



## 第三次航空与代用燃料会议 (CAAF/3)

2023年11月20日至24日，阿拉伯联合酋长国，迪拜

### 议程项目 4：更清洁能源的融资

#### 航空能源转型融资：业界观点

(由航空运输行动小组 (ATAG)、国际机场协会 (ACI)、民用航空导航服务组织 (CANSO)、国际航空运输协会 (IATA)、国际公务航空理事会 (IBAC) 和航空航天工业协会国际协调理事会 (ICCAIA) 提出)

#### 摘要

本工作文件阐述了可持续航空燃料 (SAF) 融资在航空业向净零碳排放转型中的作用。实现净零排放需要大量资金支持，预计需要 1.45 万亿至 3.2 万亿美元用于 SAF 资本开发。我们认为金融界有能力支持此次转型，包括可持续类别的私募投资、机构投资者的可观资助以及来自净零银行业联盟等倡议的支持。混合融资等创新金融机制可扩大对新兴市场的投资。国际民航组织 (ICAO) 的作用是对接亟需 SAF 投资的国家与各种资金来源，坚定贯彻“不让任何国家掉队”的理念，助力全球航空能源顺利转型。此外，ICAO 还在联手多边开发银行和联合国机构共同应对这项挑战。

会议采取的行动见第 6 段。

### 1. 导言

1.1 在国际民航组织第 41 届大会上，ICAO 通过了到 2050 年国际航空全行业实现净零碳排放的国际航空长期全球理想目标 (LTAG)。2021 年 10 月，包括本文件签署方在内的航空业各方同意强化 2009 年首次设立的行业脱碳减排承诺，确立到 2050 年实现净零排放的目标。

1.2 实现我们共同理想目标需要全球各方携手努力。除了引进新的技术、提高运营效率及基础设施效率之外，还要快速实现向新型可持续能源的重大转变，尤其是采用即用型替代碳氢燃料，通常也称为可持续航空燃料 (SAF)。

<sup>1</sup> 中文、阿拉伯文、英文、法文、俄文和西班牙文版本由航空运输行动小组提供。

1.3 完成这一转型需要政府、航空业、能源供应商和金融界等航空业内外的利益相关方快速携手合作，付出非同以往的努力。挑战固然严峻，但 ICAO 第三次 CAAF 会议将为引导全球政策方向和能源转型融资带来重要的转折点。

1.4 本文件阐述了实现转型所需的融资，包括银行、机构投资者、混合融资的作用，以及 ICAO 在协助 SAF 部署的各方面促进融资的关键作用。

## 2. 向 SAF 转型所需的融资规模

2.1 对于航空业实现净零排放转型所需的融资规模，不同组织给出的预算各不相同，但 SAF 生产所需的资本投资数额庞大。ICAO《长期全球理想目标报告》（LTAG Report）分析表明，2050 年前 SAF 的开发活动需要 3.2 万亿美元资本投资<sup>2</sup>。据 ATAG 的《燃料净零排放》（Fueling Net Zero）报告分析，开发新型燃料需要 1.45 万亿美元资本投资<sup>3</sup>。

2.2 尽管所需的融资数额巨大，其与全球石油和天然气行业的典型年度资本支出相比，还是相当合理的。据国际能源论坛分析，仅 2022 年，石油和天然气行业在上游基础设施上的开支高达 4990 亿美元，2023 年至 2030 年间其资本支出预计将高达 4.9 万亿美元<sup>4</sup>。

2.3 基于能源转型的性质以及传统能源供应商缺乏热情的现状，至少在转型初期，推动这一进程的主力军将是已在生产其他可再生燃料或专注生产 SAF 的新能源公司。因此，我们需与金融行业多加互动，确保他们为未来数十年的必要投资做好充分准备。

## 3. 金融界的回应

3.1 即使其他行业也存在脱碳减排的融资需求，目前的投资资本仍足以支持此次航空业的能源转型。在有利的政策条件下，我们认为能源供应行业将获得稳定、长期的投资。为实现净零排放和《巴黎协定》目标，金融机构调整投资组合采用的多项准则同样适用于向 SAF 转型的气候相关实践。

3.2 可投资的资本数额巨大，涵盖众多资金来源和金融机制。2021 年，投入基础设施的私募投资达到了 1720 亿美元，其中 60% 用于环保类别（以可再生能源为主）<sup>5</sup>。据经济合作与发展组织估计，其成员国在 2022 年出资 2040 亿美元用于海外发展援助<sup>6</sup>。据估计，全球机构投资者拥有约 200 万亿美元资金。净零银行业联盟汇集了超过 40% 的全球金融资产，是大型金融市场参与者团体“格拉斯哥净零金融联盟”<sup>7</sup>的一员。该联盟致力于协调金融体系各部门间的工作，加速实现向全球净零经济的转型。

