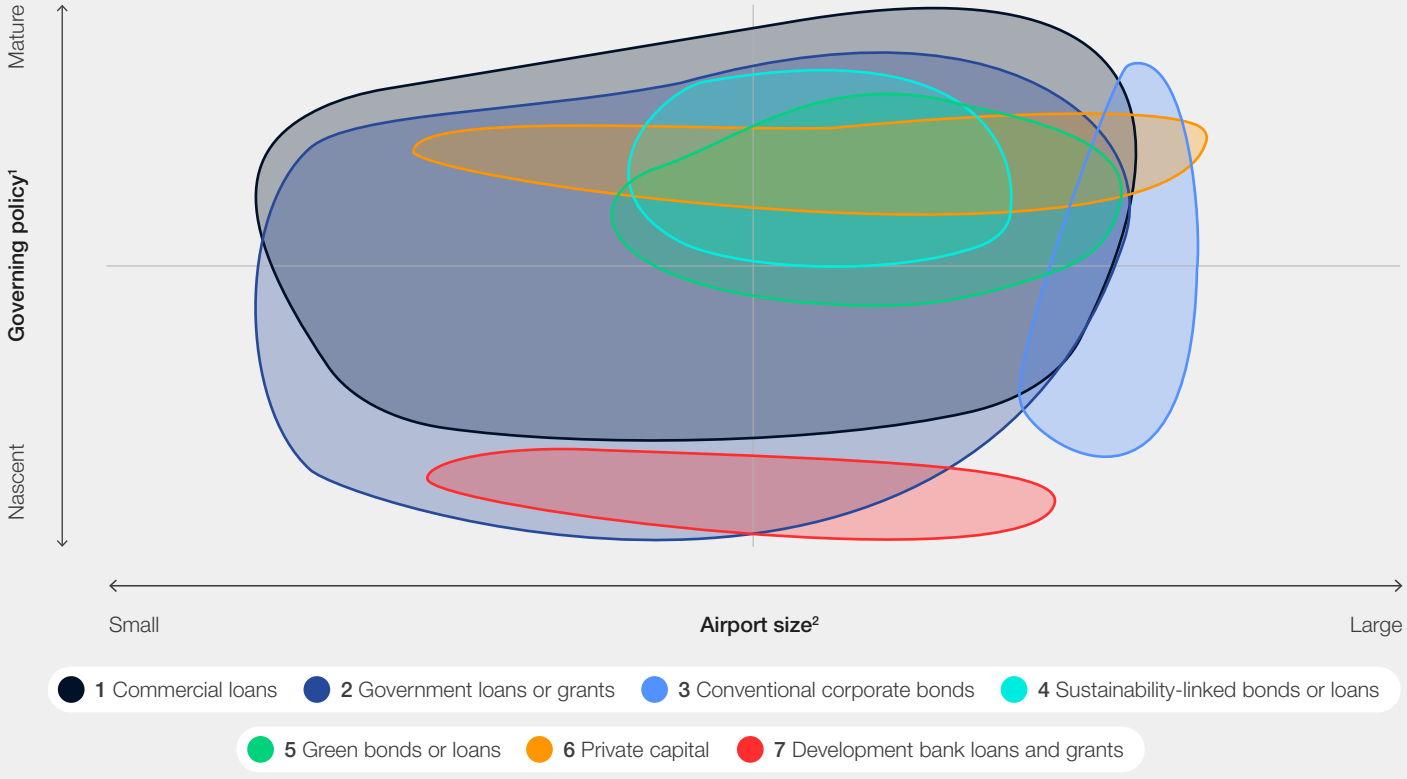
When looking to fund decarbonization projects, airports may wish to consider alternative sources alongside or instead of conventional finance, including sustainability-linked bonds or loans and green bonds or loans. While the specific financing options available to an individual airport may vary, this chapter considers a range of funding sources that support decarbonization projects, examines their prerequisites and presents relevant case studies.

