

Drivers of Change in the Environmental Impact of the Aviation Industry

by

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3 Disclaimer

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5 List of Abbreviations

Where abbreviations are jurisdiction specific, the relevant jurisdiction is shown in brackets and where it is unclear as to what an abbreviation may refer, further information is shown in brackets.

ARC, American Carbon Registry

ART, Architecture for REDD + Transactions

ASA, Advertising Standards Authority (U.K.)

CDM, Clean Development Mechanism

CFTC, Commodity Futures Trading Commission (United States of America)

CAR, Climate Action Reserve

CORSIA, Carbon Offsetting and Reduction Scheme for International Aviation

CSRD, Corporate Sustainability Reporting Directive (EU Legislation)

CS3D, Corporate Sustainability Due Diligence Directive (EU Legislation)

EEA, European Economic Area

EETC, Enhanced Equipment Trust Certificate

EEUs, Eligible Emissions Units

ESG, Environmental, Social, and Governance

ESRS, European Sustainability Reporting Standards

EU, European Union

EUA, Emission Unit Allowance

EU ETS, EU Emissions Trading Scheme

FCPF, Forest Carbon Partnership Facility

GHG, Greenhouse Gases

GCC, Global Carbon Council

GS, The Gold Standard

IATA, International Air Transport Association

ICAO, International Civil Aviation Organization

NFRD, Non-Financial Reporting Directive (EU Legislation):

NGO, Non-governmental Organisation

NZIA, Net Zero Insurance Alliance

OEM, Original Equipment Manufacturer

REDD+, Reducing Emissions from Deforestation and Forest Degradation

SAF, Sustainable Aviation Fuel

SBTi, Science Based Targets initiative

SEC, Securities and Exchange Commission (United States)

SMEs, Small and Medium Sized Enterprises

SFDR, Sustainable Finance Disclosure Regulation (EU Legislation)

SLL, Sustainability Linked Loan

U.K., United Kingdom

UK ETS, UK Emissions Trading Scheme

U.S., United States of America

VCS, Verified Carbon Standard

References to aviation jet fuel are references to conventional fossil-fuel-based kerosene jet fuel.

6 Executive Summary

Aviation is one of the most difficult sectors to decarbonise. However, a wide range of pressures are driving the decarbonisation of the aviation industry.

The pressures on the aviation industry to decarbonise fall into two broad categories:

I. Consumers, activists, NGOs, and civil litigation increasingly informed by levels of audited greenhouse gas emission (“GHG”) disclosures under the Corporate Sustainability Reporting Directive and the actions being taken to mitigate or bring to an end sustainability impacts which will be required under the forthcoming Corporate Sustainability Due Diligence Directive.

II. Increasing costs, particularly for EU airlines, arising from: (a) carbon taxes on airline GHG emissions ramping up to cover 100% of emissions from 2026; (b) gradually incrementing requirements to use increasing amounts of sustainable aviation fuel which is two to three times the cost of aviation jet fuel; and (c) possible increases in the cost of debt and equity capital for airlines and aircraft lessors due to increasing focus on lenders and institutional investors in relation to the climate change and sustainability risks inherent in their portfolios.

In the short term, only the most profitable airlines in Europe are likely to be able to bear the rising costs. The level of competition in the European airline industry is likely to decrease and become more like the level of competition in the U.S. In time, the surviving European airlines might be able to pass on rising costs to passengers assuming the secular growth rate for the demand for aviation travel is not affected by the higher fares and the combination of consumer, NGO, and civil litigation pressures. At the same time, the desire to drive down increasing costs is likely to facilitate investment in SAF production and its supporting delivery infrastructure to lower its cost over time. The greater use of SAF or e-fuel ought to reduce in time the cost of debt and equity capital for the aviation industry as aviation decarbonises.

For airlines operating outside of the EU, most of the pressures identified in I. above apply. At the moment, the pace of implementation of carbon taxes and requirements to use SAF or e-fuel is not as great as in the EU. The cost of carbon offsets under the Carbon Offsetting and Reduction Scheme for International Aviation (“CORSIA”) which is designed to achieve carbon-neutral growth in the aviation industry is significantly lower than the cost of an EU Emission Unit Allowance (“EUA”)¹. Besides the CORSIA offsetting requirement only applies to the growth in emissions above a baseline.

There is no simple single solution to decarbonise the aviation industry over a relatively short time horizon. Decarbonising the aviation industry is highly complex from the perspectives of engineering innovation, airline safety regulations in testing the efficacy and safety of new technologies, and, because no single country can decarbonise the aviation industry, global political cooperation is required. In the short to medium term, SAF is likely to be the preferred method of reducing the GHG emissions from long-haul flights while both hydrogen powered flight and SAF are possible candidates for decarbonising short-haul flights.

¹ An EUA is a tradable permit that gives the holder the right to emit one tonne of CO₂e. A tonne of CO₂e (“tCO₂e”) is a metric ton of carbon dioxide equivalent, which is a standardized unit for measuring carbon footprints for all greenhouse gases.

7 Introduction

In June 2023, the EU European Court of Auditors and the Climate Change Committee of the UK Parliament both released reports of their audits of climate goals which naturally considered the impact of aviation greenhouse gas (“GHG”) emissions. Both reports highlighted insufficient progress in reducing greenhouse gas emissions.

The report of the European Court of Auditors noted that 90% of emissions arising from the EU’s share of international aviation are excluded from the EU’s greenhouse gas emissions target.

The UK Parliament’s report had a very strong focus on the aviation industry including: (i) questioning a number of technological assumptions advanced by the aviation industry as a means of reducing GHG emissions; and (ii) recommending government should take actions to discourage flying and limit the expansion of airport infrastructure.

Aviation is one of the most difficult sectors to decarbonise. The objectives of this paper are to: (i) provide an overview of the consumer, regulatory, litigation, and financial pressures on the airline industry to reduce its carbon footprint; and (ii) illustrate one possible route to the decarbonisation of the aviation sector.

We have compiled a list of potential sources of pressure on the aviation industry in relation to its GHG emission and discuss the possible implications of each potential source of pressure. Our list of the potential sources of pressure on the aviation industry in relation to its GHG emissions is as follows:

- Airline Consumers
- Consumer Groups
- Climate Activists
- Litigation Risk
- Reputational Risk
- EU Corporate Sustainability Disclosure Regulation
- Sustainable Finance Disclosure Regulation
- EU Sustainable Finance Disclosure Regulation
- Banks and other lenders
- ReFuelEU and
- EU Emission Trading Scheme
- Carbon Offsetting and Reduction Scheme for International Aviation

In closing the paper, we discuss the prospects for sustainable aviation fuel (“SAF”) in decarbonising the aviation sector and consider the GHG emissions outlook for the aviation industry.

8 Net Zero Claims

A net zero target claim by a company encompasses the entity's overall business operations and the associated emissions. The entity aims to reduce Scope 1, Scope 2, and Scope 3 emissions across its entire business operations and offset any remaining emissions through the removal of CO₂. Table 1 provides a brief description of each of the three emission scopes and sets out the difficulties in computing each scope's emission.

Table 1

Scope	Description	Computation Difficulties
1	Scope 1 emissions are direct greenhouse gas emissions from equipment owned or controlled by an entity. For an airline, Scope 1 emissions are likely to include emissions from burning jet fuel in airplane engines owned or controlled by the airline, the largest source of emissions for airlines, emissions from fuel used in planes while taxiing, emissions from fleet vehicles used on airfields, emissions from fuels used to heat the airline's offices, hangars, lounges, emissions from leaked refrigerants from coolers, air conditioning and refrigeration units owned by the airline at facilities, and emissions from fire suppressant chemicals in fire extinguishing systems owned by the airline.	Computing Scope 1 emissions requires robust and rigorous systems to collect quality global fuel usage data. IATA's fuel reporting framework aims to standardise and improve aviation emissions accounting.
2	Scope 2 emissions are emissions for which the entity is indirectly responsible. For an airline, Scope 2 emissions are likely to include emissions from the generation of electricity used to power airports, hangars, offices, data centers, etc., emissions from purchased steam, hot or chilled water used for heating or cooling airline facilities, emissions from electricity used to prepare in-flight meals, and emissions from powering data used in ticketing and wi-fi.	Computing Scope 2 emissions requires investment in metering, data management and calls for partnerships with utilities and airports to obtain high quality Scope 2 emissions data.
3	Scope 3 emissions are all other indirect emissions that arise from downstream and upstream activities of the entity. For an airline Scope 3 emissions are likely to include emissions arising from purchased goods or services, emissions from extracting, refining, and transporting jet fuel used in airline operations, emissions from employees traveling for business by rail, taxi or rental cars, emissions arising from customers traveling to or from airports via cars, trains, buses, etc., and emissions from leased equipment.	Computing Scope 3 emissions are an airline's the biggest climate accounting challenge because of the huge range of indirect sources across the value chain. A strong push for transparency across aviation value chains will be required along with a consistent estimation approach.

There is no standard against which a claim of net zero can be certified; rather it is assessed against frameworks such as the Science-Based Targets initiative or the Net Zero Investment Framework.

Businesses that make net-zero statements that rely on offsets risk litigation and reputation damage unless each offset purchased can be proven to have removed a ton or kept a ton of CO₂ equivalent ("tCO₂e")² out of the atmosphere.

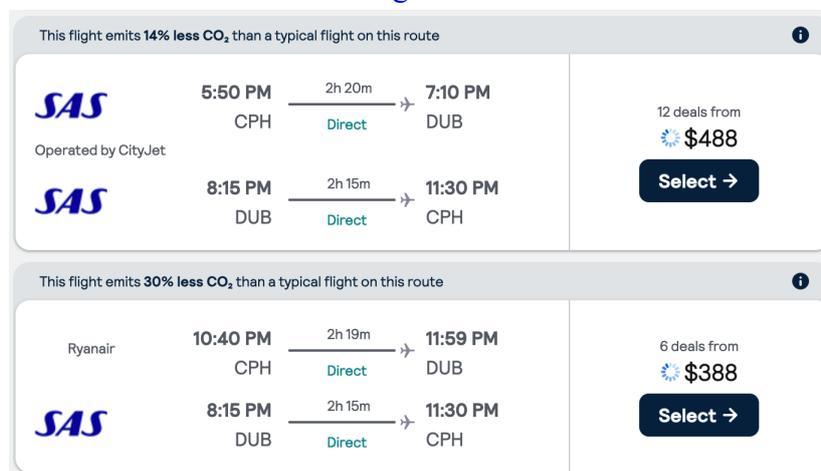
² tCO₂e is a metric unit which accounts for the global warming potential in a common unit when an emission contains a mix of gases. For example, over a century, the global warming potential of methane is 25 times that of CO₂. Thus, a ton of methane emissions would equal 25 tons of CO₂ emissions in terms of global warming potential. With t for ton and e for equivalent basis, tCO₂e permits consistent measurement and comparison of total greenhouse gas emissions when an emission contains a mix of different gases.

9 Pressures from Airline Customers

Consumers have a growing awareness of the carbon footprint they create when they use aviation transport.

Skyscanner is an airline travel aggregator for flights. Skyscanner provides its customers with emissions information using data supplied by Travalyst. As shown in Figure 1, Skyscanner provides relative CO₂ emissions data on flights for travel between two airports. For example, the extract from the Skyscanner website in Figure 1 below shows the Ryanair flight in the lower panel is quoted as emitting 30% less CO₂ than a typical flight on the route whereas the alternative flight in the upper panel is quoted as emitting just 14% less CO₂ than a typical flight on the route. According to Skyscanner the figures quoted for flight emissions are “*calculated per traveller and based on factors such as aircraft type, capacity and number of stops.*”

Figure 1



Source: Skyscanner.com

One can see how this information is at the very least raising awareness of GHG emissions by the aviation industry and influencing consumer choices. One might dismiss this as a form of “green” marketing by Skyscanner; however, audited figures show that between 2019 and July 2023, 159 million travellers using Skyscanner chose a flight with less than typical emissions for a flight on the route they were planning to travel³. While an interesting statistic, a realistic assessment of the figure would require details of whether each of the choices made by travellers was also due to a lower cost flight.

Further, as companies that use the aviation industry are forced to disclose their emissions, some are cutting back on flights taken by their staff. For example, we understand from conversations with colleagues that Zurich Insurance Group AG and Swiss Re have strict carbon budgets for staff flights.

³ “CO₂ Emissions”, *Skyscanner*, <https://www.skyscanner.com/environment>, accessed 22 October 2023.

10 Pressure from Consumer Groups

In June 2023, BEUC⁴ and 23 of its member organisations from 19 countries filed a complaint with the European Commission and the network of consumer protection authorities denouncing misleading climate-related claims by 17 European airlines.

The complaint was filed under Directive 2005/29/EC which deals with unfair business-to-consumer commercial practices in the internal market.

The complaint accused 17 European airlines of greenwashing in connection with their marketing practices, alleging breaches of EU regulations governing unfair commercial practices.