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<sup>2</sup> ICAO《长期全球理想目标报告》（LTAG Report），2022 年：[www.icao.int/environmental-protection/LTAG/Pages/LTAG-report.aspx](http://www.icao.int/environmental-protection/LTAG/Pages/LTAG-report.aspx)

<sup>3</sup> ATAG 和 ICF《燃料净零排放》（Fueling Net Zero）报告，2021 年 9 月：[www.aviationbenefits.org/W2050](http://www.aviationbenefits.org/W2050)

<sup>4</sup> 国际能源论坛《2023 年上游投资报告》（Upstream Investment Report 2023）：[www.ief.org/focus/ief-reports/upstream-investment-report-2023/download](http://www.ief.org/focus/ief-reports/upstream-investment-report-2023/download)

<sup>5</sup> G20 全球基础设施中心《2022 年基础设施监测报告》（Infrastructure Monitor 2022）：<https://cdn.github.org/umbraco/media/5262/gih-infrastructure-monitor-2022-report-may-2023.pdf>

<sup>6</sup> 经济合作与发展组织《2022 年官方发展援助》初步数据（ODA levels in 2022, preliminary data），2023 年 4 月：[www.oecd.org/dac/financing-sustainable-development/ODA-2022-summary.pdf](http://www.oecd.org/dac/financing-sustainable-development/ODA-2022-summary.pdf)

<sup>7</sup> 格拉斯哥净零金融联盟：[www.gfanzero.com](http://www.gfanzero.com)

3.3 一项针对 20 家主要金融机构的调查<sup>8</sup>表明，其中三分之二的机构对投资 SAF 十分感兴趣，或者已经开始投资。在问及制定商业案例所需的政策类型时，这些机构反馈了两个关键要素：长期稳定的政策环境；以及政府担保计划和需求确定性等早期风险防范措施。

#### 4. 创新金融机制的作用

4.1 虽然在对 SAF 早期需求量最高的发达经济体中，投资兴趣开始显著增加，但想要实现全球航空业净零碳，世界各国都需要开发 SAF。绝大多数国家都可能需要发展 SAF 产业：改善能源安全、建立绿色能源部门，并在此过程中支持或调整约 1400 万个就业岗位<sup>9</sup>。但并非所有国家面临的风险水平都相同，因此混合融资或可成为制定 SAF 部署投资案例的途径之一。

4.2 混合融资是一种将公有和私营机构资金相结合，为新兴市场发展项目和倡议调动更多投资的融资方式。混合融资的目标是吸引私营机构将资金投入具有显著影响力、但投资者可能认为商业可行性较低的项目和行业。混合融资最常见的形式是利用公共基金或慈善基金（例如发展融资或拨款资助）来降低风险或促进私营机构投资。具体方法包括担保、信用增级和其他风险缓解形式。混合融资可以通过降低投资的感知风险，激发对私营投资者的融资吸引力，促使其投资原本可能不会考虑的项目。

4.3 转型需要不同公共资金来源，包括多边开发银行、捐助国的公共支持以及部分慈善投资，采取协调一致的方法（尤其是鉴于技术或流程尚未成熟，初期需要降低投资风险；或是降低新兴市场的投资风险）。之后，还需要私营资本投资者和机构投资者进一步扩大投资规模。

#### 5. ICAO 在融资方面的作用

5.1 虽然 ICAO 并不会为开发本身直接提供资金支持，其主要作用在于将需要 SAF 投资的国家与各种投资援助来源（包括多边开发银行、机构投资者、慈善组织或其他形式的融资援助）进行对接。这种“对接”业务（例如有关设立 ICAO 金融投资中心的提议）符合 ICAO “不让任何国家掉队”的理念，同时帮助航空业获得脱碳减排所需的投资，这对于确保世界各国能从航空能源转型受益至关重要。

5.2 通过与全球多边开发银行和其他联合国系统机构开展最高级别的合作，ICAO 还可以吸引各方对转型相关挑战的高度关注。

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<sup>8</sup> 2023 年 7 月 ATAG 和 ICF 开展的金融机构调查：[https://atag.org/media/oy3douye/survey-on-saf-financing\\_july-2023.pdf](https://atag.org/media/oy3douye/survey-on-saf-financing_july-2023.pdf)

<sup>9</sup> ATAG 和 ICF 《燃料净零排放》（Fueling Net Zero）报告，2021 年 9 月：[https://aviationbenefits.org/media/167495/fueling-net-zero\\_september-2021.pdf](https://aviationbenefits.org/media/167495/fueling-net-zero_september-2021.pdf)

## 6. 第三次 CAAF 会议行动措施

### 6.1 会议提请：

- a) 各方应将融资视为航空业在全球范围内成功推进净零碳能源转型的重要因素；
  - b) 促进使用并推广混合融资等创新金融机制，从而为世界各国部署 SAF 提供资金支持；和
  - c) 建议 ICAO 理事会快速部署整合 SAF 融资所需的资源，包括启用 SAF 融资对接中心。建议推进高级别协调工作，尤其是与多边开发银行的合作。
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## 附录

