3.10 Aviation

Key findings

Demand trends

- Global demand for passenger air travel grew 6.1% in 2018, while demand for freight aviation declined 4.6%.
- Passenger aviation demand continues to be driven by generous subsidies on airline fuels and airport infrastructure as well as value-added tax exemptions on international flights.
- Biofuels provided only around 0.01% of aviation fuel demand in 2019. Sustainable aviation fuels must be scaled up significantly to make a substantive impact on aviation emissions.

Emission trends

- Passenger and freight aviation were responsible for around 2.5% of global energy-related carbon dioxide (CO_2) emissions in 2018.
- Incremental efficiency gains in operations and aircraft continue to be outpaced by global demand for air travel.
- Non-CO_2 emissions in aircraft contrails contribute twice as much to climate change as direct aircraft CO_2 emissions.

Policy measures

- The expansion of airline pricing measures is internalising a share of the external costs of aviation but remains insufficient to significantly influence consumer behaviour.
- Airlines must significantly increase the ambition of their emerging commitments to reduce aviation emissions in order to meet Paris Agreement mitigation targets; they can have greater impact with more industry co-ordination, increased alignment with global targets and strengthened national ambitions.
- It is critical to complement "Improve" strategies in the aviation sector with appropriate "Avoid" and "Shift" measures.
- The optimisation of complementary transit modes such as high-speed rail is reducing the demand for air travel in some countries, but additional investments and incentives are needed to make a global impact.

Impacts of the COVID-19 pandemic

- The impacts of the pandemic on international flight capacity ranged from an estimated 37% reduction in Africa to 72% in Asia, although this near-term drop in flights is not expected to greatly alter emission trajectories.
- Pandemic recovery packages are reshaping discussions among airlines and governments on bailouts, taxes, fuel mandates and sustainability conditionalities.
- The large impact of the COVID-19 pandemic on commercial aviation operations is likely to reduce the prioritisation of aviation policies on climate change – which were increasing before the pandemic – in favour of maintaining air connectivity for economic activity.

Overview

Aviation started 2020 on an upward trend, after global demand for flying grew 6.1% in 2018 led by Asia, Europe and Latin America.[1] With the demand for air travel growing rapidly, calls accelerated in 2019 for the International Civil Aviation Organization (ICAO) to introduce stricter restrictions on carbon offset credits under the market-based Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which has been criticised for lacking ambition.[2]

As the COVID-19 pandemic spread in early 2020, aviation demand plummeted, and the ICAO predicted that global passenger traffic for the year could drop by 1.9 million to 3.2 million passengers, with a 33% to 60% reduction in seats (compared to business as usual) (*see Box 1*).[3] As recovery plans began taking shape, a few European governments linked airline bailout packages to sustainability conditions, but most did not, underscoring the limitations of individual commitments.[4] Although CORSIA initially sought to rely on average aviation emissions in 2019 and 2020 as the baseline for its annual offsetting requirements, the ICAO Council later opted to exclude 2020 data in light of the short-term decline in flights due to the pandemic.[5]

Box 1. Carbon offsets and aviation

Carbon offsets are intended to reduce the impacts of air travel by investing in projects that mitigate carbon emissions. The Paris Agreement requires all countries and all sectors to directly reduce emissions; thus, carbon offsetting is not a Paris-compliant strategy. Further, CORSIA's low ambition level and offset costs do not provide sufficient incentive to drive needed efficiency improvements for aviation.