Table 2 below lists the alleged misleading practices complained of, illustrates the wording of some of the alleged misleading claims, and the reasons why BEUC believes the practice is misleading.

Table 2

Nature of Alleged Misleading Practice	Sample Claims Supporting the Allegation ⁵	Reasons why BEUC Believe the Practice is Allegedly Misleading
Claims that purchasing carbon credits can offset, neutralise, or compensate the CO ₂ emissions of a flight.	<p>“Compensate your CO₂ emissions”</p> <p>“You can offset your carbon emissions”</p> <p>“Carbon offset compensation”</p>	The climate benefits of offsetting activities are highly uncertain, while the harm caused by the CO ₂ emissions from air travel is certain.
Giving the impression that air travel can be “sustainable,” “responsible,” and “green.”	<p>“green by nature;”</p> <p>“Think Green Fly Green,”</p> <p>“Green fares: fly more sustainably;” “fly more responsibly;” or “reduce your footprint”</p>	None of the strategies deployed by the aviation sector are currently able to prevent greenhouse gas emissions.
Charging consumers more to contribute to the development of sustainable aviation fuels.	“For the planet for the people – did you know that your donation helps to reduce CO ₂ emissions”	Sustainable aviation fuel is not readily or widely available and is unlikely to be so before 2030. After 2030, sustainable aviation fuels will only be a small fraction of the total fuel used by airlines.

⁴ Bureau Européen des Unions de Consommateurs (BEUC), is an umbrella group for 45 independent consumer organisations from 31 countries. The main role of BEUC is to represent its member organisations to EU institutions and defend the interests of European consumers. See: <https://www.beuc.eu/press-releases/consumer-groups-launch-eu-wide-complaint-against-17-airlines-greenwashing> for the press release of the complaint.

⁵ Source: “Targeted airlines & identified practices”, BEUC, https://www.beuc.eu/sites/default/files/publications/BEUC-X-2023-086_Green_Flying_Targeted_airlines_%26_identified_practices.pdf, accessed 25 October 2023.

BEUC called for an Europe-wide investigation into what it termed “this greenwashing practice” and for all airlines to stop making claims that give consumers the impression that flying is sustainable. BEUC’s general point is that it is simply untrue to say that flying is sustainable and somehow bound to become so in the near future.

BEUC went even further in requesting the relevant Consumer Protection Cooperation⁶ network to ask airlines to refund customers who paid ‘green’ fees based on such allegedly misleading claims.

10.1 Tougher EU Legislation on Generic Environmental Claims

In May 2023, the European Council adopted its negotiating mandate supporting an amendment to the Unfair Commercial Practices Directive and the Consumer Rights Directive to enhance consumer rights against alleged greenwashing.

If passed into EU law, the directive would ban generic environmental claims such as ‘eco-friendly’, ‘green’, or ‘climate neutral’. Producers would no longer be allowed to advertise their products, processes, or businesses in such general terms if the claims cannot be substantiated by a publicly accessible certification scheme.

The EU also proposes to introduce a voluntary environmental labelling scheme enabling the environmental performance of flights to be measured. The labels issued pursuant to the proposed legislation shall certify the level of environmental performance of a flight.

The level of environmental performance of a flight shall be determined on the basis of the average environmental performance of the flights carried out by an aircraft operator on a specific route for the previous corresponding scheduling period.

Labels will provide the following information:

- (a) the expected carbon footprint per passenger, expressed in metrics such as in kilograms of CO₂ per passenger, for the period of validity of the label;
- (b) the expected CO₂ efficiency per kilometre, expressed in metrics such as in grams of CO₂ per passenger per kilometre, for the period of validity of the label.

The European Union Aviation Safety Agency shall determine the expected carbon footprint per passenger and the expected CO₂ efficiency per kilometre of a flight based on: (i) the types of aircraft, average number of passengers and freight loads supplemented when needed with estimations of those factors, such as the average load factors for the specified route for a given time period; and (ii) the performance of the fuel used on the flights carried out by the aircraft

⁶ The Consumer Protection Cooperation network is an important mechanism established by the European Union to enhance cooperation among national authorities responsible for enforcing consumer protection laws across EU member states, as well as Iceland, Liechtenstein, and Norway.

operator based on the fuel uptake and using metrics such as the total amount of sustainable aviation fuel (“SAF”) uplifted, the percentage over the total fuel uptake, the quality and origin, the composition and the lifecycle emissions from fuel use calculated for the flight.

Labels issued shall be valid for a limited period not exceeding one year and shall be clearly displayed by the aircraft operator.

10.2 Rail a Replacement for Short-haul Flights?

To mitigate the climate change impacts of aviation, it is often suggested that short-haul flights should be replaced by high-speed rail, which is capable of delivering travel times similar to those provided by short-haul flights but at lower emission levels.

In May 2023, France passed a law which under certain conditions would prohibit domestic flights within mainland France where there is an option for travellers to use rail transport, where the journey time is less than two-and-a-half hours, and the rail service operates several times a day allowing travellers to spend at least eight hours at their destination⁷. Despite the news headlines the law generated, in reality it will impact a very tiny portion of departures from French airports.

In this debate, it should be noted that considerable investment in infrastructure is required to build high-speed rail and high-speed rail infrastructure takes time to deliver. This time to deliver element needs to be compared with the time to deliver the decarbonisation of aviation which is most likely to come first for short-haul flights thereby reducing the relative emissions gap between rail and air travel.

Further, where high-speed rail is powered by electricity, the carbon footprint of the electricity generated needs to be considered: Is the electricity generated mainly from renewable sources or from fossil fuels?

For short journeys, there is no guarantee that travellers will opt for rail over flying. They may simply choose to travel by car thereby increasing overall emissions.

However, even routes operated by highly fuel-efficient turboprops can't be replaced by rail because in some cases the gauge of the rail network is not uniform, inhibiting the development of cross border train routes. This is particularly the case when one tries to travel by train between Eastern and Central Europe. In Baltic countries trains from East (Russia) can't connect to the West because of the different width of the rails. Similarly, within the EU, Spain and Portugal do not share the same railway gauge. Specifically, Spain uses a track width of 1,668 mm while Portugal has a track width of 1,435 mm. Absent gauge changers or variable gauge axles, the lack of a shared rail gauge makes direct train connections between the two countries impossible.

⁷ Source: “Vaunted French Ban on Short Domestic Flights Is a Pale Shade of Green”, New York Times, <https://www.nytimes.com/2023/05/24/world/europe/france-short-haul-flights-emissions.html>, accessed 24 October 2023.

Following the Russian invasion of Ukraine in 2022 and the turmoil it caused, the European Commission gave EU member states until 2025-26 to come up with a plan to adopt the standard European gauge, 1435 mm⁸ to ensure the integrity of supply chains and food security.

In a research paper⁹ published in the Journal of Transport Geography in October 2022, the authors quote the statistics in Table 3 in relation to all departing flights from 31 European countries.

Table 3

Flight Length	Percentage of Departures	Percentage of Total Fuel Burnt
Less than 500km	27.9%	5.9%
Longer than 4,000km	6.2%	47.0%

They conclude that targeting shorter flights which often exist to alleviate physical obstacles imposed by physical geography will contribute little to reducing the impact of aviation on climate, and that policy initiatives that target longer flights are urgently needed.

Transport & Environment, an NGO, points out that booking a flight to travel from one EU destination to another is significantly easier than booking a train ticket to travel between the two points. In a move to address this issue, the European Commission is planning to present a legislative proposal on multimodal digital mobility services¹⁰, such as route-planners or ticket vendors, to help compare travel options.

A study published in July 2023 by Greenpeace¹¹ showed that tickets for trains were on average twice the price of flights based on a sample of 112 routes in Europe at 9 different points in time. An extreme example taken from the study showed that despite the significantly lower emissions per passenger on rail versus aircraft, the cost of a rail ticket from London to Barcelona was as much as 30 times the cost of a flight when booked at short notice and on average 10 times the cost of a flight.

As part of BEUC's complaint to the European Commission in June 2023, it called on decision makers to provide consumers with reliable, attractive, and sustainable alternatives to flying such as higher-quality long-distance rail connections.

⁸ Source: "Plans for standard gauge in all EU member states to be ready by 2025-26", Railtech, <https://www.railtech.com/infrastructure/2022/12/07/plans-for-standard-gauge-in-all-eu-member-states-to-be-ready-by-2025-26/>, accessed 25 October 2023.

⁹ Source: Dobruszkes, F., Mattioli, G., Mathieu, L. (2022). Banning super short-haul flights: Environmental evidence or political turbulence? Journal of Transport Geography. <https://www.sciencedirect.com/science/article/abs/pii/S0966692322001806>.

¹⁰ Source: "Legislative proposal on multimodal digital mobility services", European Parliament, <https://www.europarl.europa.eu/legislative-train/theme-a-europe-fit-for-the-digital-age/file-multimodal-digital-mobility-services>, accessed 25 October 2023.

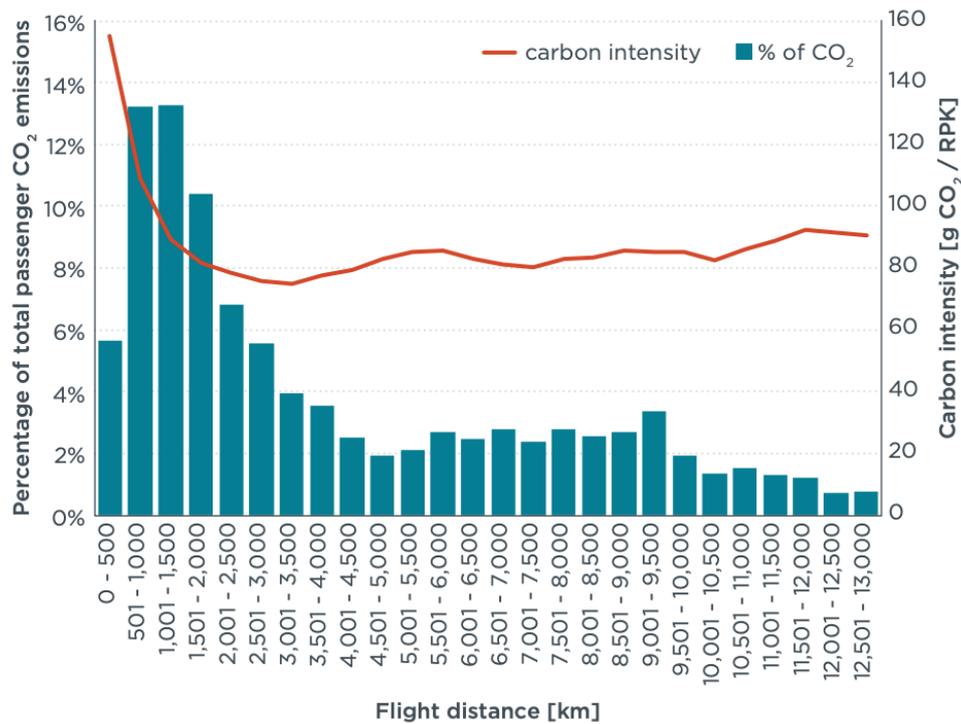
¹¹ Source: "Cheap pollution means taking the train to Europe is four times the cost of flying", Greenpeace, <https://www.greenpeace.org.uk/news/cheap-pollution-means-taking-the-train-to-europe-is-four-times-the-cost-of-flying-report/>, accessed 25 October 2023.

11 CO₂ Emissions from Commercial Aviation

The International Council on Clean Transportation produced a report on the CO₂ Emissions from commercial aviation¹², showing that the carbon intensity in grams CO₂ emitted per passenger kilometre varies with flight distance.

For flights of less than 1,000 km, the carbon intensity is very high, falls with increasing distance until around 1,500 to 2,000 km, at which point it levels out changing very little with increasing distance. Figure 2 illustrates the concepts graphically.

Figure 2



Share of passenger CO₂ emissions and carbon intensity in 2018, by stage length.

Source: The International Council on Clean Transportation

Available at: https://theicct.org/sites/default/files/publications/ICCT_CO2-commercl-aviation-2018_20190918.pdf

The principal reason for this pattern of carbon intensity (in grams CO₂ emitted per passenger kilometre) is that take-off requires much more energy input than the cruising phase of a flight. Thus, the extra fuel needed for take-off is spread over a much smaller total distance on short flights compared with long distance flights which have a higher component of the more fuel efficient cruise phase of the journey. Further, if less fuel-efficient aircraft are used for short flights, the carbon intensity in grams CO₂ emitted per passenger kilometre will be even higher.

¹² Source: "CO₂ emissions from commercial aviation, 2018", ICCT, https://theicct.org/sites/default/files/publications/ICCT_CO2-commercl-aviation-2018_20190918.pdf.

12 Non-CO₂ Emissions from Commercial Aviation

In addition to CO₂, jet engines emit water vapour, oxides of nitrogen, soot particles, carbon monoxide and small amounts of unburnt hydrocarbons. Water vapour is the primary exhaust emission.