3.1 Airport driver matrix determines access to financing

The size of projects and access to financing will be determined by the location of the airport on the airport driver matrix (see Figure 8). Airports fall into the relevant quadrant of the matrix based on their size and the maturity level of their governing policy. The largest airports located in the most policy-mature jurisdictions are found in the upper right-hand quadrant. The funding sources most readily available to airports have been overlayed onto each quadrant and include the following:

1. Commercial loans
2. Government loans or grants
3. Conventional corporate bonds
4. Sustainability-linked bonds or loans
5. Green bonds or loans
6. Private capital
7. Multilateral development bank loans and grants

FIGURE 8 **Funding sources, by government policy and airport size**



Notes:
[1]This is a blend of the local government policies in both the airport geography and the airport owner's geography. The more mature jurisdiction will be the driver.
[2]Airport size generally refers to the number of passengers served but may also refer to the size of an airport's operator, given the capacity of larger operators to reduce risks, gain greater access to funding and build relationships with financial institutions and investors.

3.2 Airport decarbonization financing options and case studies

Commercial loans

Description

Commercial loans are a conventional source of funding that allow airports to access debt-based capital from financial institutions at a fixed or floating interest rate at the time the loan was issued. To secure the loan, debt issuers may require airports to post collateral including future revenues, property or equipment, which may be confiscated in case of default.

Airports can use commercial loans to finance a variety of capital improvements, such as constructing new facilities, purchasing equipment and renovating existing infrastructure.

These loans can be obtained from a variety of financial institutions, including banks. Eligibility for commercial loans is determined by evaluating an airport's creditworthiness through examination of an airport's financial statements and credit history. Loan pricing is dependent upon a number of factors, including airport creditworthiness, yield type, loan term and a variety of other factors.

Term loans priced against London Interbank Offer Rate (LIBOR)[26] ranged considerably based on their yield type: highly leveraged loans for airports ranged from LIBOR +250—1000 basis points (bps),[27] leveraged loans were from +70—370 bps and near-investment grade and investment grade were between +3.5—250 bps.[28]

Considerations

- Flexibility to fund decarbonization or conventional projects
- Available to both large and small airports in mature or nascent governing policy geographies
- Not linked to decarbonization targets or strategy
- Predictable cost of capital for airports

Case study

Antalya Airport, Turkey is an international airport handling over 31 million passengers in 2022. In 2023, Antalya Airport sought funding for the expansion of passenger terminals and construction of additional apron spaces and taxiways.

The European Bank for Reconstruction and Development (EBRD) provided a commercial bridge loan to Antalya to cover €140 million of the €2,469 million project, which will be financed by a combination of equity and debt.

In addition to financial eligibility requirements, the EBRD instituted climate requirements in the terms of funding. The funding required a comprehensive environmental and social impact assessment prior to project work beginning and is contingent upon adherence to an environmental and social action plan.

In addition, portions of the funding will be used for LEED-certified[29] terminal construction, a solar power plant and increased employee diversity with a commitment to increasing the share of women in its contractor workforce. Antalya Airport also committed to achieving ACA level 4+ as an outcome of the funded projects.

Government loans or grants

Description

Government loans or grants are another conventional source of financing that allow airports to raise debt-based capital. While loans need to be repaid, grants do not. The majority of airports globally rely on government loans or grants to some extent for funding.

The extent to which these loans and grants are orientated towards funding core airport operations versus decarbonization projects is determined by the maturity of government decarbonization policy.

Government-owned airports, particularly smaller airports without the ability to access other sources of finance, rely on government loans and grants for day-to-day operations and functional infrastructure upgrades.

These airports may apply for additional grants to be used for decarbonization projects; however, funding constraints

mean that the implementation of such projects will depend on how advanced the regional decarbonization policy is and more broadly the attitude of the governments towards decarbonization as a public goal.

Larger government-owned airports with additional options for funding will have more flexibility in diverting public funds towards decarbonization-related projects, which may in turn open more doors to funding from environmentally minded investors.

Considerations

- Funds may have defined eligible uses and may not be used for decarbonization projects
- More affordable capital for airports
- Available to both large and small government-funded airports in mature or nascent governing policy geographies
- May not cover all the cost of operations

Case study

El Dorado International Airport (BOG) in Bogota, Colombia, is the primary airport serving the country and accounts for nearly half of all air traffic in Colombia, serving 36 million passengers in 2022.

BOG is owned by the Colombian government and operated by a consortium of companies, including Colombian construction and engineering firms and Flughafen Zurich AG, the operator of Zurich Airport.