**ATAG 有关 SAF 融资及混合融资的文件**

# ACCELERATING ADOPTION OF SUSTAINABLE AVIATION FUEL: FINANCING AND RELATED ISSUES

Follow-up notes from an informal ICAO Council briefing in June 2022 by CDPQ<sup>1</sup> with questions by ATAG<sup>2</sup>

Since the air transport industry's adoption of a 2050 net zero carbon goal last October, a key issue is the acceleration of a programme of effective emission reduction, energy transition and innovation in the industry. A critical element is the availability and use of fuels that have a lower carbon footprint: sustainable aviation fuel (SAF). Two major challenges for accelerating the provision and adoption of SAF are (i) the large and growing size of the jet fuel market and hence significant financial outlays that are required (including for storage and distribution), and (ii) the hurdles created by cost of SAF which is higher than petroleum-based jet fuel. This briefing note discusses a number of issues related to these challenges and the likely options for meeting them.

*The SAF data in this briefing is drawn from the Waypoint 2050 report and its accompanying analysis in Fueling Net Zero.*

Waypoint 2050 can be found:  
[www.aviationbenefits.org/W2050](http://www.aviationbenefits.org/W2050)

## Is there adequate capital to finance the move to SAF to meet the net zero goal?

There is no doubt that the move to SAF to meet the net zero goal will require significant outlays. While estimates vary somewhat, investments totalling up to \$1.45 trillion<sup>3</sup> will be needed between now and 2050 for the infrastructure to deliver the needed quantities of SAF. This averages out at \$48bn a year, compared to typical oil and gas capital expenditure of around \$420bn a year. The cost of purchasing that SAF by airlines also needs to be considered as part of the operational aspects of decarbonisation (potentially around \$5.3 trillion over the period<sup>4</sup> - by comparison, airlines have spent some \$4.3 trillion on fuel over the last 30 years). This reflects the fact that the global demand for jet fuel is likely to more than double over the next thirty years (from 320 million tonnes in 2019 to nearly 700 million tonnes by 2050), and despite the likely technological innovations, a very significant increase in SAF production would be needed.

The required outlays are large. But these are over a period of almost thirty years, thus for any given sub-period the investment requirements would be correspondingly smaller. More importantly, these outlays should be seen in the context of available resources globally. While public sector resources in most countries are constrained, very large amounts are potentially available from the private sector for investments in SAF.

The latest estimates from the Financial Stability Board suggest that the private institutional sector has over \$225 trillion in assets and these assets are likely to more than double by 2050. Thus, even a small proportion of investments by the private institutional sector (sometimes known as non-bank financial institutions, or NBFIs) can finance the outlays needed for a significant acceleration in the production and utilisation of SAF.

## Global financial assets<sup>5</sup>

Financial Stability Board: Global Monitoring Report on Non-Bank Financial Intermediation 2021 (USD)

	Total global financial assets	Central banks	Banks	Public financial institutions	Institutional (NBFIs) sector
Size at end-2020 (USD Trillion)	468.7	41.9	180.4	19.9	226.6
Share of total global financial assets (%)	100.0%	8.9%	38.5%	4.2%	48.3%
Growth in 2020 (y/y, %)	10.9%	32.3%	11.1%	7.7%	7.9%
Growth 2014-2019 (annualised, %)	5.0%	6.9%	3.7%	4.5%	5.9%

## Why would investments in SAF be attractive to the private sector?

There are several reasons why investments in SAF can be potentially attractive to the private institutional sector:

1. Investment in SAF would help institutional investors meet their objectives regarding green energy. The net zero commitment has increased markedly across a wide range of institutions over the past five years and is now widespread. Private financial institutions already have large infrastructure investments globally, and many – for instance, members of groupings such as GFANZ, the Institutional Leadership Network (ILN), Sustainable Markets Initiative (SMI), and Global Investors for Sustainable Development (GISD) Alliance – are helping the move to the transition to a net-zero economy. Investments in SAF would be thus highly complementary to these commitments. The Glasgow Financial Alliance for Net Zero (GFANZ) by itself brings together 450 firms managing \$130 trillion in assets. These investors, together with governments and official agencies, are attaching significant importance to climate change investments.
2. The private institutional sector has a strong preference for projects that yield a steady stream of cashflows and acceptable risk return-calculus. As discussed below, risk-return trade-off for investing in SAF will become increasingly attractive as the countries' governments take measures to improve the policy environment, the public sector undertakes measures to ameliorate excessive risk, and as the market for SAF expands. In this regard, the role of the private sector investment in turbo-charging other renewables especially solar energy is striking.
3. SAF can offer important diversification benefits as an asset class. In other words, the strong likelihood that returns to SAF investments are not correlated with returns to equities or fixed income markets in other sectors and products would help stabilize the overall returns to a portfolio that has SAF as an asset. Similarly, there could be geographical diversification benefits in that SAF investments may occur in countries where investors' exposure in other assets is limited.
4. Such investments would also provide an additional opportunity to work with domestic agencies and governments to help meet their own goals for green investments and jobs and support the adaptation of strategic assets and activities (such as airports and airlines). Additionally, the positive addition of energy security would be an attractive benefit for many governments, particularly those that have relied on energy imports. For institutional investors, with long investment horizons and often the need or the desire to coinvest with the public sector in other areas, especially in emerging economies, this can constitute an important benefit.
5. SAF projects can afford future-proofed investment opportunities with the impending emergence of nature-based mechanisms for green finance. COP15 in Montreal saw over 190 member states sign on to the Global Biodiversity Framework (GBF) initiative for 2030. The GBF builds upon a growing momentum behind accountability for not only an entities' carbon footprint, but their broader impact on biodiversity and nature. As mechanisms like the GBF and those recommended via the Taskforce for Nature-related Financial Disclosures (TNFD) become embedded in green finance, high impact regenerative and/or restorative SAF projects become an increasingly compelling pitch as long-term, future-proofed, bankable avenues for investment.