Condensation trails, contrails for short, form when hot and moist exhaust fumes from jet engines mix with the cold ambient air, producing condensation of water vapor that forms icy clouds. While some contrails disappear quickly others can persist and grow to span wide areas. Persistent contrails that spread into extended cirrus clouds they generate can trap outgoing radiation and contribute to warming with an estimated effect 2-3 times that of CO₂. Understanding contrails is essential to achieving climate-neutral aviation.

According to a 2021 research paper entitled *Influence of Sustainable Aviation Fuels on the Formation of Contrails and Their Properties*¹³, in 2017, the aviation sector contributed approximately 5% of the global radiative forcing¹⁴ caused by human activities, with the radiative forcing attributed to contrails and contrail cirrus being estimated as 50 mW/m².

Soot emissions from aircraft can also contribute to contrail formation and persistence. More modern aircraft engines have lower soot emissions and thus help reduce contrail formation. Reducing contrail formation by altering flight times, altitudes, and routes has been proposed as a way to lower aviation's climate impact.

About 65% of jets flying at cruising altitudes of 30,000 feet (9,144m) to 38,000 feet (11,582m) create contrails and about 10% of those are persistent contrail formations¹⁵.

At present, emission trading schemes like the EU Emissions Trading Scheme (“ETS”) do not cover the climate impact of non-CO₂ emissions or that of contrails.

EUROCONTROL has a contrail observatory in Brétigny, near Paris-Orly Airport, which is designed to monitor and help analyse the formation and evolution of contrails¹⁶. It collects data using two state-of-the art cameras will support research into contrail avoidance and aviation’s efforts to reduce the climate impact of non-CO₂ aviation emissions. Contrails have differing effects at different times of the day. The two cameras operate in different spectrums, one for visible light during the day, and the other for infrared both at day and night.

¹³ Source: Narciso, M. & Melo de Sousa, J. (2021). Influence of Sustainable Aviation Fuels on the Formation of Contrails and Their Properties. *Energies*. 14. 5557. 10.3390/en14175557.

¹⁴ Radiative forcing quantifies the change in energy balance of the Earth system due to an imposed perturbation. It is defined as the change in net downward radiation at the boundary between the troposphere and stratosphere after accounting for surface and tropospheric adjustments. It is measured in watts per square meter (W/m²). A positive radiative forcing indicates a warming effect, while a negative radiative forcing indicates a cooling effect.

¹⁵ Source: “Airlines are finally admitting contrails are an environmental problem”, *Phys.org*, <https://phys.org/news/2022-12-airlines-contrails-environmental-problem.html>, accessed 25 October 2023.

¹⁶ Source: EUROCONTROL. “New EUROCONTROL contrail observatory at our Innovation Hub will support contrail avoidance research,” <https://www.eurocontrol.int/news/new-eurocontrol-contrail-observatory-our-innovation-hub-will-support-contrail-avoidance>, accessed 2 December 2023.

The data collected will be annotated and combined with satellite data, correlated with aircraft traffic data, and used to develop a machine-learning-based contrail detection algorithm. All data and the detection algorithm employed will be made publicly available to the wider research community which could significantly improve understanding of the formation and evolution of contrails and their contribution to climate change.

13 Pressure from Climate Activists

Climate activists place another layer of pressure on the aviation industry and promote their own solutions to address the aviation industry's contribution to climate change.

Pre-pandemic, organised protests contributed to anti-aviation attitudes. Movements such as *Fridays for Future* and *Extinction Rebellion* backed large street protests. In 2019, climate protests drew 4 million protesters in over 2,500 events hosted by over 160 countries. Such protests brought awareness about aviation's role in climate change to a wider audience and had the power to influence travel patterns in 2019.

The activism encouraged pledges to not fly from individuals and political pressure to oppose infrastructure projects such as airport extensions. However, these trends have been obscured by the impact of the pandemic on flying. It is not clear if those trends will resume in 2024. It has been noted that the discourse advanced by activists diverges from how the industry presents itself. Samples of the protesting language include¹⁷:

“Only witches fly CO₂ neutral”

“Flying destroys our planet”

“Fly even more then there will be no snow”

“For our grandchildren & children – Stop CO₂—No SUV—No aircraft”

The solutions promoted by climate activists focus on reduced air travel through individual behaviour change, replacing air travel with rail travel, and monetary solutions such as taxing aviation, cheaper rail tickets, and no more cheap flights. Promoted solutions leave out carbon offsetting and technological solutions, hence deviating from the solutions advanced by the aviation industry¹⁸.

Innovation and technological developments are very important elements of the aviation industry's pathway to neutrality. According to the International Air Transport Association (“IATA”), the biggest contributions towards the net-zero target for the aviation sector will be achieved through the development of sustainable aviation fuel (“SAF”) (65%), offsets and carbon capture (19%), new technology design (13%), and infrastructure improvements (3%).

The climate change problem posed by aviation has been noticed particularly in Sweden, where since 2016, many journalists, academics and celebrities have committed publicly to reduce their flying for climate concern reasons. This indicates that the current discourse of aviation as too important to be restricted is being challenged. A new theme (Staying on the ground) is arising, and it is based on moralisation (flying is ethically wrong) and persuasion (emphasising alternatives) to challenge the current practice of air travel, particularly leisure travel, from

¹⁷ Source: Kreil, A. S. (2021). Visual protest discourses on aviation and climate change. *Annals of Tourism Research Empirical Insights*, 2(1), 100015 <https://www.sciencedirect.com/science/article/pii/S2666957921000069>

¹⁸ Ibid.

desirable or necessary to problematic¹⁹.

Europe's leading clean transport campaign group, the NGO Transport & Environment, highlighted that aviation jet fuel enjoys an exemption from a range of fuel taxes compared with say, diesel which is used for ground transportation.

The NGO backed a study which was published in July 2023 and estimated that for the calendar year 2022, an additional EUR34.2 billion could have been collected in tax revenue in Europe if the aviation industry did not enjoy exemptions mainly from fuel taxation and carbon pricing.

As part of the EU's Fit for 55 strategy, there are plans to introduce a minimum taxation rate for aviation jet fuel used for flights within the EU²⁰.

Also, in July 2023, New Economic Foundations, a U.K. think tank, notes the exemption from fuel duty and VAT on aviation jet fuel granted by the U.K. government is only partly offset by the Air Passenger Duty²¹.

The NGO Transport & Environment also leads a global campaign called 'Travel Smart' through a coalition of partners across Europe, North America and Asia. Its aim is to reduce corporate air travel emissions, as the most effective way to significantly reduce aviation's climate impacts in the present decade. Its website tag line reads: *Fly less, achieve more* and it argues that by reducing frequent flying, while making the most of rail journeys and virtual collaboration, companies can innovate purposeful travel and see benefits for both their business and the planet.

¹⁹ Ullström, S., Stripple, J. & Nicholas, K.A. (2023) From aspirational luxury to hypermobility to staying on the ground: changing discourses of holiday air travel in Sweden, *Journal of Sustainable Tourism*, 31:3, 688-705. <https://doi.org/10.1080/09669582.2021.1998079>

²⁰ Source: "European Commission Confirms Plans for Aviation Fuel Tax", *Aviation International News*, <https://www.ainonline.com/aviation-news/air-transport/2021-07-14/european-commission-confirms-plans-aviation-fuel-tax>, accessed 25 October 2023

²¹ Source: "Losing Altitude", *New Economics Foundation*, https://neweconomics.org/uploads/files/NEF_Losing-altitude.pdf, accessed 25 October 2023

14 Litigation Risk

In May 2023, a consumer class action lawsuit was filed in the United States District Court for the Northern District of California by Mayanna Berrin²² (the “Plaintiff”) against Delta Air Lines Inc. (“Delta” or the “Defendant”). This lawsuit is one of a growing trend of greenwashing private action claims in the United States. The claim asserts that Delta falsely state that it is the world’s “*first carbon-neutral airline.*”

The Plaintiff claims three causes of action against Delta:

- (i) violation of the Consumers Legal Remedies Act;
- (ii) false advertising in contravention of the Business and Professions Code; and
- (iii) unlawful, unfair, and fraudulent trade practices in violation of the Business and Professions Code.

The Plaintiff asserts that Delta used carbon credits purchased in the voluntary carbon offset market to offset its emissions, but the benefits from those carbon credits are largely exaggerated, and therefore, Delta’s reported emissions data is false and misleading.

14.1 Carbon Markets: Regulated and Voluntary

In this section, we unpick some of the complaints raised in the Delta case as a way to highlight potential areas of litigation risk for airlines in the context of their decarbonisation efforts.

In the context of carbon offsets, there are two main markets: the regulated carbon market and the voluntary carbon offset market.

14.1.1 Regulated Carbon Markets

There are regulated carbon markets in, for example, the EU, the U.K., New Zealand, California, and Canada (Western Climate Initiative). Regulated carbon markets use cap-and-trade systems which are regulated by national or regional, or international carbon reduction regimes. In a regulated carbon market, a cap on emissions is established and this cap reduces gradually over time. Entities subject to compliance in a regulated carbon market and third parties may trade allowances. An allowance permits the release of 1 tonne of CO₂e. Allowances can be bought by those who do not have sufficient allowances. Fines are applied if an entity subject to compliance fails to surrender an allowance for every tonne of CO₂e emitted.

14.1.2 Voluntary Carbon Markets

Participation in voluntary carbon markets is voluntary. Compared with the regulated carbon markets of, for example, the EU, the U.K., New Zealand, California, and Canada (Western Climate Initiative), the voluntary carbon offset market is:

- (i) Unregulated;²³

²² Mayanna Berrin filed the claim on her own behalf and on behalf of all others similarly situated.

²³ In the United States, a number of Democratic senators have asked the Commodity Futures Trading Commission to improve the regulation of the market for carbon offsets.

- (ii) Suffers from a less than perfect image regarding the quality of the verification of climate mitigation by the offsets. In 2022, the Chair of the International Organisation of Securities Commissions cited concerns about the “*appropriate levels of integrity, transparency, and liquidity*” of voluntary markets.
- (iii) Lacks transparent pricing. Carbon offsetting is cheaper than carbon removal. In the voluntary carbon market, the permanence of the storage of the CO₂ removed is the main driver of the price of a tonne of CO₂ removal.

Due to the wide variety and quality of the voluntary carbon market’s emission reduction, avoidance, and carbon removal schemes, one can only give a very rough estimate of the average price of a tonne of CO₂ removal. The rough estimates given below are at the time of writing, November 2023.

Reforestation and afforestation, planting trees to absorb and store carbon dioxide from the atmosphere through photosynthesis, has an average market price of about USD25 per tonne of CO₂ estimated to be removed. Absent a risk of reversal from, for example, forest fires or deforestation in the future, such projects may be able to remove CO₂ from the atmosphere for up to 40 years.

Land burial projects take carbon already captured in biomass and store by burying it underground to keep it isolated from the atmosphere. The efficacy of land burial projects depends on the suitability of the land and soil conditions to effectively store carbon over long periods. Such projects might have an average market price of about USD95 per tonne of CO₂ estimated to be removed. Again, absent the risk of reversal, such projects may be able to remove CO₂ from the atmosphere for up to a century. If the biomass is heated in a low oxygen environment to produce biochar, a charcoal-like material, before it is buried, biochar can store carbon in soils for hundreds of years. Biochar projects have a wide price range depending on their quality; USD225 per tonne of CO₂ estimated to be removed might be an average market price.

The most expensive CO₂ removal projects are direct air capture and geological storage and currently cost more than USD800 per tonne of CO₂ estimated to be removed. For such projects, the risk of reversal is relatively low and the permanence is of the order of a millennium.

A properly managed carbon removal project which closely monitors the offsetting supplier using a range of sources to verify the estimated number of tonnes of CO₂ removed would compare the information and methodologies for estimating the CO₂ removal provided by the developers of the carbon removal project with those received from carbon rating agencies and third-party verification reports and actively query any major discrepancies.

In the case of *Berrin v. Delta Air Lines Inc.*, the complaint picks up on the differences noted above between the regulated and voluntary carbon markets and alleges that the voluntary carbon offset market “*cannot make a company ‘carbon neutral’*” because “*the primary offset*

vendors offer offsets replete with” false data, including:

- A. inaccurate accounting;
- B. non-additional effects on worldwide carbon levels due to the vendors crediting offsets for projects that would have occurred with or without offset market investment;
- C. non-immediate speculative emissions reductions that will, at best, occur over decades, despite crediting purchasers with the sum of those projected offsets; and
- D. impermanent projects subject to disease, natural disasters, and human intervention²⁴.

For the case to proceed, the Plaintiff must first obtain class certification from the court. If the Plaintiff obtains class certification, doing so will probably encourage additional consumer litigation against airlines, alleging greenwashing. Regardless of whether or not the Plaintiff ultimately succeeds at trial on the merits of the case, the filing of the complaint may have significant indirect impacts on climate change decision-making in the aviation industry.