Bogota Airport gained ACA level 4 in 2023, becoming the first airport in Latin America and the Caribbean to achieve that level and the highest level of any airport in the region.

As a government-owned airport, BOG receives funding from the Colombian government and is supported by its operating consortium to finance the decarbonization projects required to reach ACA level 4. Bogota Airport has invested in renewable energy by installing more than 11,000 solar panels, which is the largest photovoltaic installation in South America, reduced electrical energy consumption by more than 11% through adoption of LED lighting technology and committed to responsible waste management, with nearly 80% of waste generated being repurposed.

Conventional corporate bonds

Description

Conventional corporate bonds – debt raised from institutional investors such as pension funds – are another popular source of financing. When an investor buys a corporate bond, they are effectively buying an "IOU" from the corporation that is to be repaid at a pre-determined date ("maturity").

The bond will also typically pay "coupons", which are interest-based payments made to the bondholder at regular intervals. To set up and execute the sale of the bonds, corporations usually enlist the help of investment banks which function as underwriters.

Airports issue corporate bonds for infrastructure projects, operational improvements, airport expansion and decarbonization projects. Given the significant costs involved, corporate bonds are more commonly issued by larger airports than smaller ones.

Larger airports may issue airport revenue bonds, which are secured by the operating revenue of the airport generated from airport activities such as landing fees, terminal rents, concession revenue, parking charges and other income streams.

Smaller, publicly owned airports may at times be able to issue bonds with government entities backed by that entity's taxing authority, to reduce the risk associated with lower operating revenues.

In terms of pricing, analysis of over 300 bonds issued by airports since 2018 totalling over $65 billion showed an average 2.96% coupon rate.[30]

Considerations

- Flexibility to fund decarbonization or conventional projects
- No risk of greenwashing
- Predictable cost of capital for airports
- Less accessible for small airports

Case study

Dallas Fort Worth International Airport (DFW) is a publicly owned global hub connector in the US and the second busiest airport by passenger volumes in the world.

In April 2022, DFW issued a revenue-backed $1.2 billion bond sale underwritten by Citigroup to help fund the airport's capital programme for terminal and other infrastructure improvements between 2022 and 2027, which is projected to cost $5.9 billion.

DFW's capital programme is a component of its 2021-2024 strategic plan, of which one prong is sustainability with an overall goal of net-zero emissions by 2030.

Funding will be used to electrify DFW's fleet of vehicles, build an electric central utility plant and, eventually, to invest in carbon dioxide removal (CDR) technology.

Sustainability-linked bonds or loans

Description

Sustainability-linked bonds or loans are financial instruments that incentivize the issuer to achieve predetermined sustainability performance targets (SPTs), such as decarbonization targets, while potentially providing the opportunity to reduce financing costs, usually through lower interest rates (see Figure 9).

Funds from sustainability-linked instruments need not be used exclusively for environmental or social projects. Rather, they can be used to finance any project whose funding costs are linked to those predetermined SPTs that consider the holistic performance of an airport towards decarbonization targets and other climate goals.

Airports that do not attain the agreed-upon progress on their SPTs will incur penalties in the form of higher interest rates. Research of recent issuances shows that penalties can be anywhere from 5 to 25 bps per annum.

To be eligible for sustainability-linked funding, airports must have clear and credible transition plans which include an established baseline for their carbon emissions, a set of rigorous and credible carbon reduction targets, and institutionalized reporting and tracking protocols to measure progress.

These eligibility requirements are generally recorded in sustainable financing frameworks, which help borrowers to access sustainability-linked funding by documenting their sustainability strategies, including any sustainability goals and associated KPIs, sustainability programme governance, rationale for establishing a sustainable finance framework and alignment to any external sustainable finance instrument programmes like the International Capital Market Association (ICMA) bond and loan principles.[31]

Sustainability-linked bonds and loans have no meaningful difference in pricing compared with conventional instruments in most cases; however, emerging evidence shows that involving external reviewers to validate sustainability targets and illustrate the ambition of the framework may affect pricing positively for the lender.[32]

Considerations

- Potential to achieve lower interest rates with SPTs being met
- Flexibility to fund decarbonization or conventional projects
- More involved application process than conventional bonds or loans (requires development of sustainability-linked finance framework and second-party opinion from a reputable institution)
- Requires additional tracking and reporting compared to conventional loans or bonds
- Risk of greenwashing arising from scepticism around targets, tracking and reporting
- Less accessible to small airports with less capacity to develop and document decarbonization strategies and applicable projects
- Potential for cost of capital penalties if SBTs are not met

Case study

Grupo Aeroportuario Centro Norte, Mexico, known as OMA, is a Mexican airport operator headquartered in San Pedro, Mexico. It operates 13 international airports and served over 23 million passengers in 2022.