## What are the supply and cost calculus for accelerated development of SAF?

There is no doubt that the realisation of net zero target by the aviation industry is highly dependent on airlines sourcing more sustainable aviation fuel and become less reliant on traditional fossil-based jet fuel. But then the supply of expected SAF that would be needed to achieve net zero by 2050 would require a quantum increase.

Currently SAF is more expensive than traditional jet fuel. However, costs are expected to come down for advanced SAF pathways as technology and processes mature.

In order to accelerate the decarbonisation of the sector, large quantities of sustainable aviation fuel at reasonable prices are needed in the near and medium term and beyond. Policy measures, as well as support for investment in the production facilities are required to help kick-start the transition away from fossil fuels. Moreover this will bring other benefits, aside from the carbon reductions: currently, around 22 countries supply over 90% of global oil. SAF presents

**Profits** from the 10 largest oil companies in the world in 2022 alone:

**\$450 billion**

(annual average capital expenditure on SAF scale-up around \$48bn)

an opportunity for new energy industries to be established in many other countries worldwide making use of local feedstock resources (waste streams, solar other renewables, limited non-food crops, etc). Importantly, it is also estimated that such a global shift could support or sustain 14 million jobs in a new energy economy, as well as boost energy security for many countries<sup>6</sup>.

Sustainable aviation fuel is currently in short supply. The biological and non-biological resources such as oil crops, sugar crops, algae, waste oil, waste gases, municipal solid waste, hydrogen and low-carbon electricity etc., that are the raw materials that play an important role in the entire production chain of SAF need to be expanded significantly. Investment also needs to be made in production plants – some would be greenfield opportunities, but there are many existing oil and gas production facilities that could usefully be retro-fitted into SAF-compatible units. Repurposing existing or mothballed fossil fuel plants to generate low-carbon fuels is an excellent opportunity to retain jobs and make use of existing facilities.

Given that, as noted above, adequate funding can be available, what is needed is a virtuous cycle to create and expand the market, which will then, given the technology breakthroughs that are occurring by the day, entice as much funding, on attractive terms, as needed.

### **What can be done to accelerate private sector investments in SAF?**

Institutional investors have the resources that could help unlock the scale-up needed. What is required is the enabling environment that is conducive to a material increase in the market for SAF. A key element in this regard is improving expectations regarding the demand for SAF: long-term contracts with creditworthy agencies or airlines could play a critical role. This can play an important role in kick-starting the industry. At the same time, regulatory and legal frameworks that are transparent and predictable, as well as economic and financial stability at the macro level would be helpful.

As noted above, long-term institutional investors (comprising public pension funds, for example) have a stake in the developments of the economies they operate in. While risk-return calculus is relevant given their fiduciary duties, these are not investors that are focused only or even primarily on obtaining excessive returns, or only on the short-run. Nonetheless, given the rapid pace of innovation in SAF, and the long-term nature of investments there can be risks that private sector may be unable or unwilling to take.

Measures and policies that can help reduce the risks can thus accelerate private investments. This is particularly so in emerging and developing economies. Just as important, there has to be an adequate development of pipeline of projects. In the latter context, capacity building and showing significant demand signals – either with government policy, or airline commitments to purchase SAF – is key.

Risks and uncertainties related to exchange rates, and regulatory and legal factors can constitute additional constraints. Were these constraints to be reduced or eliminated, large amounts of capital would be forthcoming.

### **What role can governments and multilateral development banks (MDBs) play in accelerating SAF?**

Governments and MDBs are in theory well-suited to take the range of risks entailed in infrastructure investments, many over long-term. However, they do not have adequate resources, nor are the incentives and constraints necessarily consistent with mobilising the quantum of needed investment for the scale-up that will be required. Nonetheless they can play an important role in facilitating the acceleration of private sector investments in SAF in several ways.