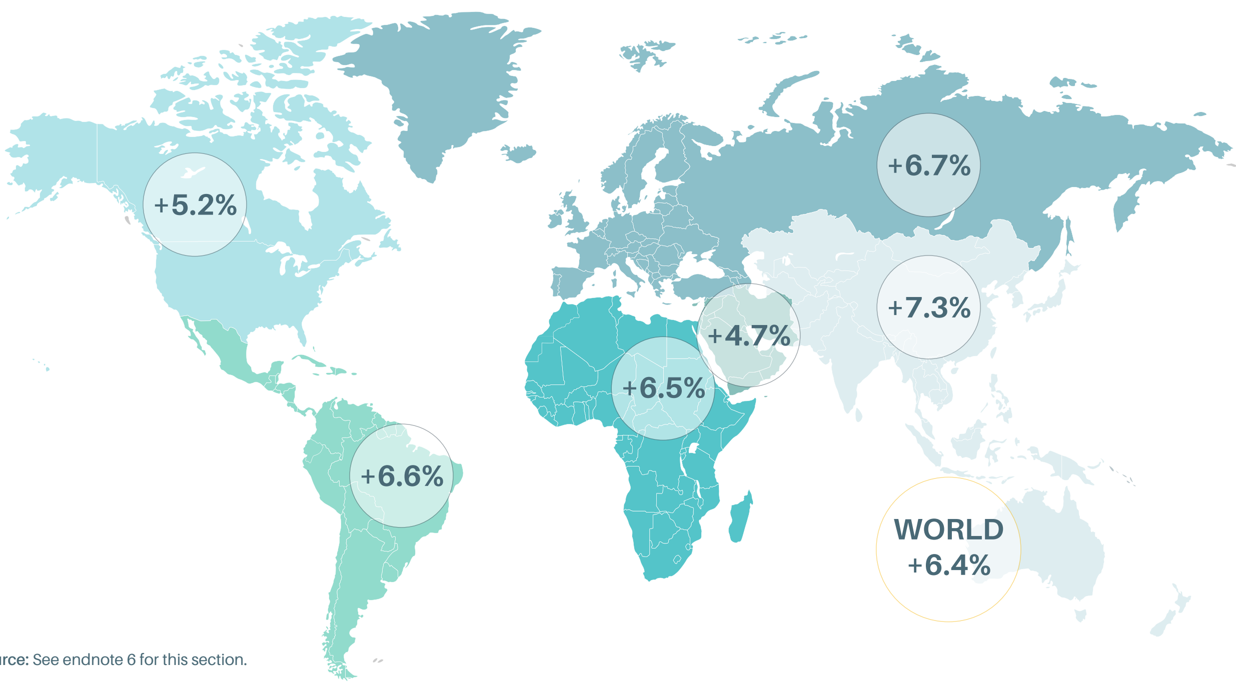
A recent European Commission study found that up to 85% of offsets from projects under the United Nations Clean Development Mechanism have not fully delivered claimed emission reductions. Therefore, offsets are not a reliable strategy to reduce fuel consumption or emission growth, which can only be assured through direct measures like aircraft efficiency standards and phase-outs of fuel subsidies.

Source: See endnote 36 for this section.

Demand trends

Global demand for passenger air travel grew 6.1% in 2018, while demand for freight aviation declined 4.6% (*see Figure 1*).[6] Passenger activity increased to 8.2 trillion revenue passenger-kilometres, with the total number of passengers reaching a record 4.3 billion.[7] Growth was led by Asia (up 7.3%), Europe (6.7%) and Latin America (6.6%).[8] Aviation freight demand was already falling in 2018 due to weak growth in global trade and then plummeted in 2020 after the onset of the COVID-19 pandemic.[9]

Figure 1. Growth in passenger aviation, 2018



Source: See endnote 6 for this section.