In 2023, OMA issued more than $175 million in sustainability-linked bonds across two issuances ($35 million in 3-year notes at a variable rate of Interbank Equilibrium Interest Rate (TIIE) 28 + 23 bps, $140 million in 7-year notes at a fixed rate of 10.26%) tied to a reduction in Scope 1 and 2 emissions by 58% by 2025 compared to a 2018 baseline.

This SPT was documented in OMA's sustainability-linked framework, published in 2022, in accordance with the ICMA sustainability-linked bond principles (2020).

OMA plans to achieve the SPT through installation of solar panels, a power purchase agreement with a wind energy supplier and investment in energy efficiency systems across airports. In addition, OMA has committed to obtain ACA level 2 for its five largest airports by passenger traffic by 2025.

Should OMA not meet the SPT it has committed to, the bond issuances will face an interest rate step-change of 25 bps in 2026 unless OMA can demonstrate that it has achieved the defined carbon reduction KPI. The issuances received the highest ratings in Mexico of AAA.mx by Moody's and AAA (mex) by Fitch. The book runner on the issuances was Citibanamex.

Green bonds or loans

Description

Green bonds or loans are a financial instrument that allows airports to raise debt-based capital specifically for green projects, including carbon reduction projects (see Figure 9).

Green financial instruments do not tie the interest rate to performance against targets, but are "for-purpose", meaning the financing may only be used for specific low-carbon or carbon reduction projects vetted by the financial institution providing the funding.

Failure to demonstrate carbon reduction potential for a project will disqualify an airport from receiving green funding. Green bonds and loans depend on green or sustainable finance frameworks that define which projects and investments are considered "green investments" as well as a process for project evaluation and selection, governance to manage proceeds including supervision, tracking and reporting, and a detailed description of the frequency, duration and level of allocation reporting for any funds received in order to avoid greenwashing.

On average, green bonds are priced slightly cheaper than conventional bonds, suggesting that investors are willing to invest in green bonds that are comparable to conventional bonds or accept a slightly lower yield (-1 to -9 bps on the secondary market) for green labelling. However, there is a substantial amount of variation in the primary market for green bonds, with spreads compared to conventional bonds (-85 to +213 bps).[33]

Considerations

- Potential to be less expensive than conventional debt-based funding
- Avenue to fund decarbonization projects for airports in mature governing policy geographies
- For-purpose funding is more restrictive than other sources of capital
- More involved application process than conventional bonds or loans (requires development of green and/or sustainable finance framework and second-party opinion from a reputable institution)
- Requires additional tracking and reporting compared to conventional loans or bonds
- Some risk of greenwashing for airports and financial institutions
- Less accessible to small airports with less capacity to develop and document decarboni-zation strategies and applicable projects

Case study

Indira Gandhi International Airport, India (DEL) is the busiest airport in India by passenger traffic and served 65 million passengers in 2022. Delhi Airport is owned by the Airports Authority of India, a government-entity, but operated through a joint venture with GMR Group, Airports Authority of India and European operator Fraport. Delhi Airport has achieved the highest ACA level – level 4+ transition, as a sign of its commitment to decarbonization and progress towards net zero.

In 2021, Delhi Airport issued a four-year, seven-month $450 million green bond at a coupon rate of 6.25%. The bond received a rating of Ba3/BB and was well received by the market at 2.8x oversubscribed.

In advance of the green bond issue, DEL published a second-party validated green finance framework that outlined eligible green projects to be funded, including LEED-certified green buildings, renewable energy generation, electric vehicle charging stations, energy efficiency projects within buildings and water management projects. HSBC and JP Morgan Securities acted as the joint lead structuring agents on the bond issue.

Private capital

Description

Private capital is funding that includes private equity, venture capital and other forms of alternative investments typically provided by institutional investors, high net-worth individuals and private equity firms.