They can help ameliorate the risk-return nexus (via for instance blended finance – see below). But just as important is project preparation and the availability of project pipeline. Financing per se can only proceed if there are adequate, financeable projects available. This is an area that requires particular attention in many of the developing economies, and where MDBs and development finance institutions (DFIs), such as the Industrial Finance Corporation of India (IFCI), Industrial Development Finance Corporation of US (DFC), and Development Finance Institute (DFI) in Canada can play a constructive role.

With regard to governments, predictable policies that offer long-term visibility build market confidence. The experience with other renewables underlines this: for example in India, by

setting up various government and state entities to help bolster the solar market, resolving congestion issues, and mitigating off-take risks, India sent a strong signal to investors about their commitment to harnessing the country's significant solar potential. Capital flowed in quickly, and India has since become a global leader in solar power. Similarly in the case of Chile, established regulatory framework and the presence of strong off-takers have been key to the rapid scale-up of solar investment in the country. Coupled with their commitment to decarbonisation, Chile is credited to be one of the most attractive emerging markets for clean energy investment.

### **What is blended finance and how can it be helpful?**

» *See also the ATAG briefing on Blended Finance for SAF*

Blended finance combines private funding with concessional public funds to mobilize capital that may not be forthcoming on strictly commercial terms. It is still in its early stages, despite having grown rapidly in the past decade<sup>7</sup>. Blended finance uses relatively small amount of public funding to rebalance a project's risk profile, helping mobilise private funding. In other words, limited public funds act as a "catalyst" for eliciting much larger amounts of private funds.

This type of financing is particularly suited for projects, as in SAF production, when investors perceive the risks to be such that either because of the pioneering nature of a project or a challenging environment, returns have to be commensurately high. The use of blended finance can help ease investor concerns by including the right combination of debt, equity or grant financing, the right seniority of investors in terms of absorbing losses and earning returns, and appropriate risk-mitigation products. Blended financing for instance may seek to leverage long-term subordinated debt, a portion of which may be provided at concessional terms, to ameliorate the investment and crowd-in commercial senior debt at more competitive terms. Given that external investors want the returns in their currency, blended finance can also help deal with the foreign exchange risk; and assist in the general development of a menu of instruments to modify or attenuate risks.

Blended finance guarantees can help mitigate demand risk also. Blended finance has achieved notable success in Sub-Saharan Africa, financing climate-smart agribusiness and energy investments. It can for instance help with risk mitigation measures, such as long-term power purchase agreements in the case of off-grid solar energy.

To stimulate large amounts of private funding, governments, DFIs, MDBs and philanthropic organisations need to make private capital mobilisation a core part of their strategies. Blended finance can be mobilised through a platform approach, whereby a particular investment strategy for mixing public and private capital is used across a group of countries to catalyse increased private capital. Thus public resources can be used to modify the risk profile or blend private financing opportunities. These efforts complement support to governments for policy and business climate reforms.

Importantly, MDBs should assist governments with the creation of a pipeline of investible bankable projects; and encourage co-investing between the private sector and MDBs. We also need other innovative approaches: one of these is to complement the important country-specific approach to sustainable infrastructure with cross-country platforms.

The public sector can also be a catalyst in accelerating technological innovation by, for instance, exploring novel use of non-traditional raw materials (including carbon oxides, deconstructed plastic etc.) that will help cost competitiveness.

### **Can government subsidies help?**

To the extent that government subsidies help with redressing the risk-return trade-offs, public sector subsidies could certainly play a useful role, especially in the early stages. In this context it is helpful to draw some lessons from the evolution of other renewables in many countries – ranging from India, China, EU, Japan, USA (which were subsidised initially by governments)<sup>8</sup>.

These subsidies helped address market failures, such as to deal with the price disparity with fossil fuels when environmental costs are not accounted for. Moreover, spill-over benefits from research and development and economies of scale justified subsidies in early years.

By increasing the deployment of renewables, subsidies played an important role in accelerating adoption and ramp up production to more rapidly bring scale and reduce reliance on fossil fuels and as well as greenhouse gas emissions.

The results of subsidies that played an important role in creating demand and stimulating technological breakthroughs are instructive: the cost of renewable energy has drastically fallen since 2010. Over the past 10 years, the price of solar electricity dropped over 90%, and the price of onshore wind dropped 70%. The price of solar photovoltaic power (from solar panels) reduced from around \$360 per megawatt hour to \$40, the cheapest of any of the power options. Over the same time period, the price of coal barely shifted, from \$111 per megawatt hour in 2009 to \$109 in 2019.

In 2009, building a new solar farm was 225% more expensive than building a new coal plant. Now, it has flipped: Electricity from a new coal plant is 175% more expensive than electricity from new solar panels (on a levelized basis – that is cost of electricity generation for a generator over its life-time). What caused the switch? Huge leaps in technological advancement, and like other technologies, the more that was produced, the cheaper it became to produce<sup>9</sup>.