Passenger aviation demand continues to be driven by subsidies on airline fuels and airport infrastructure as well as value-added tax exemptions on international flights. Airlines benefit from a universal exemption from fuel taxation and thus are subsidised at an estimated annual value of more than EUR 60 billion (USD 73 billion) globally and EUR 20 billion (USD 24 billion) in Europe alone.[10] A leaked 2018 European Commission study concludes that the aviation sector is undertaxed and that taxing aviation fuels (which is common in other countries) could cut emissions from aviation at least 10% without adverse impacts on gross domestic product (GDP).[11]

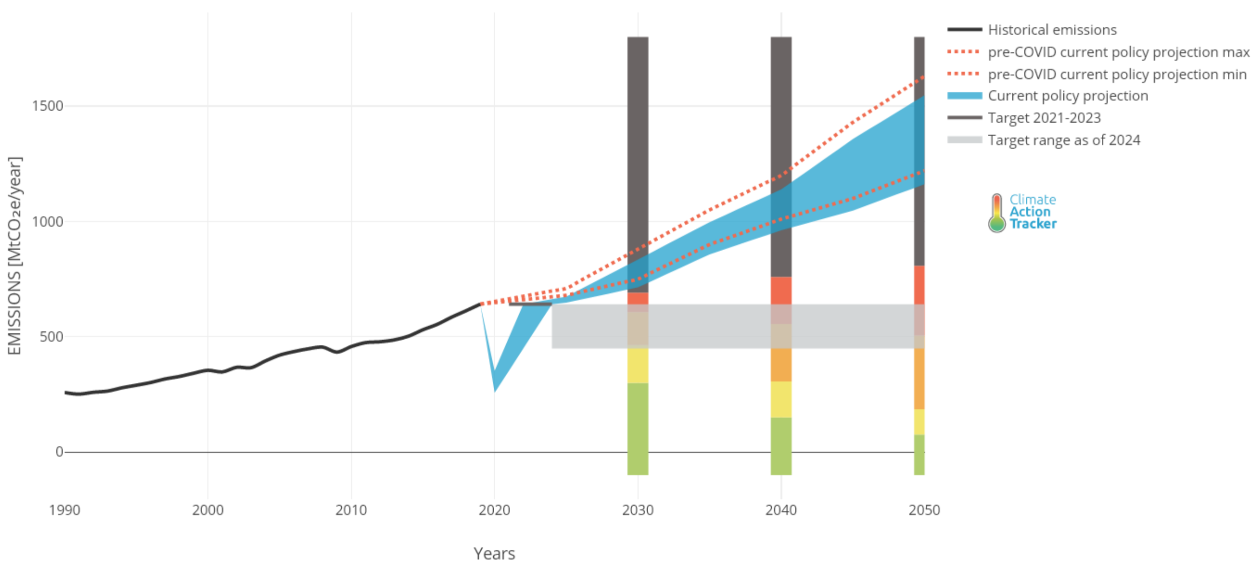
Biofuels provided only around 0.01% of aviation fuel demand in 2019.[12] Sustainable aviation fuels must be scaled up significantly to make a substantive impact on aviation emissions. Technology for producing renewable electro-fuels for the sector exists, but costs remain much higher than for fossil-based fuels, and policy support is lacking.[13] Mandates for biofuels and other sustainable aviation fuels are critical to reducing fossil fuel use in the sector, but to ensure their sustainability, advanced biofuels must meet strict criteria and crop-based biofuels must be excluded.[14] Recent efforts to scale up demand for biofuels include the following:

- The **European Union** (EU) published its updated Renewable Energy Directive (RED II) in December 2018, outlining the use of renewable transport fuels from 2021 to 2030. Robust national implementation is needed to promote clean advanced renewable fuels (and avoid unsustainable biofuels) for effective decarbonisation.[15]
- In 2019, **Finland** announced a target for 30% biofuels in aviation by 2030 to be achieved through a blending obligation, although this target may rely on biofuels derived from palm oil.[16]
- **France** adopted legislation in 2020 requiring all airliners refuelling in the country to use at least 1% renewable bio-jet fuel, with plans to increase this obligation to 5% by 2030 and 50% by 2050.[17]
- In 2020, **Germany** set a mandate for 2% hydrogen-based electro-fuels in aviation by 2030.[18]
- At the end of 2019, **Sweden**'s Halmstad Airport committed to requiring airlines to use at least 5% sustainable aviation fuel at the airport, in line with the municipality's target to be fossil fuel-free by 2030.[19]