It is used by airports to finance growth or to raise funds by selling equity. Private capital has become increasingly important for airports in recent years, as many airports have turned to private money to fund infrastructure and other improvement projects to fill a gap in funding not met by debt from banks or government loans and grants.

Private capital involvement in airports includes different models such as public-private partnerships (PPPs), which are a hybrid between private and public ownership of the airport and full or partial privatization. PPPs maintain government funding while bringing in much-needed capital investment to improve airport infrastructure.

Private capital on average is priced slightly higher than

conventional corporate loans. For airports' term loans priced against the LIBOR, highly leveraged loans ranged from +250—725 bps, leveraged loans were +250—525 bps and near-investment grade and investment grade loans ranged from +200—250 bps.[34]

Considerations

- Funding may be used for conventional or decarbonization projects
- May fill gaps in funding not met by government loans and grants or debt from banks
- Different models of funding create flexibility for airports
- More stringent requirements for decarbonization strategies and targets in mature governing policy geographies
- Less available for small airports, given higher risk and private capital's focus on return on investment
- May be more expensive than government loans

Case study

LaGuardia Airport (LGA) in New York City, US, is a public airport owned by the Port Authority of New York and New Jersey and is one of three major airports that serves the New York metropolitan area.

In 2016, LGA underwent the LaGuardia Terminal B redevelopment project in the largest transportation public-private partnership infrastructure project in US history.

The LaGuardia Gateway Partners (LGP) PPP consortium was led by Vantage Airports Group, a Canada-based private equity firm, to fund the $5.1 billion project. Vantage, an equity shareholder in LGP, oversaw the project and will manage ongoing operations in the reconstructed terminal.

The Terminal B redevelopment project was the first airport project in the world to achieve LEED gold v4 certification and involved other sustainability and decarbonization measures, including a more energy-efficient baggage handling system that can save 37% of energy used in traditional baggage handling technology, as well as rooftop solar hot water systems, electric GPUs at each gate for aircraft, preferred parking for low-emission vehicles and additional electric car-charging stations.

Multilateral development bank loans and grants

Description

Multilateral development banks (MDBs) are financial institutions that provide medium- and long-term capital for productive investment, often accompanied by technical assistance, in financially disadvantaged countries.

In certain instances, banks like the European Investment Bank (EIB) may make funding available for certain projects in developed countries as well, though in no case would such funding go towards airport expansion.

Airports in financially disadvantaged or developing countries that wish to finance decarbonization projects may raise debt-based capital through concessionary loans or bonds from MDBs. In these countries, airports may be able to finance expansion projects if there is a clear social and economic benefit.

Considerations

- Higher lending risk tolerance for airports in nascent governing policy regions
- Avenue to fund projects for airports in developing countries
- Less common than conventional financial institutions
- Smaller overall pool of funding available

Case study

Kunming Changshui International Airport (KMG) in Yunnan Province, China is the primary airport serving the south-west of China and an international gateway to South-East and South Asia serving over 48 million passengers in 2019.

In 2023, the Asian Infrastructure Investment Bank (AIIB) provided a sovereign-backed loan of around $500 million for the KMG expansion and green development project, which has a dual focus of green development and expanded connectivity for the airport.

The project includes the construction of two new runways, aprons, a cargo terminal, maintenance area, general transport centre and working areas. The project also includes the construction of a new terminal building, T2, with a capacity of 40 million passengers per year.

Within the project's scope, the AIIB will fund construction of airside infrastructure in the eastern part of the airport, construction of aprons and associated lighting around T2, electrified ground-handling service provider vehicles and chargers, electric GPUs, noise monitoring equipment and technical support and capacity building.

AIIB specified that KMG is eligible to receive funding for this project due to China's national decarbonization commitments, which are Paris-aligned.

FIGURE 9 | **Green finance and sustainability-linked bonds and loans**

	Green bonds and loans	Sustainability-linked bonds and loans
Use case	**For-purpose** May only be used for green projects	**General purpose** May be used for decarbonization projects or general corporate purpose
Eligibility	**Must be used on green projects** as defined by a green finance framework	**Performance against borrower's targets** documented in a sustainability-linked finance framework
Terms	Determined at issuance – **not tied to project outcomes**	**Tied to performance against sustainable performance targets** (SPTs) – failure to reach targets can result in penalties from 5 to 25 basis points
Pricing	On average, green bonds are **priced slightly cheaper than conventional bonds**	On average, sustainability-linked bonds and loans are **priced slightly cheaper than conventional bonds**

4 Looking Ahead

Airports will struggle to access finance without demonstrating progress on decarbonization – but tackling emissions and investing in clean energy will secure their future.