In the case of SAF, and depending on the country, the private financial sector would not necessarily need the subsidies on the same long-term scale. They could of course help in the early stages of development but what is really needed is to create and expand the market at the same time we create the technology and production facilities. As investors see the expanding market they will invest in all stages of the production chain of SAF. There are a range of policy measures that could help the acceleration: these have been explored reports such as the *Sustainable Aviation Fuel Policy Toolkit*<sup>10</sup>.

### **What other factors could help facilitate investment?**

There is a critical need to ensure transparency and reduce uncertainties in the regulatory and legal environment. The governments have to set the right framework for action. To reduce the risk profile, countries need to make significant progress; upgrade their macro policy frameworks; have more macro stability and appropriate regulatory as well as legal frameworks; but many of these factors, and the related variables that go into credit ratings are slow moving (including institutional and economic profile, fiscal positions, debt stocks)<sup>11</sup>. Blended finance is a useful tool to help mitigate the excessive risks; goal of blended finance is to create “market equivalent” investments to mobilise private sector investment for climate (and SDG) projects.

### **What role can global cooperation play, and how can we ensure that capital doesn't just flow to the developed world and large developing markets?**

There are many areas where global cooperation can play an important role in helping emerging market and developing countries accelerate the deployment of SAF. A low-hanging fruit is simply sharing knowledge, information and expertise in the development of SAF projects pipelines. Capacity building – through the ICAO ACT-SAF process as well as others – is very important as part of the means of implementation. There can be fruitful cooperation in the regulatory environment that is most conducive to SAF. Understanding what has worked, what hasn't and how to improve the framework within which the private sector will invest can be helpful. More generally, the pursuit of appropriate macro, financial and sectoral policies that will help SAF, and green infrastructure more generally, can be facilitated by global cooperation, bilaterally and multilaterally.

The global cooperation can play a role in setting common standards (including standardised long-term contracts), and in the case of multi-country platforms for blended finance, helping with the risk-return nexus, and the adoption of policies that can help ameliorate risks. These global cooperation measures, as well as measures noted above to improve the risk-return trade-offs, blended finance, and an improvement in domestic economic, financial and regulatory environment can go a long way towards ensuring that adequate capital is available for developing and emerging market economies. In the case of smaller economies, the portfolio approach, whereby strategies are developed for groups of countries (e.g. the Caribbean region, groups of Commonwealth countries, etc) can ensure that country size is less of a hindrance to the flow of capital.

## References

<sup>1</sup> Caisse de dépôt et placement du Québec is an institutional investor that manages several public and parapublic pension plans and insurance programs in Quebec with assets of nearly \$400 billion. Answers drafted by Manmohan S Kumar for CDPQ

<sup>2</sup> Air Transport Action Group: [www.atag.org](http://www.atag.org)

<sup>3</sup> Air Transport Action Group Waypoint 2050 and Fueling Net Zero analysis: [www.aviationbenefits.org/W2050](http://www.aviationbenefits.org/W2050)

<sup>4</sup> Air Transport Action Group fact sheet on the cost of meeting net zero: [www.atag.org/component/attachments/?task=download&id=1008:FACT-SHEET\\_15\\_cost-of-net-zero-transition](http://www.atag.org/component/attachments/?task=download&id=1008:FACT-SHEET_15_cost-of-net-zero-transition). International aviation alone is estimated by the ICAO LTAG analysis to be around \$4 trillion.

<sup>5</sup> Financial Stability Board: Global Monitoring Report on Non-Bank Financial Intermediation 2021.

<sup>6</sup> Air Transport Action Group Fueling Net Zero analysis: [www.aviationbenefits.org/W2050](http://www.aviationbenefits.org/W2050)

<sup>7</sup> "The State of Blended Finance 2021" Convergence 2021: [www.convergence.finance/resource/0bbf487e-d76d-4e84-ba9e-bd6d8cf75ea0/view](http://www.convergence.finance/resource/0bbf487e-d76d-4e84-ba9e-bd6d8cf75ea0/view)

<sup>8</sup> Energy Subsidies, International Renewable Energy Agency 2020: [www.irena.org/publications/2020/Apr/Energy-Subsidies-2020](http://www.irena.org/publications/2020/Apr/Energy-Subsidies-2020)

<sup>9</sup> "Why did renewables become so cheap so fast", Max Roser in Our World in Data (Online science publication in partnership with Oxford University), December 2020)

<sup>10</sup> World Economic Forum and Energy Transitions Commission: [www.weforum.org/reports/clean-skies-for-tomorrow-sustainable-aviation-fuel-policy-toolkit/](http://www.weforum.org/reports/clean-skies-for-tomorrow-sustainable-aviation-fuel-policy-toolkit/)

<sup>11</sup> For a recent summary of the measures government can take to improve their creditworthiness and prospects of attracting foreign capital, see a note by the head of IMF Kristalina Georgieva, and Tobias Adrian, "Public sector must play a major role in catalyzing private finance", IMF, August 18, 2022

# HOW BLENDED FINANCE CAN SUPPORT THE AVIATION ENERGY TRANSITION IN EMERGING AND DEVELOPING ECONOMIES

Innovative instruments and equity finance are needed to enhance risk-sharing through public-private partnerships and maximise the impact of scarce public funds.