“Carbon neutrality” usually refers to a specific part of an entity’s business operations, refers only to Scope 1 and 2 emissions, and requires validation or certification to defend against allegations of greenwashing. Currently, the leading standard for carbon neutrality is PAS 2060 which was developed by the British Standards Institution. Carbon neutrality claims are coming under increasing scrutiny from regulatory authorities, climate change activists, and the public in general. As a result, many companies have avoided making claims of carbon neutrality.

The case of *Berrin vs Delta Air Lines* likely marks only the beginning of what is to come in aviation litigation. We are witnessing a rise in litigation against allegations of corporate greenwashing. The Sabin Center identified 2,341 climate change actions across more than 40 jurisdictions. These actions, some of which are aviation related, were initiated by individuals or corporations who have alleged that they have endured damage arising from climate change. The pattern identified indicates there is no longer one recognisable class of litigants, although typically they are individuals or NGOs, but the litigants employ recognisable strategies across different jurisdictions²⁵.

Most recorded cases seek outcomes that can be interpreted as favourable to climate action, pro-climate; 301 of the 549 cases in which a decision has so far been made are favourable to climate action. Some of these cases had direct outcomes and led to policy changes. Even the unsuccessful climate cases may have significant indirect impacts on climate change decision-making. Interestingly, a new generation of litigants is increasingly active; they seem less motivated by financial compensation than their predecessors and are not interested in settling. Their cases aim to change corporate behaviour or bring about changes in public awareness.

²⁴ Source: Cadwalader, Wickersham & Taft, <https://www.cadwalader.com/uploads/media/031140120068.pdf>, accessed 25 October 2023.

²⁵ Source: Setzer J and Higham C (2023) *Global Trends in Climate Change Litigation: 2023 Snapshot*. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science.

Aside from the Delta case, there are a number of other examples of lawsuits against airlines over greenwashing claims.

14.1.3 Lufthansa and the U.K. Advertising Standards Authority

In March 2023, the U.K. Advertising Standards Authority (“ASA”) banned an advertisement campaign by Lufthansa which claimed that its green initiatives were protecting the world. The ASA ruled that the advertisement was misleading consumers over the environmental impact of flying²⁶.

The director of complaints and investigations at the ASA, Miles Lockwood, was quoted in the Guardian newspaper as saying:

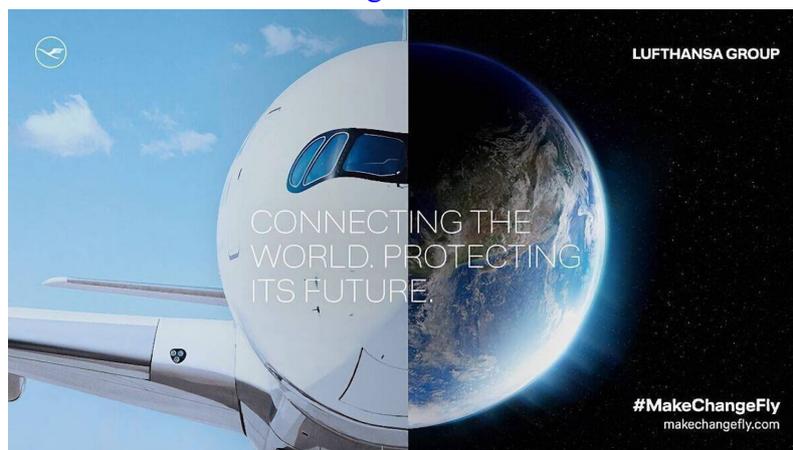
“Climate change and the environment is the key and enduring issue of our age”

AND

“Advertisers in high carbon emitting sectors shouldn’t make claims that give consumers a misleading impression about their green credentials and plans or which they can’t substantiate with robust evidence.”

Figure 3 shows an image of the advertising campaign.

Figure 3²⁷



14.1.4 ClientEarth-KLM Case

In June 2023, a Dutch court granted permission for a greenwashing lawsuit against KLM to proceed.

The permission was granted to Dutch campaigners Fossilvrij and Reclame Fossilvrij²⁸ to bring the claim against KLM alleging that its climate advertisements and marketing breach EU consumer law standards by creating a false impression that its flights do not contribute to the worsening climate emergency.

²⁶ Source: “Lufthansa’s ‘green’ adverts banned in UK for misleading consumers”, The Guardian, <https://www.theguardian.com/business/2023/mar/01/airline-green-adverts-banned-uk-lufthansa-asa>, accessed 25 October 2023.

²⁷ Source: “Connecting the world. Protecting the future.”, Lufthansa Group, <https://business.lufthansagroup.com/be/en/sustainability>, accessed 25 October 2023.

²⁸ Fossilvrij’s and Reclame Fossil lawsuit is supported by Reclame Fossilvrij and ClientEarth.

The decision established for the first time that an environmental non-profit can bring a greenwashing claim under a recently passed Dutch class action law.

The decision comes after KLM informed the judge that it had dropped its ‘Fly Responsibly’ advertisements, which were challenged by the lawsuit.

While the threat of this lawsuit caused KLM to drop its ‘Fly Responsibly’ campaign, KLM has not made any commitments regarding its future advertising, nor has it addressed the carbon offset marketing that is also targeted by the lawsuit²⁹.

In a ClientEarth press release dated 7 June 2023, ClientEarth’s legal team is quoted as saying:

“The ongoing struggle to stamp out aviation greenwashing underscores the urgent need to ban fossil fuel advertising and protect the public from misleading practices that subvert climate action.”

14.1.5 Austrian Airlines Case

In September 2023, Austrian Airlines, a subsidiary of Lufthansa group, was convicted³⁰ of misleading advertising for its “a false impression” by marketing to customers the possibility of travelling to the Venice Biennale without polluting the planet.

14.1.6 Airline Sponsorship

There are a number of signs that events sponsored by airlines may face boycotts because of a perception that the aviation industry is a polluting one. London’s 2023 Pride Festival had United Airlines as its ‘Headline Sponsor’. A member of the London Assembly was quoted as saying³¹:

“London should be leading the way with the radical change required, ending all fossil fuel subsidies, and prioritising the rights of the marginalised, not putting carbon polluters at the forefront of our Pride.”

The Mayor of London, Sadiq Khan, was forced to defend the sponsorship by United Airlines.

In October 2022, Greenpeace and Extinction Rebellion sent an open letter to the Van Gogh Museum in Amsterdam regarding KLM Royal Dutch Airlines sponsorship of the museum. The letter argued that KLM’s operations contribute significantly to carbon emissions and climate change and its sponsorship of the museum is at odds with the spirit of Van Gogh's work, which often captured the beauty of nature. The environmental groups asked for the Van Gogh Museum to reconsider KLM's sponsorship unless the airline takes more ambitious climate action.

²⁹ Source: “Landmark greenwashing lawsuit against KLM airline granted court permission”, ClientEarth, <https://www.clientearth.org/latest/press-office/press/landmark-greenwashing-lawsuit-against-klm-airline-granted-court-permission/>, accessed 25 October 2023.

³⁰ Source: “A carbon-neutral flight? Austrian Airlines guilty of greenwashing”. The Brussels Times, <https://www.brusselstimes.com/708924/a-carbon-neutral-flight-austrian-airlines-guilty-of-greenwashing>, accessed 25 October 2023.

³¹ Source: “Could airline sponsorships be targeted by environmental groups?”, Simplifying, <https://green.simpliflying.com/p/could-airline-sponsorships-be-targeted>, accessed 25 October 2023.

14.1.7 Allegations of State Sponsored Greenwashing

Another interesting development is complaints alleging state sponsored greenwashing. Such cases dispute government efforts to deal with the increased claims of sustainability made by companies. For example, a group of European NGOs challenged the inclusion of natural gas as a low-carbon transition fuel under the EU's new Green Taxonomy, which is meant to help investors make sustainable investments. Past cases of complaints against government institutions include a case against Ontario for a misleading advertising campaign against a federal carbon pricing scheme, and a case filed against France regarding Total's sponsorship of the Louvre Museum³².

However, not all cases are aligned with climate goals and a new phenomenon is emerging in the U.S., referred to as 'ESG backlash' litigation. Climate supportive groups have been targeted by Republican politicians in the U.S. for being perceived to be unfair to the oil and gas industry. Recently, in the U.S., 23 Republican state attorneys general expressed concerns about the Net-Zero Insurance Alliance ("NZIA") and whether the NZIA's requirements comply with federal and state laws. Consequently, several global insurers quit the NZIA, which is one part of the Glasgow Financial Alliance for Net Zero created before the UN climate summit, COP26, in 2021.

While the litigation landscape continues to develop, we note that for the moment, the most likely type of litigation that can impact the aviation sector is related to allegations of greenwashing and false advertising.

Not unlike the request of the BEUC to Consumer Protection Cooperation, which asked that airlines refund customers who paid 'green' fees based on allegedly misleading claims, the Plaintiff in the Delta case alleges that because Delta's carbon-neutrality claims are false and misleading:

"consumers would not have purchased tickets on Defendant's flights, or paid substantially less for them, had they known the claim of carbon neutrality was false."

The Plaintiff claims that she paid a premium for Delta flights under the impression that she was:

"engaged in more ecologically conscious air travel" and participating "in a global transition away from carbon emissions."

14.2 Potential Regulatory Litigation

In early 2023, the chair of the Commodity Futures Trading Commission ("CFTC") said in a speech that the CFTC regards environmental products as commodities that:

³² Source: "Could airline sponsorships be targeted by environmental groups?", Zero Fossile France, <https://france.zerofossile.org/liberons-le-louvre-13march/>, accessed 25 October 2023

“can play a role in voluntary [carbon] markets, and that carbon markets must be transparent and have integrity and adhere to basic market regulatory requirements.”

In June 2023, the CFTC Whistleblower Office³³, solicited tip-offs regarding potential manipulation and fraud in carbon allowances and carbon credit markets.

Then, in July 2023, the CFTC announced the setting up of a new Environmental Fraud Task Force within the Division of Enforcement to:

"combat environmental fraud and misconduct in derivatives and relevant spot markets."

The task force will focus mainly on:

- (i) fraud arising from the environmental benefits represented by carbon offsets, for example, double counting of carbon offsets and illusory offsets listed on carbon registries; and
- (ii) material misrepresentations regarding environmental, social, and governance products or strategies, for example, misrepresentations regarding the quality, quantity, environmental benefits, and permanence of the carbon offset.

³³ The Whistleblower Office is a part of the CFTC's Division of Enforcement.

15 Reputational Risk: Climate-Related Shareholder Activism

During the 2023 round of company annual general meetings, climate-related shareholder activism gained significant headlines. Companies like Barclays, BP, and Shell have come in for significant criticism from some of their shareholders.

Regardless of whether shareholder campaigns succeed or not, they are capable of causing significant reputational damage to a company, as evidenced by the high-profile lawsuit brought by ClientEarth³⁴ against the Shell plc board which was filed in the High Court of England and Wales in February 2023.

The lawsuit was what is termed a “*shareholder derivative action*”, a legal action that is taken by shareholders of a company who act as representative plaintiffs. The shareholder plaintiffs actually file suit on behalf of the company, part of which they own. Typically, a shareholder derivative action claim is filed against members of the board of directors or others within a position of power in the company and who may be engaging in misconduct.

Under English law, ClientEarth needed to obtain the permission of the court before bringing a derivative action on behalf of the company.

The lawsuit against the board of directors of Shell plc alleged that Shell’s directors breached their legal duties under the U.K. Companies Act 2006 by failing to adopt and implement an energy transition strategy that aligns with the Paris Agreement. ClientEarth’s claim received support among a group of institutional investors that collectively held more than 12 million shares in the company and something of the order of half a trillion US dollars in total assets under management.

In May 2023, the judge in the case refused permission for the claim to proceed, highlighting that ClientEarth held only 27 shares in Shell and was supported by holders of only 0.17% of Shell’s shares. The judge ruled that ClientEarth’s real interest was not how to promote the success of Shell for the benefit of its members as a whole but that its ulterior purpose for bringing the claim was to advance its own policy agenda. The judge ruled that ClientEarth had not brought the claim in good faith.

In a perhaps an unusual departure from the normal rule in shareholder derivative actions, the High Court ordered that ClientEarth pay the costs incurred by Shell in relation to the case. This decision may discourage other activist shareholders from bringing a shareholder derivative action claim.

However, even when a case is not successful, it may lead to changes in corporate behaviour. In a previous case, in 2021, ClientEarth took legal action against the Belgian National Bank over its implementation of an European Central Bank corporate bond purchase scheme. The

³⁴ ClientEarth is a non-profit organisation that uses the law to create systemic change that protects the Earth for and with its inhabitants.

scheme, designed to help the ECB's financial stability mandate, was allegedly supporting the activities of some of Europe's most polluting companies, which, as ClientEarth argued, were inconsistent with the Paris Agreement. The case was dismissed on procedural grounds. ClientEarth appealed, but it soon withdrew the case after the bank updated its policy to ensure new bond issuance favoured climate-friendly activities, aiming to align with the Paris Agreement. This demonstrates that even an unsuccessful case may influence climate governance. In the future, a case like that of ClientEarth against Shell may have a different outcome, especially if carried out in a different jurisdiction.