While it is challenging to predict with any certainty which green transition projects airports will need to finance and when, or indeed even what role airports will play going forward, there are some generally accepted scenarios for the long term.

4.1 Airports as an energy hub

In a green transition future, airports will no longer serve only as passenger and cargo hubs. This report anticipates that airports will become renewable energy production and distribution hubs for their local communities.[35] This new role for airports as energy hubs will create opportunities for economic growth and expansion into new income streams, particularly at times of high energy production and demand. Additionally, the expansion into renewable energy creation and distribution will generate a new source of green jobs for airport communities.

Airports will need to secure access to – or produce and distribute their own – abundant, cost-effective clean energy to supplement limited local electricity grids. Much of the increase in renewable electricity demand will go towards the production of green hydrogen or the charging of battery-powered aircraft as these new technologies come online. This will be especially the case in smaller hubs and regional airports that serve a smaller radius of destinations.

As an example of the scale of the challenge ahead, a leading global hub airport has calculated that moving 900 people a day on electric vertical take-off and landing aircraft (eVTOLs) – a promising technology for electricity-powered flight – would command 40% of its total current electrical capacity, making the business case to implement this much more challenging.

Airports may be required to switch to other renewable energy sources to meet the anticipated demands of the airport ecosystem for low-carbon energy. However, with an advanced energy production system, like the kind that would be required for an airport to transition to the role of an energy hub, the extra electrical capacity required may not be a significant problem.

4.2 Hydrogen infrastructure

One potential solution to Scope 3 emissions is investing in the infrastructure, technology and operational capabilities required for the production, storage and distribution of hydrogen at airports. Hydrogen is a clean and versatile energy source and is an expected source, along with electricity, for alternative propulsion in aviation's path of decarbonization to net zero by 2050.

Airports need to consider how they should prepare for a future with hydrogen fuelling as a requirement to serve their tenants. The new technology would require significant infrastructure investment, regardless of an airport's degree of involvement in hydrogen production. While airports may not be responsible themselves for funding hydrogen infrastructure projects, many such projects will be required onsite and are likely to fall under their purview.

Some airports may want to consider onsite hydrogen production and liquefaction, which would produce economies of scale for the airport and reduce the risk and difficulty of transporting hydrogen. Airports that produce hydrogen onsite could also supply hydrogen not only to aircraft but to surrounding businesses, creating a new revenue stream for airports.

Onsite hydrogen production would require significant funding and a new level of operational expertise, which may not be a viable endeavour for smaller airports, as they may lack sufficient access to funding, either conventional or sustainable, to afford the necessary projects. In addition, space-constrained airports may not have sufficient land to accommodate the additional infrastructure required for hydrogen-powered flight.

4.3 Hybrid financing

In order to secure funding for large infrastructure projects such as those described above, a greater use of "hybrid financing" is likely. Hybrid or blended finance uses public or concessionary funding to attract private sector investment by de-risking projects that might not be commercially viable but are crucial to other goals, including the energy transition.

Beyond financial assistance, hybrid finance can also assist in sector goals through technical assistance, project preparation, how to structure and implement decarbonization projects, and specific expertise that might not otherwise be available. While it is unlikely that hybrid finance will play a significant role in addressing Scope 1 or 2 emissions reduction projects, it is expected to become common in Scope 3 emissions reduction projects.

4.4 "Do nothing" is not an option

"Without demonstrating progress towards decarbonization, airports will likely experience restrictions on access to conventional finance.

It is no longer a viable option for airports to delay their decarbonization journey. Interviews with financial institutions across the spectrum of funding sources indicate that airports in climate-mature geographies could experience more constricted access to capital in the future if they do not establish strategic decarbonization plans and demonstrate action against them.

In mature governing policy jurisdictions, financiers have relayed that access to finance is already becoming limited for airport expansion projects that increase the overall emissions of an airport. Without demonstrating progress towards decarbonization, airports will likely experience restrictions on access to conventional finance.