Analysis has shown that aviation's sector-wide long-term goal of net-zero carbon emissions by 2050 will require an energy transition away from fossil fuels and towards sustainable aviation fuels. The transition will need to be rapid – scaling-up supply of SAF from the 200,000 tonnes delivered in 2022 to potentially 445 million tonnes per year by 2050. This rapid deployment is estimated to require up to \$1.45 trillion in capital expenditure on new plants and processing and will be needed in countries all over the world.

This will present a significant opportunity for States to build green energy sectors, supporting economic development and potentially some 14 million jobs worldwide by 2050. But the capital expenditure needed will be extensive. Public sources of investment from developing or emerging economies will not be able to cover the scale required, and private sources are sometimes reluctant to undertake more risky investments in early-stage technologies or in some markets with higher risk profiles.

The use of blended finance can overcome some of these obstacles and pave the way for early-stage investment to underpin long-term private and institutional investment. In general terms, blended finance is the use of catalytic capital from public or philanthropic sources to increase private sector investment in sustainable development.

This paper explores the concept of blended finance in an aviation context and how it will be crucial to the energy transition in emerging markets as the global air transport sector works towards net-zero carbon by 2050. It also has two examples of blended finance in action for aviation:

1. de-risking investment in the first SAF facilities; and
2. bundling multi-country SAF sectors.

*The data in this report is drawn from the Waypoint 2050 report and its accompanying analysis in Fueling Net Zero.*

Waypoint 2050 can be found:  
[www.aviationbenefits.org/W2050](http://www.aviationbenefits.org/W2050)



## Blended finance

Blended finance is a financing approach that combines public and private sector funding to mobilise additional investment in development projects and initiatives in emerging markets. The goal of blended finance is to attract private sector investment to projects and sectors that have a clear development impact, but may not be considered commercially viable by investors.

The most common form of blended finance is the use of public or philanthropic funds, such as development finance or grant funding, to de-risk or catalyse private sector investment. This can take the form of guarantees, credit enhancements, or other forms of risk mitigation. By reducing the perceived risk of the investment, blended finance aims to make it more attractive to private investors and encourage them to invest in projects that they may not have otherwise considered.

Blended finance can also leverage the expertise and technical assistance from development organisations to help make projects more attractive to private investors. This can include support for project preparation, structuring, and implementation. Many development organisations and multilateral financial institutions also have a long track record of working with local experts to ensure best opportunities for each market.

Blended finance is often used in sectors such as infrastructure, energy, and sustainable development, where private sector participation can be critical to achieving development impact but where commercial returns may be uncertain or low.

*Some blended finance projects will tap in to two or more of these institutions, and some may have fewer players. There will also be a number of SAF projects and incentive schemes which bring in financing from MDBs or IFIs directly. The below provides a high-level illustration of the ways in which different institutions may play a role in SAF deployment globally.*

(Illustrative scale of relative involvement)



## Examples of blended finance at work in SAF facility development

Blended finance has the potential to catalyse the large amounts of investment required to help scale-up SAF production to levels needed for the decarbonisation of air transport. Here are two examples of how blended finance can be used in different ways to finance SAF projects in emerging economies:

### Example 1

#### De-risking investment in the first SAF facilities

An in-country initiative set up by government, aviation and energy industry and other stakeholder groups has identified several feedstocks and pathways that could be potential sources of SAF in the country. A feasibility study was commissioned, with funding for the study provided by a donor country through the ICAO ACT-SAF initiative. Several sites have been identified that would be perfect for the first couple of SAF production facilities – close to the sources of agricultural waste and municipal waste, as well as being close to airports that could use the finished SAF.

The first plant, in a semi-rural area close to both forestry and sugar cane production has the potential to produce 65,000 tonnes of SAF per year with supply to a local airport. It would also create 900 jobs – 100 running the plant itself and the rest in the collection of the raw waste feedstock from local farms. Hundreds more jobs would be created during construction. The capital expenditure for the plant would be \$700 million with a payback period of 15 years.

The second facility would partially re-use a soon-to-be-closed fossil fuel refinery close to the capital city, retrofitting it to be able to process waste oils and fats from the city to produce 400,000 tonnes of SAF for use at the country's main hub airport. Some 2,000 jobs would be created, with two thirds being transferred from the existing fossil fuel plant. The capital costs are estimated at \$400 million. The feasibility study also concluded that there was potential for at least seven other SAF facilities to be established over the coming decade.

Now, the country is looking to help finance the construction of these plants. Limited funds are available from a local infrastructure investor, but the country's regional development bank is able to provide seed financing to help de-risk the investment in the two SAF facilities with additional financing secured from a consortium of international pension funds. Part of the investment package included several policy measures from the country, including de-risking of the construction costs, tax reduction on both construction and the use of the SAF product by airlines and support in accelerating regulatory approval for construction of the facility.