Airlines may, in the future, be a target of shareholder derivative actions where their transition strategy is deemed to be flawed and there is an underinvestment in transition. Only by implementing strong ESG policies and actively engaging with shareholders, can companies mitigate the risk of shareholder activism.

16 Corporate Sustainability Reporting Directive Driving Disclosures

The EU Corporate Sustainability Reporting Directive (“CSRD”) came into force on 5 January 2023. The CSRD will require, on a phased basis, enhanced non-financial reporting on environmental, social, and governance (“ESG”) sustainability matters, by in-scope entities.

The ESG sustainability information must be disclosed in a dedicated section within the management report in the annual financial statements and the sustainability information must be digitally tagged in line with a digital taxonomy for speed of user access.

The reporting will be accompanied by an assurance opinion, initially “limited” but ultimately likely to move to “reasonable”. The European Sustainability Reporting Standards (“ESRS”) set out a harmonised and pan EU framework for the reporting that aims to ensure data availability, quality, and consistency. Companies currently subject to the EU Non-Financial Reporting Directive³⁵ (“NFRD”), all ‘large’ EU companies, and all companies listed on EU regulated markets other than micro companies are in scope of CSRD. The first group of companies to which the CSRD will apply are those companies currently within scope of the NFRD.

The definition of a ‘large’ company is:

Exceeds at least two of the following:

- (i) balance sheet total of €25 million
- (ii) net turnover of €50 million
- (iii) more than 250 employees on average during the financial year

In terms of OEMs, Airbus is clearly within the scope of CSRD and according to Paul Sheridan, Leader, Aviation Finance Advisory Services, PwC Ireland³⁶, any lessor with around twelve or more young aircraft in a consolidated entity in Ireland will fall into the ‘large’ company category.

Also, in scope of the CSRD are non-EU companies that:

Have at least one subsidiary or branch in the EU³⁷

and

Net turnover in excess of €150 million in the EU for two consecutive

³⁵ Broadly speaking, large public interest entities (banks, insurance companies, etc.) with more than 500 employees and either net turnover in excess of EUR50 million or a balance sheet in excess of EUR25 million. The non-financial statement should allow a reader to understand the development, performance, position, and impact of the company’s activity, as it relates to environmental, social and employee matters, respect for human rights, anti-corruption, and bribery matters.

³⁶ Source: Ishka: The ‘ABC’ of ESG reporting: What’s to come and how should lessors plan for it? <https://www.ishkaglobal.com/News/Article/7036/The-ABC-of-ESG-reporting-Whats-to-come-and-how-should-lessors-plan-for-it> Accessed 27 November 2023.

³⁷ An EU subsidiary must be a large undertaking or public interest entity to come within the scope of the CSRD. A branch in the EU must have generated €40 million net turnover in the preceding financial year to come within the scope of the CSRD.

years.

Thus, many international aviation leasing companies based in Ireland will be within the scope of CSRD.

16.1 Double Materiality Reporting Basis

Traditionally, materiality in financial reporting focused primarily on what is material to the entity: the financial significance of information for decision-making by investors and other stakeholders. The CSRD directive has evolved the concept of materiality to include not only financial impacts but also ESG impacts.

One of the key features of reporting under the CSRD is that in-scope companies will have to report on a double materiality basis. Firms will be required to report on how: (i) sustainability matters affect the firm's balance sheet; and (ii) the activities of the firm impacts the environment, social factors, human rights, etc.

Thus, double materiality means reporting on: (i) the impacts of the reporting entity's operations on the environment and people; and (ii) how social and environmental issues create financial risks and opportunities for the company.

16.2 Reporting Timescale

The reporting requirements of the CSRD are being phased in over time for different entities. Table 4 illustrates the phasing in of reporting under CSRD.

Table 4

Entity Type	Financial Year Starting on or After
Large EU public interest entities currently subject to the NFRD. This category includes large EU companies with EU regulated market listed securities, EU insurance companies, and EU credit institutions having more than 500 employees. Non-EU companies listed on a regulated market in the EU within the definition of large undertakings with more than 500 employees.	1 January 2024
Large EU organisations not presently subject to the NFRD and large non-EU companies listed on a regulated market in the EU.	1 January 2025
Listed EU and certain small and medium sized enterprises ("SMEs") including non-EU SMEs listed on a regulated market in the EU, captive insurance undertakings, and small and non-complex credit institutions.	1 January 2026
Non-EU companies falling within the rules solely on account of the turnover test.	1 January 2028

The first sustainability statements will appear in 2025 and will cover financial years beginning on or after 1 January 2024. The first group of entities to report under CSRD are those entities currently subject to the NFRD. It is estimated that there are about 12,000 such entities in the EU. Thus, planning and data collection for CSRD will have to start in 2024 for such entities.

The sustainability reporting requirements will include reports on plans to ensure that its business model and strategy are compatible with three main EU objectives:

1. The transition to a sustainable economy
2. Limiting global warming to 1.5 degrees C in line with the Paris Agreement
3. The objective of achieving climate neutrality by 2050, and where relevant the exposure of the undertaking to coal, oil and gas related activities.

In-scope companies will have to provide information relating to short, medium, and long-term time horizons covering a range of issues including:

- (i) The resilience of the company's business model and strategy to sustainability risks
- (ii) Sustainability strategy and transition plans
- (iii) The manner in which the company's business model and strategy consider its impacts on sustainability matters
- (iv) Description of the undertaking's policies in relation to sustainability matters
- (v) Sustainability targets and policies
- (vi) Description of the role of the management with regard to sustainability matters, and of their expertise and skills in relation to fulfilling that role or the access such bodies have to such expertise and skills
- (vii) Principal adverse impacts be they potential or actual in relation to the firm's operation and value chain
- (viii) Any incentive schemes linked to sustainability matters
- (ix) Indicators relevant to the company's sustainability-related disclosures
- (x) Description of the due diligence processes with regard to:
 - a. sustainability matters and
 - b. actions taken to remediate or mitigate potential adverse impacts in its supply chains.

The CSRD's requirement to describe the due diligence processes in relation to sustainability matters and actions taken to remediate or mitigate potential adverse impacts in its supply chains is likely to be of interest to airline passengers conscious of their carbon footprint, NGOs, and airline creditors, and shareholders. To ensure the disclosures are reasonably accurate, the reports will have to be accompanied by an assurance opinion. Initially, only limited assurance will be required, but this is likely to transition to "reasonable assurance" over time. The standardisation of information will allow consumers and non-governmental organisations to compare sustainability statements issued by reporting entities in the aviation industry and to assess the quality of the data and the metrics used to compile the sustainability statements.

16.3 European Sustainability Reporting Standards

At the end of July 2023, the EU Commission adopted the European Sustainability Reporting

Standards (“ESRS”) for use by all companies subject to the CSRD when preparing and presenting their sustainability statements so as to comply with the reporting obligations under the CSRD.

The ESRS cover the full range of environmental, social, and governance issues. Under the environmental heading, disclosures include climate change, pollution, circular economy, biodiversity, water and marine resources. Under the social heading, disclosures cover the workforce and impact on customers and communities. Governance disclosures focus on business conduct. This information will assist investors in understanding the sustainability impact of the companies in which they invest. The period for possible objection by the co-legislators to the ESRS Delegated Act ended on 21 October 2023³⁸ which heralds the way for the integration of the ESRS into the European legal framework. The ESRS Delegated Act will come into force for companies in scope of CSRD on 1 January 2024.

In order to ensure a very high degree of interoperability between EU and global standards and to prevent unnecessary double reporting by companies, the ESRS take account of discussions with the International Sustainability Standards Board and the Global Reporting Initiative.

An in-scope company must carry out a materiality assessment both from a financial perspective and an impacts perspective in relation to its business model and activities and make disclosures in relation to the following matters if found to be material in the assessment:

- (i) Climate and if material disclosure of Scope 1, Scope 2, Scope 3 and total GHG emissions
- (ii) Pollution
- (iii) Water and marine resources
- (iv) Biodiversity and ecosystems
- (v) Resource use and the circular economy
- (vi) The workforce of the in-scope firm
- (vii) Workers in the in-scope firm’s value chain
- (viii) Affected communities
- (ix) Consumers and end users
- (x) Business conduct

In view of the importance of climate change, if a firm concludes that climate change is not a material matter and therefore does not report on it in accordance with the ESRS, it must provide a detailed explanation of the conclusions of its materiality assessment.

16.4 Sustainability Statement

A sustainability statement will contain four sections: (1) General Information; (2) Environmental Matters; (3) Social Matters; and (4) Governance Matters.

³⁸ Source: <https://www.efrag.org/News/Public-453/EFRAG-welcomes-the-final-adoption-of-the-ESRS-by-the-European-Institut?AspxAutoDetectCookieSupport=1>, accessed 3 November 2023.

Each section will make disclosures on relevant sustainability matters within a framework covering: (a) governance; (b) strategy; (c) impact and risks & opportunity management; and (d) metrics and targets.

Within section (2), environmental matters, entities in scope will also report on alignment with the EU Taxonomy Regulation³⁹ which provides a list of environmentally sustainable activities by reference to technical screening criteria for each environmental objective. The technical screening criteria are defined in EU delegated and implementing acts.

16.5 Transposing the CSRD into Member States' National Laws

As the CSRD is an EU directive, member states must introduce laws that transpose the directive into national law. Member states have until 16 June 2024 to transpose the CSRD into their national laws. France was the first EU member state to submit a draft of the national law that will impose CSRD reporting.

16.6 Corporate Sustainability Due Diligence Directive

While there was no final text of the directive as of October 2023, the directive is currently in the EU trialogue process with the EU Commission, Council, and Parliament having reached their positions. While the CSRD is about identifying and reporting on sustainability impacts, the Corporate Sustainability Due Diligence Directive (“CS3D”) aims to move firms from identifying and reporting on sustainability impacts to actually identifying sustainability impacts and then reducing, mitigating, preventing, or bringing them to an end.

In its current draft, the CS3D aims to engender greater corporate responsibility, improve sustainability due diligence and corporate governance standards, and give stakeholders rights to access remedies so that victims of damages arising from the failure of a company to comply with the CS3D can obtain compensation through civil proceeding. It proposes to achieve those aims by imposing due diligence obligations on companies to identify adverse environmental and human right impacts in their operations, in those of their subsidiaries, and value chain and to reduce, minimise, and stop those impacts.

In terms of enforcement, the CS3D proposes that within each EU Member State a designated authority, supported by an EU network of such authorities, will supervise and impose fines and orders to require compliance for breaches of the CS3D. While such fines should be proportionate they are likely to send a message to nudge compliance among other would-be violators of the CS3D.

In its current draft, CS3D widens the scope of the duties of directors of the EU companies subject to the CS3D by requiring directors to take into account the climate change, human rights, and environmental implications of their decisions.

³⁹ Source: EU Directive: 2020/852/EU <https://www.eurosif.org/policies/eutaxonomy/>

Aircraft industry companies will have to bear the costs of both: (i) setting up and running the due diligence programmes; and (ii) re-engineering day-to-day operations and supply chains to comply with CS3D.

16.7 Securities and Exchange Commission Proposed Climate Rule

In July 2023, the U.S. Securities and Exchange Commission (“SEC”) proposed⁴⁰ rule amendments that would require a domestic or foreign entity registered with the SEC to include certain climate-related information in their registration statements and periodic reports, including:

- Climate-related risks and their actual or likely material impacts on the registrant’s business, strategy, and outlook;
- The registrant’s governance of climate-related risks and relevant risk management processes;
- The registrant’s greenhouse gas (“GHG”) emissions, which, for accelerated and large accelerated filers and with respect to certain emissions, would be subject to assurance;
- Certain climate-related financial statement metrics and related disclosures in a note to its audited financial statements; and
- Information about climate-related targets and goals, and transition plan, if any.

By requiring SEC registered companies to make official filings in relation to climate related matters, the care with which the information is prepared and the accuracy of the information filed is likely to rise in view of: (i) the potential legal liability of such companies for filing inaccurate or misleading information; and (ii) the threat of SEC enforcement.

The SEC is of the view that climate related risks may affect the economic outlook for a company and therefore such risks ought to be disclosed so that investors may make more informed decisions regarding the purchase and sale of the company’s securities.

⁴⁰ Source: “Enhancement and Standardization of Climate-Related Disclosures”, SEC, <https://www.sec.gov/files/33-11042-fact-sheet.pdf>

17 Sustainable Finance Disclosure Regulation

The Sustainable Finance Disclosure Regulation (“SFDR”) for short requires asset managers, pension funds, advisors, and financial products to disclose their approaches, policies and risks related to integrating sustainability into their investment process.