Emission trends

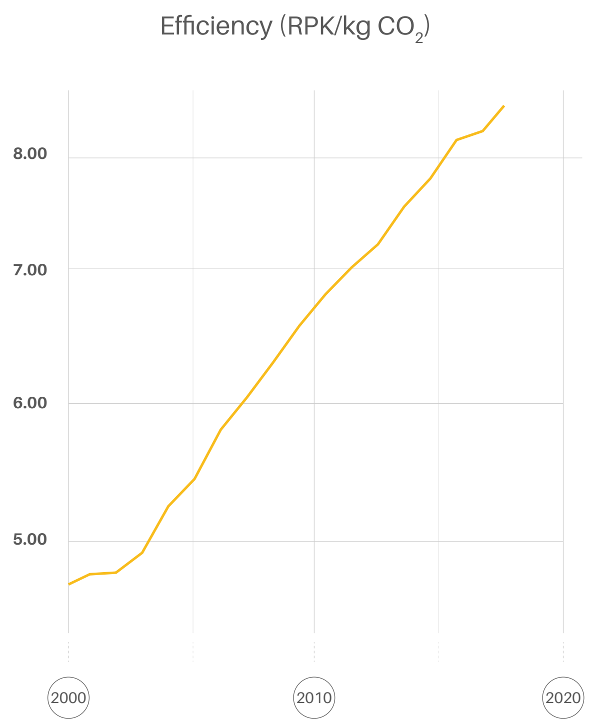
Passenger and freight aviation were responsible for around 2.5% of global energy-related CO_2 emissions in 2018.[20] Passenger aviation represents more than 80% of this total.[21] Aviation emissions grew 32% between 2013 and 2018, but the onset of the COVID-19 pandemic in 2020 temporarily reduced emissions (*see Figure 2*).[22]

Figure 2. Pre- and post-COVID-19 projections for aviation emissions to 2050



Source: See endnote 22 for this section.

Figure 3. Fuel economy in aircraft, 2000-2020



Source: See endnote 24 for this section

International aviation has continued to grow in the absence of sufficient policies and measures in place to reduce direct aviation emissions. Despite the declines during the COVID-19 pandemic, emissions from international aviation could still increase a projected 220-290% between 2015 and 2050 (compared to an increase of 230-310% projected before the pandemic), underscoring the challenge of achieving carbon-neutral growth in the sector.[23]

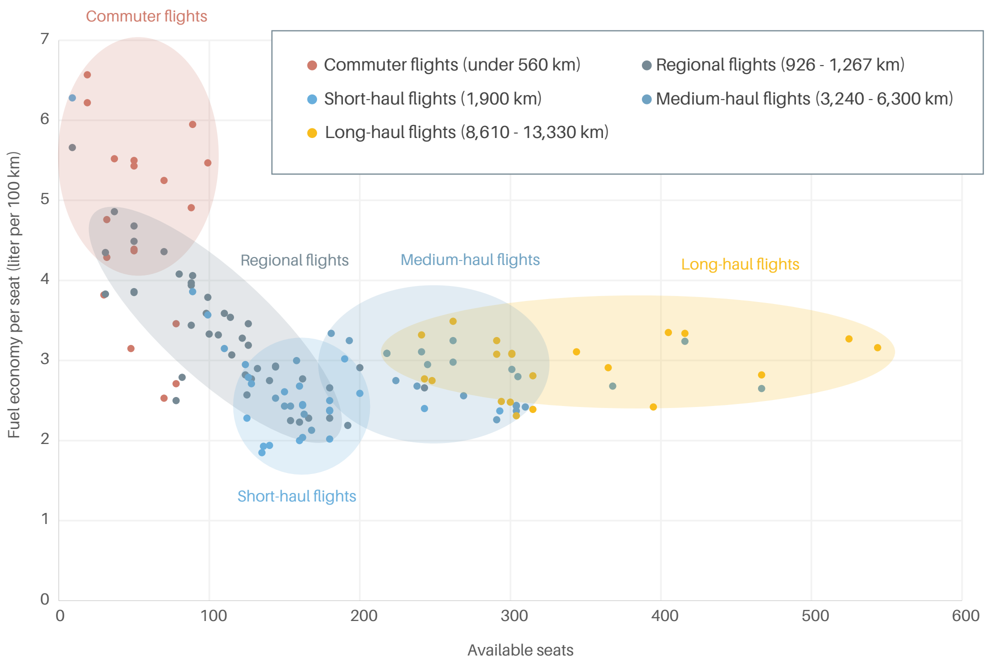
Incremental efficiency gains in operations and aircraft continue to be outpaced by global demand for air travel. Airline fuel efficiency gains averaged 2% annually between 2009 and 2019, whereas estimated growth in aviation CO_2 emissions during the same period averaged 3% annually (*see Figure 3*).[24]