### Example 2

#### Bundling multi-country SAF sectors

One of the challenges with financing nascent industries in many developing and emerging economies is the risk profile of those markets. One option to help overcome this is to 'bundle' projects across several countries.

A group of four small Central American states all benefited from the ICAO ACT-SAF initiative and, working together, identified an initial 12 potential feedstocks and sites for SAF production across the countries. They worked with the Inter-American Development Bank to fund a four-country feasibility study to determine the best options for the first tranche of investment. Six facilities were chosen, at least one in each country, with financing of a total of \$1.8 billion required for the facilities which range from 50,000 to 130,000 tonnes of SAF per year. Up to 7,000 jobs in the four countries are expected to be generated.

Some local investment and a supportive policy environment from the four countries ensured that a consortium of multilateral development banks, institutional and private investors invested in the process. A multinational energy company, which already had retail facilities in one of the countries, also invested. The fact that four countries were involved helped to lower the risk for the international investors, by creating a more stable regional policy environment and ensuring that short-term political or economic changes in one country was able to be balanced across this portfolio.

## Finance sources and institutions

Although exact definitions vary, in this paper, we have used the following definitions of finance institutions and sources

Institution type	Definition	Examples
<b>Public finance</b>	Finance provided by a government from either tax revenues or by issuing debt on the bond market, for use in its own country, or as a group of countries working together. Additionally, policy support can be given in the form of de-risking investment in SAF-type projects, providing tax breaks and assisting with reducing regulatory hurdles to development of climate initiatives.	
<b>Public finance (donor)</b>	Finance provided by donor governments from national treasuries, provided directly through official development assistance (ODA) or other mechanisms; or via other international arrangements (including the international financial institutions or funds). Data from the OECD suggested that around \$150 billion in ODA was delivered from its members to low-income countries in 2019.	<ul style="list-style-type: none"> <li>» USAID</li> <li>» GIZ</li> <li>» UK DFID</li> </ul>
<b>Philanthropic funding</b>	Several large global foundations exist to help catalyse the investment in climate smart technology and energy production. Whilst these institutions would likely not invest in the capital expenditure on a large scale, they are often able to work together to look at in-country opportunities, feasibility studies and to fund collaborative partnerships that will help access the capital needed for development in the long term.	<ul style="list-style-type: none"> <li>» Breakthrough Energy</li> </ul>
<b>Global international financial institutions (IFIs)</b>	Organisations that provide financial assistance and support to countries for economic development and poverty reduction. These institutions provide loans, technical assistance, and policy advice to their member countries, often with a focus on specific sectors or regions. They also play a key role in promoting global economic stability and cooperation, and in providing a forum for international economic policy coordination.	<ul style="list-style-type: none"> <li>» International Monetary Fund</li> <li>» World Bank</li> </ul>
<b>Other Multilateral development banks (MDBs)</b>	A type of international financial institution that provides funding and support for economic development and poverty reduction in developing countries. MDBs often have a specific mandate to promote economic development and reduce poverty and a specific focus on infrastructure development and investment in a particular region, sector or theme.	<ul style="list-style-type: none"> <li>» African Development Bank</li> <li>» Asian Development Bank</li> <li>» Inter-American Development Bank</li> </ul>
<b>Institutional investors</b>	Institutional investors are organisations that invest funds on behalf of a group of individuals or other organisations. They include pension funds, mutual funds, endowments, insurance companies, and sovereign wealth funds. These organisations typically have large pools of capital and invest in a wide range of financial assets, including stocks, bonds, real estate, and private equity. They may also engage in other financial activities such as lending, derivatives trading, and risk management. They have fiduciary responsibilities and need to have certain returns with limitations on the risks they can undertake. They also tend to have a long-term investment horizon and are less likely to engage in short-term trading activities. Additionally, they often have a professional staff of analysts and portfolio managers who can conduct in-depth research on investment opportunities and make informed investment decisions. It is estimated that institutional investors look after over \$200 trillion in funds worldwide.	<ul style="list-style-type: none"> <li>» Pension and retirement funds</li> <li>» Sovereign wealth funds</li> <li>» Mutual funds</li> <li>» Insurance companies</li> </ul>
<b>Private investors / private capital</b>	The large commercial retail and investment banks have access to billions of dollars of capital. According to the McKinsey Global Banking Annual Review, in 2021 the volume of clean-energy project finance rose to \$164 billion and private-equity firms invested \$76 billion in renewable energy, sustainable mobility, and carbon technologies in 2021.	<ul style="list-style-type: none"> <li>» HSBC</li> <li>» Standard Chartered</li> <li>» JP Morgan Chase</li> <li>» Bank of America</li> <li>» Deutsche Bank</li> <li>» UBS</li> <li>» Société Générale</li> </ul>

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