The Sustainable Finance Disclosure Regulation (“SFDR”) has an ambitious range of objectives. Chief among its objectives is to increase the transparency of sustainability disclosures to investors. The SFDR also aims to drive capital towards sustainable investments and to integrate: (a) remuneration policies with sustainability risks; and (b) ESG considerations into investment processes.

The SFDR requires financial market participants to disclose information about the sustainability of their investments. This means that investment managers of public and private debt and public and private equity funds are now asking their investee companies about, among other aspects of ESG, their carbon emissions, and reporting the findings to investors at the level of their funds on an aggregate basis.

The SFDR came into effect on 10 March 2021. It is an EU regulation rather than a Directive, so it became immediately effective throughout the EU on that date. Specifically, SFDR may lead to an increased focus on sustainable financing options that align with ESG criteria. For the aviation sector, this is likely to mean a requirement to shift towards more sustainable practices, such as investing in cleaner technologies, improving energy efficiency, and reducing greenhouse gas emissions.

Aviation companies may also need to disclose more information about their sustainability performance to meet the SFDR requirements of financial market participants, which will increase transparency and accountability in the industry.

SFDR effectively created three types of funds: Article 6 funds which have no focus on ESG matters⁴¹, Article 8 funds which have environmental or social investing objectives, and Article 9 funds which have sustainable investment objectives. So, while designed as a disclosure regime, SFDR seems to be used also as a labelling system. Flows into Article 8 & 9 funds have significantly outpaced non-ESG A6 funds. This acceleration of flows into SFDR A8 and A9 funds will lead to significant impacts on capital flows away from sectors currently perceived non-ESG friendly towards more ESG friendly sectors. In a nutshell, the cost of debt and equity for aviation industry companies is likely to rise.

For funds allocating capital to the aviation sector, the trend towards ESG initiatives is likely to lead them to shift investment and financing more towards aviation lessors and airlines employing new aircraft with lower emissions than older aircraft and on a trajectory to use an increasing proportion of SAF in their fuel mix.

⁴¹ Assuming they do not opt to consider the principal adverse impacts of their investments.

18 EU Banks as a Source of Debt Finance

Banks are facing increased scrutiny of their actions in relation to the mitigation of climate change from three groups:

- (i) regulators introducing stress tests to assess and, if thought appropriate, increasing capital requirements to allow for the impact of an abrupt transition to a low carbon economy on banks' regulatory capital;
- (ii) institutional investors in bank shares and bank debt assessing the composition of their investment portfolios in meeting SFDR reporting requirements; and
- (iii) climate activists who are increasingly assessing the entire business of a bank.

These three sources of scrutiny are nudging banks to simultaneously consider the carbon footprint of their borrowers and the margin over the reference floating rate they will charge borrowers facing significant physical climate risk and climate transition risk.

In relation to (iii) above, let's look at RBC in Canada, which is by no means an outlier in this regard. There is a vocal movement of people in Canada speaking out against RBC's funding of fossil fuel projects. There have been protests outside RBC branches in Canada to urge RBC to phase out fossil fuel financing and the company moved its AGM to a relatively less populated area of Canada. Some suggest it did so to reduce the size of the protests at its AGM as seen on television and social media. The CSRD will provide data of significantly better quality and consistency on sustainability matters relating to the borrowers from EU banks. This will allow EU banks to make more detailed reporting on ESG risks faced by the businesses to which they lend in the banks' Pillar III disclosures. Such disclosures are likely to be keenly watched by NGOs focused on the mitigation of climate change.

EU banks are also required to disclose their 'green' asset ratio, the proportion of lending to borrowers the activities of which are aligned with the EU Taxonomy Regulation.

EU banks are increasingly introducing climate due diligence and score cards as part of their loan underwriting processes. Borrowers are being asked to submit emission data and a transition plan, which will be assessed as part of the underwriting process. Banking supervisors are pushing banks to move from mere estimates or proxy emissions data to actual emissions data that more accurately reflects the nature of a borrower's business. This will become an additional burden on borrowers seeking bank loans.

In relation to (i) above, in January 2022, the European Central Bank launched a supervisory climate risk stress test under the Capital Requirements Directive. The stress test aimed to assess how prepared banks were for dealing with financial and economic shocks stemming from climate risk. The aggregate results were published in July 2022.

The test focused on exposures and income sources that are most vulnerable to climate-related risk and aimed to identify the vulnerabilities and challenges banks face when managing

climate-related risk. Its results will be taken into account from a qualitative perspective in the Supervisory Review and Evaluation Process, which may give rise to additional Pillar 2 capital requirements for banks.

So, there is increased focus by the European Central Bank on physical risk, transition risk, and reputation risk, and this is likely to result in increased capital requirements for EU banks lending to entities like airlines which face significant transition risks. Higher capital requirements mean more expensive loans.

In September 2023, the ECB published the results of its second economy-wide climate stress test which assessed the resilience of banks, firms, and households in three different climate transition scenarios. The three scenarios contemplated were as follows:

1. Accelerated Transition: Green policies and investment are accelerated, leading to a reduction in emissions by 2030 in line with the goals of the Paris Agreement.
2. Late-push Transition: The current path of transition to a low carbon economy does not begin to accelerate until 2026, but is sufficient to achieve Paris-aligned emission reductions by 2030.
3. Delayed Transition: The transition to the low carbon economy does not start until 2026 and is not sufficiently ambitious to reach the Paris Agreement goals by 2030.

If the transition has to be rushed at a late stage, banks will be exposed to the highest credit risk and can expect their credit risk to more than double by 2030. This has significant implications for the cost of capital for banks which is likely to lead to increased borrowing costs for borrowers including aviation borrowers.

18.1 Sustainability Linked Loans

Some banks have responded to the regulatory focus and increased capital requirements by offering sustainability linked loans (“SLLs”) where the lending is to fund sustainable economic activity. SLLs are normally structured as a revolving credit facility. SLLs carry a slightly lower rate of interest than revolving credit facilities for non-sustainable general corporate purposes, provided the borrower meets predetermined sustainability objectives. The lower rate of interest on the loan is designed to reflect the lower transition, litigation, and reputation risk of sustainable economic activities.

The predetermined sustainability objectives of SLLs should be consistent with the borrower’s stated ESG policy. For airlines, they can then be translated into something of the order of three to five sustainability performance targets, such as:

- Reducing greenhouse gas emissions, especially Scope 3 emissions; and
- Reducing energy use or switching to renewable energy.

Agreeing on the sustainability performance targets and how they will be measured are perhaps

the most time-consuming aspects of negotiating SLLs. Measurement may take the form of a percentage improvement in the historic level of a variable or a change in the absolute value of the variable. For example, moving to more fuel efficient aircraft as part of the ongoing fleet renewal or increasing use of SAF.

The borrower will enjoy the benefit of a lower interest rate for up to a year until the performance relative to the sustainability performance targets is assessed. If the borrower:

- (i) meets the sustainability performance targets, the interest rate will fall;
- (ii) fails to meet the sustainability performance targets, the interest rate on the loan will rise.

In practice, the lower rate of interest may depend on the number of sustainability performance targets reached. The reduction in the interest rate might range from something of the order of 2.5 basis points to 5.0 basis points per sustainability target reached for a SLL with multiple performance targets where as it might range from 10.0 to 20.0 basis points per sustainability target reached where there are only one or perhaps two sustainability performance targets.

As an example of SLL, in June 2023 easyJet announced the signing of \$1.75 billion financing underwritten by a syndicate of banks and supported by a partial guarantee from U.K. Export Finance under their Export Development Guarantee scheme. The sustainability performance targets embedded in the financing cost are linked to a reduction in carbon emission intensity in line with easyJet's Science Based Targets initiative ("SBTi") validated target. In 2022, Air France-KLM and Société Générale agreed to a sustainability-linked term loan secured on an Airbus A350. In 2021, a British Airways sponsored Enhanced Equipment Trust Certificate ("EETC") linked to ESG performance indicators raised USD800 million.

Great care should be taken to ensure that meeting the sustainability performance targets gives rise to a material improvement in sustainable economic activity for the airline as a borrower. This should provide a robust defence against allegations of 'greenwashing'. Equally, banks and private debt lenders do not wish to be associated with airlines likely to be accused of 'greenwashing' arising from unambitious sustainability performance targets, which if achieved, would be no more than an insignificant improvement on previously disclosed sustainability goals.

However, in the case of some borrowers, the lower rate of interest is not regarded as sufficient to cover the cost of negotiating, documenting, and reporting on compliance with a loan's predetermined sustainability objectives.

18.2 Banks Setting 2030 Aviation Emissions Intensity Targets

A research report by Ishka⁴² published in July 2023 announced that 14 banks have set 2030

⁴² Source: Mariz, E. (2023). Briefing: 14 banks have now set 2030 aviation emissions intensity targets – Ishka research <https://www.ishkaglobal.com/News/Article/6990/Briefing-14-banks-have-now-set-2030-aviation-emissions-intensity-targets-Ishka>

aviation emissions intensity reduction targets for aviation lending and that a further 12 are expected to announce aviation emissions intensity reduction targets in the near future. However, there appears to be no consistent definition of emissions intensity across this group of banks.

19 ReFuelEU

ReFuelEU is an EU level regulation to promote the use of SAF on all flights leaving EU airports. The regulation will require mandatory blending requirements of SAF for fuel supplied at EU airports. The initial proposal was expected to start in 2025 with the minimum required volume of SAF of 2%, increasing in five-year intervals to reach a minimum volume of 63% by 2050.

In October 2023, EU lawmakers signed the ReFuelEU Aviation Regulation into law. With the exception of Articles 4, 5, 6, 8, and 10, which will apply from 1 January 2025, the other Articles of the regulation will apply from 1 January 2024. The regulation aims to further the EU's strategy to reduce greenhouse gas emissions by at least 55% by 2030. The initiative requires at least 2% of aviation fuels to be sustainable in 2025, increasing to 6% in 2030, 20% in 2035 and 70% in 2050 and includes sub-targets for e-fuels of at least 1.2% by 2030 and 35% by 2050.

The use of SAF is being incentivised through the EU ETS by increasing carbon taxes on airline CO₂ production. In effect, the EU ETS increases the costs of CO₂ pollution by requiring airlines to pay for almost all CO₂ emissions in the EU by 2026.

The EU's "taxonomy for sustainable finance" is a classification framework designed to guide capital into environmentally sustainable activities. Taxonomy-alignment means the investment contributes substantially to one of the defined environmental objectives in the EU Taxonomy Regulation. While there are currently six environmental objectives that economic activities must substantially contribute to in order to qualify as environmentally sustainable only two have technical screening criteria for determining taxonomy-alignment of activities. These are: (i) climate change mitigation, reducing or avoiding greenhouse gas emissions; and (ii) climate change adaptation, reducing vulnerability and building resilience to current and expected climate change impacts. Investment in aviation would not meet either the climate change mitigation or the climate change adaption criterion.

Zero-carbon solutions are not currently in sight for the aviation industry. In an effort to provide incentives to replace less fuel efficient aircraft with more fuel efficient aircraft without generally expanding the fleet, the European Commission has proposed that various aspects of aviation including, manufacture, leasing, operation, and purchase of aircraft that meet certain criteria be regarded as environmentally sustainable for the purposes of the taxonomy regulation.

If approved by the European Parliament and the Council, it would, for example, mean that new aviation jet fuel-powered aircraft with lower CO₂ emissions than the International Civil Aviation Organization ("ICAO")⁴³ limits and capable of operating from 2028 on sustainable aviation fuels, could be classified as a sustainable investment for the purposes of articles 8 and

⁴³ The ICAO is a United Nations agency which was established to help countries share their skies for their mutual benefit.

9 of the SFDR and the ‘green’ asset ratio computed by EU banks. This development is likely to lead to lower financing costs for aviation industry companies that are taxonomy aligned and perhaps higher financing costs for those not aligned with the EU taxonomy.

The proposal has been criticised by environmental groups as it is seen as allowing aircraft powered by fossil fuels to be labelled as sustainable.

Under the EU’s Fit for 55 strategy, while there is a proposal to introduce a minimum rate of tax on aviation jet fuel used for flights within the EU, SAF would not be subject to such a tax for a period of 10 years.

This marks an important decarbonising step for the European aviation.

20 EU Emissions Trading Scheme

The EU Emissions Trading Scheme (“EU ETS”) has been in operation since 2005 and is considered a fundamental instrument of the EU’s policy framework and its efforts to reduce CO₂ emissions. The scheme obliges certain companies, including airlines, to hold a permit for every tonne of CO₂ tonne they emit. The target of the EU ETS is to reach net zero CO₂ emissions by 2050, with an intermediate target to reduce greenhouse gas emissions by at least 62% below 2005 levels by 2030.

The EU ETS covers flights landing and taking off in the European Economic Area⁴⁴ (“EEA”). The EU ETS is revised regularly, and in 2021, it entered its fourth trading phase (2021-2030). In its history, the scheme underwent two major revisions before starting Phase 3 and Phase 4. The third major revision was agreed upon in December 2022 and adopted in April 2023⁴⁵, in order to align the EU ETS with the targets of the European Green Deal.