Total revenue passenger-kilometres in 2019 increased 4.2% over 2018, as consistent with projected growth rates from 2013 to 2035.[25] Growth in air travel has outpaced both historic fuel economy improvements and corresponding CO_2 emission reductions for aircraft, compromising the sustainability of the airline industry (*see Figure 4*).[26]

Non-CO_2 emissions in aircraft contrails contribute twice as much to climate change as direct aircraft CO_2 emissions.[27] Using cleaner aviation fuels and changing flight paths to lower altitudes can reduce contrail formation and reduce emissions of nitrogen oxides, water vapour, soot and black carbon.

- Rerouting fewer than 2% of flights in **Japan** reduced the warming effect of contrails by almost 60% during a six-week period.[28]

Figure 4. Fuel economy (litres/100 kilometres) per seat by flight type, 1981-2020



Source: See endnote 26 for this section.

Policy measures

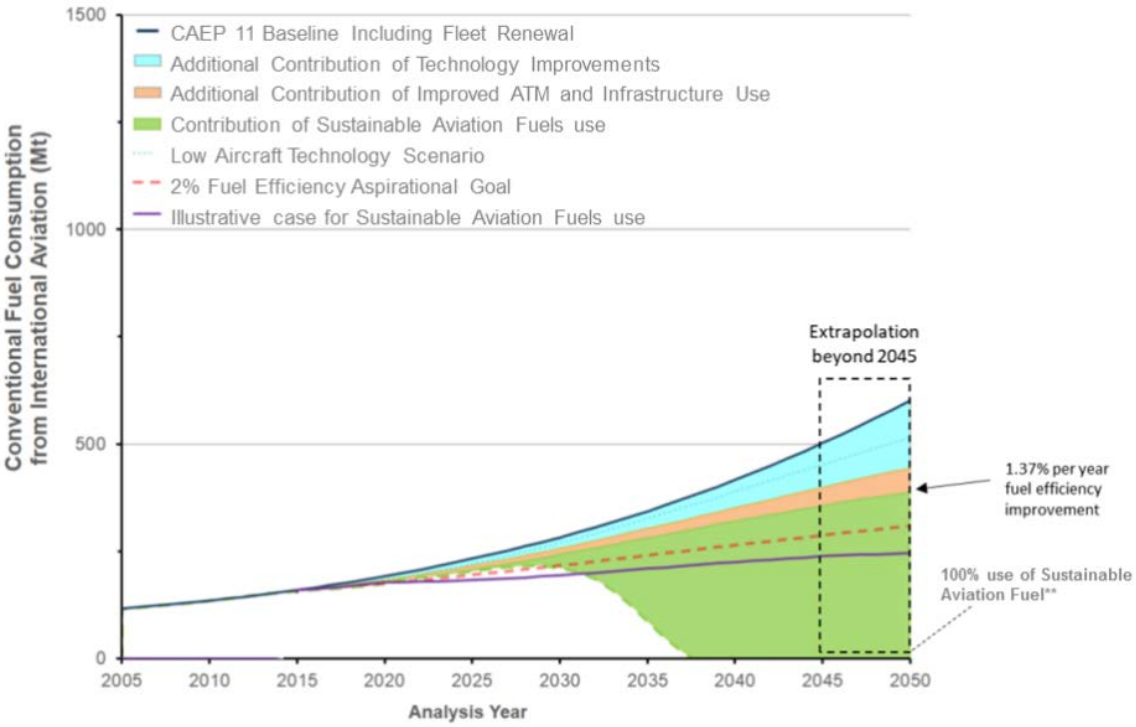
The expansion of airline pricing measures is internalising a share of the external costs of aviation but remains insufficient to significantly influence consumer behaviour.