Financial institutions will continue to respond to pressure from policy within climate-mature geographies and from investors to limit funding to hard-to-abate industries like aviation. Airports must act now to plan for a future targeting net zero and ensure that they employ decarbonization strategies that give them access to the sources of finance they will require.

Conclusion

While the challenge faced by airports to decarbonize can seem daunting, airports stand ready to take responsibility for the portion of the global carbon footprint within their control and are already starting to define and implement decarbonization strategies. Their dilemma is the larger part of their emissions profile that falls beyond their control and for which no immediate, comprehensive solutions exist.

But through the continuous collaboration of onsite and offsite airport ecosystem members, systemic decarbonization can and will occur. Among the most pivotal keys to success will be the ability of airports and their ecosystems to secure financing for the expected $5 trillion capital investment necessary to transition airports and aviation to net-zero operations by 2050.

It is the hope of Oliver Wyman, the World Economic Forum, ACI World and Mundys that this toolkit will help airports identify and access sufficient and innovative funding sources to support the sector-wide goal of decarbonization.

Glossary

ACA: Airport Carbon Accreditation.

ACI: Airports Council International.

ANSPs: Air Navigation Service Providers.

Biofuels: Fuels derived from renewable resources that can be used as alternatives to traditional fossil fuels.

Carbon emissions profile: The total amount of carbon dioxide emitted into the atmosphere as a result of human activities.

CO_2: Carbon dioxide.

Decarbonization: The process of reducing or eliminating carbon dioxide emissions.

eVTOL aircraft: Electric vertical take-off and landing aircraft.

Emissions intensity: The amount of greenhouse gas emissions per unit of activity or output.

EU taxonomy: The EU taxonomy for sustainable activities is a classification system established to clarify which investments are environmentally sustainable.

Forum: World Economic Forum.

GHG: Greenhouse gas.

GHSP: Ground-handling service providers.

GPU: Ground power unit.

GSE: Ground service equipment.

HVO: Hydrotreated vegetable oil.

ICAO: International Civil Aviation Organization.

IIJA: Infrastructure Investment and Jobs Act.

IRA: Inflation Reduction Act.

KPIs: Key performance indicators.

LIBOR: London Interbank Offered Rate.

LTO: Landing and take-off [cycle for aircraft].

Net-zero: Achieving a balance between the amount of GHG emissions produced and the amount removed from the atmosphere.

NZBA: Net Zero Banking Alliance.

NZE: Net-zero emissions.

Offsite participants: Ecosystem participants that are predominantly off the airport grounds, including policy-makers and governments, local community members and financial institutions and investors.

OEMs: Original equipment manufacturers.

Onsite ecosystem members: Ecosystem participants on the airport grounds, including the airports themselves, airlines, ground-handling service providers and ANSPs.

Paris-aligned: In reference to commitments or plans that are consistent with the Paris Agreement on climate change.

PPA: Power purchase agreement

SBTi: Science Based Targets initiative.

Scope 1 emissions: Direct greenhouse gas emissions from sources that are owned or controlled by an organization, such as emissions from combustion in owned or controlled boilers, furnaces, vehicles etc.

Scope 2 emissions: Indirect greenhouse gas emissions from the consumption of purchased electricity, heat or steam.

Scope 3 emissions: Indirect greenhouse gas emissions that are a consequence of an organization's activities but occur from sources not owned or controlled by the organization, such as emissions from the production of purchased materials, transportation of goods and waste disposal.

SDGs: Sustainable development goals.

SPT: Sustainable performance target.

Sustainable finance: The provision of finance to investments that provide environmental, social and governance benefits.

Sustainable financing frameworks: Framework documents used to document sustainable goals and targets of an organization, criteria for alignment with environmental, social and governance considerations and projects that may fall within those considerations to receive funding.

Sustainable aviation fuel or SAF: A type of aviation fuel that is produced from renewable sources, such as biomass or waste materials and has lower greenhouse gas emissions than conventional aviation fuel.

TIEE: Interbank Equilibrium Interest Rate.

Zero-tailpipe CO_2 operation: The operation of vehicles or equipment with zero emissions of carbon dioxide from the tailpipe, such as electric vehicles or equipment powered by hydrogen fuel cells.

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