The EU ETS is the world’s largest carbon market, regulating approximately 40% of the total GHG emissions in the EU. It is based on a cap-and-trade scheme. A cap is set on emissions and emission allowances are distributed for free and through auction. In 2021, 82% of allowances for airlines were free, 15% were auctioned, and 3% were reserved for new or fast-growing airlines.

Under the reform of the EU ETS, free emissions allowances for the aviation sector will be phased out one year earlier than originally planned. They will be phased out gradually, a 25% reduction in 2024 and a 50% reduction in 2025. From 2026, allowances will only be available by purchasing them through the regular EU ETS auctions.

Also, each year, the total number of available allowances will reduce; the cap will be reduced gradually by an annual rate of 4.3% (2024 to 2027) and 4.4% (2028 to 2030) from its previous reduction rate of 2.2% so that even fewer allowances will be issued in the future. The cap is rebased at 90 million allowances in 2024 and 27 million in 2026.

Airlines that are able to reduce emissions can trade unused allowances; other airlines can buy additional emission units if they exceed their allowances. The revised points of the EU ETS policy will significantly increase the cost of carbon for EU airlines, which is expected to stimulate emissions reductions within the sector over time.

The price of one emission unit allowance (“EUA”) under the EU ETS was very volatile earlier in 2023. Prices exceeded EUR100 per metric tonne of CO₂, peaking at EUR101 per metric tonne of CO₂ in March 2023 but stabilising afterwards. EUA prices are expected to average EUR 88 per tonne in 2023, rising to EUR 112 per tonne in 2026, EUR 117 per tonne in 2027,

⁴⁴ EEA: EU countries and also Iceland, Liechtenstein, and Norway, allowing the latter three countries to be part of the EU’s single market.

⁴⁵ Source: Council of the European Union <https://www.consilium.europa.eu/en/press/press-releases/2023/04/25/council-and-parliament-agree-to-decarbonise-the-aviation-sector/>

and hit EUR 160 per tonne by 2030. Recent trends also suggest EUA prices have been rising faster than initially forecast⁴⁶.

The money raised from the EU ETS through the auctioning of allowances goes back to the Innovation Fund of the European Commission. The Innovation Fund, a successor of the NER300 Programme, is one of the world's largest programmes set up to invest in low-carbon technologies and contribute to GHG reduction. The Innovation Fund awarded EUR 3.6 billion to 41 large scale clean technology projects in 2023, but it also supports smaller scale projects with a capital expenditure between EUR 2.5 million and EUR 7.5 million.

In Ireland, the fund currently supports one project, providing EUR 4.2 million out of the total relevant costs of EUR 7.1 million. The Irish project is a demonstration of the use of flexible electrical demand to assist the electrical grid facilitating higher levels of renewable power and is expected to contribute to a total GHG emission reduction of 102,344 tonne CO₂ in the first 10 years of operation⁴⁷.

20.1 Credit Risk Management Issues for Aircraft Lessors

Flyr, a Norwegian low-cost carrier, launched in the summer of 2021 and filed for bankruptcy in February 2023. Flyr was already experiencing liquidity problems when attempting to raise NOK 330 million (EUR 28.5 million) to pay its EU ETS fees due in April 2023. EU ETS charges were partially blamed for Flyr's bankruptcy.

For aircraft lessors, a concern would be that a lien may be imposed on a leased aircraft or it may be detained pending payment of EU ETS fees due by the aircraft operating lessee.

However, the risk of permitted liens on leased aircraft for EU ETS charges has been assessed as minimal by the law firm Watson, Farley & Williams⁴⁸ ("WFW"). WFW point out:

"... each of the EU ETS, UK ETS and CHETS schemes look to the aircraft operators to enforce penalties. Further, neither the Commission, the UK regulators, nor the Swiss authorities require, or even recommend, the imposition of liens or the detention of aircraft as enforcement mechanisms. When looking at this from a local law perspective, the position is the same in the vast majority of jurisdictions that are part of such schemes."

Flyr's bankruptcy, however, highlights the competitive disadvantage new entrants to the European airline market can have compared to the established airlines that still benefit from free emission allowance allocations under the EU ETS. It is assumed Flyr did not benefit from the New Entrants Reserve of free allowances under EU ETS⁴⁹. There is an expectation that this unfavourable environment for new entrants will no longer exist when the free allowances

⁴⁶ Source: Mariz, E. (2023) Ishka Insights. Briefing: Rising EU ETS prices – a boon for neos and MAXs? <https://www.ishkaglobal.com/News/Article/6991/Briefing-Rising-EU-ETS-prices-a-boon-for-neos-and-MAXs>

⁴⁷ Source: https://ec.europa.eu/assets/cinea/country_factsheets/innovation_fund/INNOVFUND_Ireland.pdf

⁴⁸ Source: Watson, Farley & Williams: <https://www.wfw.com/articles/eu-ets-uk-ets-and-ch-ets-undue-fears-for-lessors-over-liens-and-aircraft-detention-rights/>

⁴⁹ Source: Mariz, E. (2023) Ishka Insights. Flyr bankruptcy may carry EU ETS lessons for lessors <https://www.ishkaglobal.com/News/Article/6877/Flyr-bankruptcy-may-carry-EU-ETS-lessons-for-lessors>

are completely phased out by 2026.

Despite the minimal risk identified by WFW, good credit risk management for lessors may now dictate that the scope of permitted liens in aircraft leases be widened to include unpaid EU ETS carbon taxes and that a further condition precedent be authorisation of the disclosure of carbon tax payments by the lessee as Eurocontrol can sell an aircraft to fund unpaid carbon taxes. This possibility raised many questions within the lessor community, especially since the bankruptcy of Flyr.

20.2 U.K. Emissions Trading Scheme

In July 2023, the U.K. government moved to tighten limits on aviation emissions from 2024 by means of the U.K. Emissions Trading Scheme (“UK ETS”) which covers U.K. domestic flights, flights departing from the U.K. to the EEA, and flights between Gibraltar and the U.K.

In line with the EU, the U.K. aims to cut free carbon allowances for the aviation industry in 2026 by requiring aviation entities to buy regulated carbon credits on the UK ETS for each tonne of CO₂ emitted under the scheme.

However, unlike the EU, which is phasing out free allocation entitlements under the EU ETS on a gradual basis, the free allocation entitlements for aviation entities under the UK ETS will remain until 2026.

21 Carbon Offsetting and Reduction Scheme for International Aviation

The Carbon Offsetting and Reduction Scheme for International Aviation (“CORSIA”) is intended to be a temporary measure, running from 2021 to 2035, to achieve carbon-neutral growth in the aviation industry.

CORSIA was adopted in 2016 at the 39th Session of the International Civil Aviation Organization (“ICAO”) Assembly and will be delivered in three phases. The pilot phase and the first phase are voluntary.

- Pilot phase (2021-2023)
- 1st phase (2024-2026)
- 2nd phase (2027-2035)

In January 2023, out of ICAO’s 193 member states, 115 volunteered to participate in CORSIA’s pilot phase. Applications for new members are accepted every year by the 30th of June. The list of voluntary members will grow to 125 by January 2024 based on the new applications received in 2023. In the spirit of the *No Country Left Behind* initiative, ICAO provides support and capacity building to all its member states.

Since 2019, airlines have been monitoring and reporting their annual CO₂ emissions, having them verified by third parties, and submitting them ultimately to ICAO. The 2019 reported values represent the baseline from which all calculations for offsets are derived. Under CORSIA, airlines must offset any CO₂ emissions they emit above a pre-set baseline by buying credits on the carbon market from environmental projects recognised by CORSIA and other international agencies.

CORSIA only covers international flights between participating states. As CORSIA is still at a voluntary stage, only international flights between participating member states are subject to offsetting requirements. Some major international markets are not part of the voluntary stage; China, India, Russia, and Brazil are not participating states. Consequently, approximately 40% of CO₂ emissions from international aviation are not subject to CORSIA offsetting.

There are exemptions from CORSIA offsetting requirements to protect aviation activities linked to humanitarian and medical activities. Also, there are exemptions for aircraft operators from Least Developed Countries, Small Island Developing States, and Landlocked Developing Countries for aircraft operators with less than 10,000 metric tons of CO₂ emissions per year from international operations and to aircraft with less than 5,700 kg maximum take-off weight.

ICAO’s calculation for the baseline and the share of each operator’s quantity of offsets have been amended multiple times. ICAO originally planned to use the average traffic and emissions from 2019 and 2020 as a baseline. However, in 2020, ICAO redefined the baseline

in terms of 2019 alone, due to the pandemic. A further amendment changed the baseline to:

- 100% of 2019 CO₂ emissions during the pilot phase (2021 – 2023, Compliance Period)
- 85% of 2019 CO₂ emissions after the pilot phase (2024 – 2035, First and Second Phase).

The scheme aims to cap aviation emissions at the baseline levels by requiring airlines to offset the growth of their emissions beyond that year. The airlines compensate for any increase in emissions above the baseline by buying credits on a carbon market from a list of environmental projects recognised by CORSIA and other international agencies. The unit of the carbon offset is 1 tonne of CO₂.

Offsetting requirements for each airline are calculated according to sectoral and individual growth. The formula for an airline’s offset requirements in a particular year was updated to reflect primarily sectoral growth rather than individual growth – which only plays a role from 2033 onwards. Until 2032, an airline’s annual offsets are calculated as follows:

The airline’s offsets equal

$$[\text{Airline's emissions subject to CORSIA}] * [\text{Sector's growth factor}_{\text{Year}}]$$

where Sector’s growth factor_{Year} equals

$$(\text{Total emissions}_{\text{Year}} - \text{Total emissions}_{\text{Baseline}}) / [\text{Total emissions}_{\text{Year}}]$$

Since the CO₂ emissions subject to offsetting requirements in 2021 were lower than the corresponding amount in 2019, there were no CO₂ offsetting requirements for any airline in 2021. This is expected to hold for 2022 and maybe even 2023. However, from 2024, as CORSIA is moving into its First Phase, the baseline drops to 85% of the 2019 emission levels which will likely lead to a significant requirement for offsets.

As discussed previously, the quality of carbon offset schemes is important. As of March 2023, the CORSIA eligible emissions unit programs approved by ICAO Council include the following enterprises:

- American Carbon Registry (“ACR”)
- Architecture for REDD + Transactions (“ART”)
- China GHG Voluntary Emission Reduction Program
- Clean Development Mechanism (“CDM”)
- Climate Action Reserve (“CAR”)
- Forest Carbon Partnership Facility (“FCPF”)
- Global Carbon Council (“GCC”)
- The Gold Standard (“GS”)
- Verified Carbon Standard (“VCS”)

These suppliers of Eligible Emissions Units (“EEUs”), which airlines can purchase, are mostly approved for the compliance period 2021-2023 but not for the First Phase (2024-2026). Only the ACR and ART are approved for the First Phase. Unless the rest of the EEUs providers are

approved in 2023, there will be a significant reduction in the availability of EEU's on the market.

The issued activities for which ACR and ART are approved for the compliance period 2024-2026 started their first crediting period in 2016. Activities are actions that are:

“intentionally implemented to reduce, avoid, or sequester greenhouse gases; which are measured, monitored, and verified according to a predetermined methodology or framework and issued as emissions units”.

Many carbon reduction programmes achieve their aim in a low carbon price environment. The price of CORSIA carbon offsetting is low, especially when compared to the EU ETS carbon price. Its cost is expected to grow just as the EU ETS carbon price grew over time; the cost of carbon registered in the EU ETS was for years priced below EUR 10 per tonne, but its price exceeded EUR 100 per tonne in February 2023. By comparison, some estimates claim that the cost of CORSIA carbon offsetting may reach USD 90 by 2050, although some argue that carbon offsetting needs to reach these values by 2030.

In addition to CORSIA, several other programs are under development aiming to support the goals of the Paris Agreement and compete with the aviation industry for access to carbon credits. These other programs, together with the potential reduction in the number of available EEU's on the market, will likely raise carbon prices.

The responsibility to establish the net zero target under the ICAO agreement rests with the individual member states, each of which is required to develop its own measures to reduce emissions in line with the ICAO goal. For example, in the U.K., the Greenhouse Gas Emissions Trading Scheme Order 2020 requires airlines to monitor and report emissions. There are significant fines for failure to comply with the CORSIA requirements.

21.1 CORSIA and Aircraft Leases

Some aircraft leases have been modified to clarify that the party responsible for the purchase of offsets for any CO₂ emissions they emit above a pre-set baseline is generally the airline as lessee rather than the lessor.

21.2 Criticisms of CORSIA

A number of environmental groups have criticised⁵⁰ CORSIA as an ineffective scheme. These groups do not see CORSIA as being in step with the Paris Agreement 1.5C climate target and the net zero by 2050 goal for aviation emissions adopted by both ICAO and the industry. Further, the CORSIA scheme rules will not be reviewed again until 2025.

⁵⁰ Source: “European Parliament and Council reach compromise agreement on changes to the Aviation EU ETS”, Green Air Nes, <https://www.greenairnews.com/?p=3701>, accessed 26 October 2023

22 The Low Carbon Alternatives to Aviation Jet Fuel

According to Eurocontrol⁵¹, just under 10% of flights departing from the combined area of the EU and the U.K. are long-haul flights, i.e., flights over 3,000 km, and these account for over 50% of all aviation CO₂ emissions.

At take-off, up to 45% of the total weight of a wide-body, long-haul aircraft such as the Airbus A350 or the Boeing 787 may be accounted for by aviation jet fuel.

Any replacement fuel used to reduce emissions must have an energy density, energy per unit mass (W·h/kg), similar to aviation jet fuel; otherwise, the total weight of the long-haul aircraft will rise. Not only must a replacement fuel have a high energy density, but it must also have good cold flow properties and a low freezing point.

To put the figure of 45% in context, in a typical private car, the weight of the petrol or diesel fuel is unlikely to exceed 5% of the total weight of the vehicle.

Both hydrogen and electricity as sources of power for long-haul flights require very significant research and development and testing before they could be considered as alternative sources of power for long-haul flights.

As for electricity as a source of power for long-haul flights, a lithium-ion battery might have a specific energy density⁵² of around 300W·h/kg compared with 12,000W·h/kg for aviation jet fuel. At current battery energy density, the weight of the battery required for a long-haul flight would probably not even allow an aircraft fitted with such a heavy battery to get off the ground.

Further, emission reductions from hydrogen and battery technologies for long-haul aviation must also take into account the carbon footprint of the energy used in their production.

A decade or more may pass before the technological challenges facing these two alternative sources of aviation power for long-haul flights are overcome.

One of the other challenges with wide-body aircraft is that they tend to remain in service for more than two decades on average making their replacement by newer and more efficient aircraft slower and therefore presenting a further barrier to the decarbonisation of the long-haul aviation sector.

For the foreseeable future, the use of sustainable aviation fuel (“SAF”) combined with new aircraft technology design, offsets and carbon capture, and improvements in infrastructure are likely to be the key components of the means to decarbonise the long-haul aviation sector.

⁵¹ Source: “Long-haul flight decarbonisation: When can cutting-edge energies & technologies make a difference?”, Eurocontrol, <https://www.eurocontrol.int/publication/eurocontrol-think-paper-21-long-haul-flight-decarbonisation-when-can-cutting-edge>

⁵² Specific energy, measured in watt hours per kilogram (W·h/kg) is the nominal battery energy per unit mass. Specific energy in combination with the energy consumption of the aircraft determines the battery weight required to achieve a given range.

The picture may be somewhat brighter for the earlier decarbonisation of the short-haul aviation sector. In September 2023, H2FLY, a Stuttgart-based firm, focused on the development of aircraft powertrain systems had completed “*the world’s first piloted flight of an electric aircraft powered by liquid hydrogen*”⁵³.

The flight used the firm’s HY4 demonstrator aircraft which was fitted with a hydrogen-electric fuel cell propulsion system and cryogenically stored liquid hydrogen. H2FLY is reported to have completed four such flights and one of the flights exceeded three hours in duration. The series of flights is part of a project called “Hydrogen Energy and Vertical Electric Aircraft Network” which is supported by European-governments and led by H2FLY.

The maximum range of the HY4 aircraft was approximately doubled from 750km to 1,500km by replacing hydrogen in the gaseous state by hydrogen in the liquid state. Liquid, cryogenic hydrogen has significantly less weight than pressurised gaseous hydrogen enabling the increase in distance flown.

⁵³ Source: “First liquid hydrogen-powered piloted plane soars into sky”, Interesting Engineering, <https://interestingengineering.com/innovation/first-liquid-hydrogen-powered-piloted-plane-soars-into-sky>, accessed 26 October 2023.

23 Low Carbon Aviation Fuels

23.1 Sustainable Aviation Fuel

SAF can reduce greenhouse gas emissions by something of the order of 70% compared to aviation jet fuel. Currently, to qualify as sustainable, a SAF must reduce greenhouse gas emissions by at least 50% relative to aviation jet fuel. SAF can potentially be made from a range of sources including: (i) animal waste fat; (ii) waste oils; (iii) municipal waste such as food leftovers; (iv) forestry and agricultural waste; (v) municipal waste; and (vi) animal feedstock. These sources of waste material are put through a conversion process to produce aviation fuel with lower carbon emissions than aviation jet fuel. If renewable energy sources are used to power the process, the net CO₂ will be even lower.

23.2 E-Fuel

E-fuel is another source of low carbon aviation fuel. It is produced by extracting CO₂ from the air and combining it with hydrogen derived from the process of electrolysis. The electrical energy for the electrolysis is derived from renewable sources. The ultimate product of the production is a synthetic crude that can be refined into fuel compatible with aviation jet fuel.

As SAF has similar chemical and physical properties to traditional aviation jet fuel, it can be easily used as a substitute for aviation jet fuel without having to redesign the fuelling system or the aircraft engines.

At present, there are at least two factors currently preventing the widespread adoption of SAF:

- (i) SAF is currently something of the order of two to five times more expensive than aviation jet fuel; and
- (ii) It takes roughly five years to build a SAF production plant⁵⁴ and something of the order of 350 such plants will need to be in place by 2030 to reach IATA's target of deploying two-thirds of jet fuel as SAF and e-fuels as part of its net zero target..

In relation to point (i), aviation jet fuel currently accounts for up to 30% of annual airline operating costs. For airlines facing a rising cost of carbon emissions and increasing mandatory use of SAF, if these increased costs cannot be passed on to passengers, their net operating profit will suffer substantially, leading perhaps to the survival of only the most profitable airlines. If the costs can be passed on to passengers, demand for air travel may fall.

In relation to point (ii), to encourage investment in SAF production, the Inflation Reduction Act in the U.S. provides for a tax credit of up to USD 1.75 per gallon of SAF until 2027.

⁵⁴ Source: "Decarbonizing the aviation sector: Making net zero aviation possible", McKinsey, <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/decarbonizing-the-aviation-sector-making-net-zero-aviation-possible>

In an effort to show how SAF could replace aviation jet fuel, Virgin Atlantic, an airline, flew⁵⁵ the world's first net zero transatlantic flight from London to New York on a Boeing 787 on the 28th of November 2023. The flight, named Flight100, was completed exclusively on SAF⁵⁶.

The airline reports that it has received funding from the U.K. government for the flight and has been working with a number of partners, including Rolls-Royce, Boeing, Pratt & Whitney Canada, Imperial College London, University of Sheffield, RMI, and ICF.

While the use of 100% SAF on the flight will reduce greenhouse gas emissions by approximately 70% of those of aviation jet fuel, to make the flight net zero, the remaining greenhouse gas emissions will be offset by carbon removal through biochar credits, a material that traps and stores carbon taken from the atmosphere.

In an article published in July 2023 in *Nature Communications*⁵⁷, a scientific journal, a number of researchers from German and Swiss universities claim that, at a growth rate of air traffic of 1.8% p.a. in terms of kilometres flown, the total SAF needed to meet the final ReFuelEU SAF requirement from 2050 to 2100 would require:

- (i) The current annual electricity output in the 27 countries of the EU and the U.K. to increase by a factor of 1.3 times;
- (ii) Somewhere between 200 and 250 million hectares of land to be devoted each year to the production of SAF; and
- (iii) An annual amount of freshwater equivalent to that of the annual consumption of 27 countries of the EU and the U.K.

The production of renewable electricity, solar, wind, biomass, and hydropower, are the main drivers of the need for the use of land and freshwater. A very significant investment in the infrastructure of renewable electricity generation, electricity grid, and electrolyzers powered by renewable energy is required to produce the required volumes of SAF.

As an alternative, if the use of aviation jet fuel were to continue and its climate impacts offset by direct air carbon capture and storage, the required CO₂ storage capacity would exceed that of the storage capacity of the Norwegian continental shelf. However, relative to the alternative described above, the need for electricity, land, and freshwater would be of the order of 50% less but Europe's dependence on aviation jet fuel would remain.

⁵⁵ Source: "Virgin Atlantic flies world's first 100% Sustainable Aviation Fuel flight from London Heathrow to New York JFK", Virgin, <https://corporate.virginatlantic.com/gb/en/media/press-releases/worlds-first-sustainable-aviation-fuel-flight.html>

⁵⁶ Source: "Worlds first 100% SAF Transatlantic flight sets sights on takeoff", PR Newswire, <https://www.prnewswire.com/news-releases/world-first-100-saf-transatlantic-flight-sets-sights-on-takeoff-301882055.html>, accessed 25 October 2023.

⁵⁷ Source: Sacchi, R., Becattini, V., Gabrielli, P. et al. "How to make climate-neutral aviation fly". *Nat Commun* 14, 3989 (2023). <https://doi.org/10.1038/s41467-023-39749-y>

24 CO₂ Outlook for the Aviation Industry

Technological solutions to decarbonise aviation will not become a reality on a large scale any time soon. Gross aviation CO₂ emissions are likely to continue to grow faster than total global CO₂ emissions for three reasons:

- (1) air travel is expected to grow at about 3% p.a. over the next 20 years;
- (2) for medium and long-haul travel, there often is not a viable alternative in terms of time taken for the travel; and
- (3) low or near zero emission aircraft engines technologies will not be available until late 2030s at the very earliest.

Meanwhile other industries, where new carbon neutral technology is easier to develop, are likely to reduce their emissions before aviation does.

Despite its decarbonisation efforts, in the short term, aviation will stand out as failing to reduce emissions as people focus on the percentage of total CO₂ produced by aviation, the percentage of total emissions attributed to aviation will rise because total emissions are expected to fall, and aviation cannot reduce its carbon footprint at the same speed.

So, we are likely to see stricter legislation and higher carbon taxes, particularly in the EU.

With the convergence of CSRD and CORSIA, compliance and corresponding pressures will impact aviation players within two years.

Another key trend is that airline creditors and EU-based equity fund management firms investing in airline shares are likely to become increasingly concerned about reputational and greenwashing litigation risk because of climate change activists and climate change litigation.

It will likely lead to requirements for financiers to link lending to strong evidence of fleet renewal, operational and infrastructure advances, aircraft technology improvements, and increased use of sustainable aviation fuels.

25 Concluding Remarks

Aviation is one of the most difficult sectors to decarbonise. However, a wide range of pressures are driving the decarbonisation of the aviation industry.

The pressures on the aviation industry to decarbonise fall into two broad categories:

I. Consumers, activists, NGOs, and civil litigation increasingly informed by levels of audited greenhouse gas emission (“GHG”) disclosures under the Corporate Sustainability Reporting Directive and the actions being taken to mitigate or bring to an end sustainability impacts which will be required under the forthcoming Corporate Sustainability Due Diligence Directive.

II. Increasing costs, particularly for EU airlines, arising from: (a) carbon taxes on airline GHG emissions ramping up to cover 100% of emissions from 2026; (b) gradually incrementing requirements to use increasing amounts of SAF which is two to five times the cost of aviation jet fuel; and (c) possible increases in the cost of debt and equity capital for airlines and aircraft lessors due to increasing focus on lenders and institutional investors on climate change and sustainability risks.

In the short term, only the most profitable airlines in Europe are likely to be able to bear the rising costs. The level of competition in the European airline industry is likely to decrease and become more like the level of competition in the U.S. In time, the surviving European airlines might be able to pass on rising costs to passengers assuming the secular growth rate for the demand for aviation travel is not affected by the higher fares and the combination of consumer, NGO, and civil litigation pressures.

At the same time, the desire to drive down increasing costs is likely to facilitate investment in SAF production and its supporting delivery infrastructure to lower its cost over time. The greater use of SAF or e-fuel ought to reduce in time the cost of debt capital for the aviation industry as aviation decarbonises.

For airlines operating outside of the EU, while most of the pressures identified in I. above apply, at least for now the pace of implementation of carbon taxes and requirements to use SAF or e-fuel is not as great as in the EU. The cost of carbon offsets under CORSIA is significantly lower than the cost of an EUA and besides the offsetting requirement only applies to the growth in emissions above a baseline.

There is no simple single solution to decarbonise the aviation industry over a relatively short time horizon. Decarbonising the aviation industry is highly complex from the perspectives of engineering innovation, airline safety regulations in testing the efficacy and safety of new technologies, and, because no single country can decarbonise the aviation industry, global political cooperation is required.

In the short to medium term, SAF is likely to be the preferred method of reducing the GHG

emissions from long-haul flights while both hydrogen powered flight and SAF are possible candidates for decarbonising short-haul flights. Meanwhile, consumer, NGO, and civil litigation pressures are likely to keep the spotlight on aviation industry's work in decarbonising. What we have identified in this paper are steps in the right direction.