- The **EU**'s Green Deal provides a model for other regions in creating a set of co-ordinated airline taxes that signal clear incentives and avoid carbon leakage across national and corporate borders.[29] In 2020, a consultation was launched to test the waters for a pan-European tax on jet fuel.[30] The tax, if classified as "environmental", could avoid the need for unanimous agreement among ministers.
- In 2020, **France** introduced an aviation "eco tax" ranging from EUR 1.50 (USD 1.8) per economy ticket within the EU to EUR 18 (USD 22) per business ticket outside the EU; a subsequent proposal could raise these fees.[31]
- **Germany** advanced a duty on air passengers in 2020 despite the impacts of the COVID-19 pandemic, although it reduced the rate during severely impacted months and funded a EUR 8 billion (USD 9.7 billion) bailout for the aviation industry (but with no climate commitment).[32]
- **Spain** introduced an air transport tax in 2020 to fight climate change, in line with European Commission recommendations.[33]
- The parliament of **Switzerland** approved a tax in 2020 on all departing flights, which ranges from CHF 30 to CHF 120 (USD 33 to USD 133) depending on the class of travel and on the flight distance.[34]
- In 2020, Climate Assembly **UK**, an advisory group of private citizens commissioned by a parliamentary select committee, called for a frequent-flyer levy linked to individual air travel frequency and distance.[35]

Airlines must significantly increase the ambition of their emerging commitments to reduce aviation emissions in order to meet Paris Agreement mitigation targets; they can have greater impact with more industry co-ordination, increased alignment with global targets and strengthened national ambitions. A number of major airlines have set significant policy targets and implemented measures. However, many of these are insufficient to offset rising passenger demand, and carbon offset strategies cannot be equated to real and sufficient emission reductions within the aviation sector (*see Box 2*).[36]

- The **International Air Transport Association** (IATA) has adopted targets to mitigate CO_2 emissions from aviation including a cap on net CO_2 emissions from 2020 (carbon-neutral growth) and a reduction in net aviation CO_2 emissions of 50% by 2050, relative to 2005 levels (a goal echoed by the 10 member

Figure 5. Aviation CO_2 emission projections and potential greenhouse gas reductions to 2050



Source: See endnote 40 for this section.

airlines of Airlines for America).[37] However, such measures are insufficient to achieve emission levels compatible with the Paris Agreement, as net zero emissions by 2050 are required of all sectors, yet aviation emissions currently exceed 600 million tonnes annually.[38]

- **ICAO's Alternative Fuels Task Force** estimates that it is possible to meet 100% of international demand for aviation jet fuel with sustainable fuels by 2050, yielding a 63% reduction in CO_2 emissions.[39] However, this level of sustainable fuel production would require unprecedented capital investments in production infrastructure and robust policy support (*see Figure 5*).[40]

In early 2020, USA airline **Delta** committed USD 1 billion over 10 years to mitigate emissions through strategies such as fleet renewal, biofuels and carbon offsets, although it later reduced its offset targets due to the impacts of the COVID-19 pandemic.[41]

Starting in November 2019, UK carrier **easyJet** pledged to purchase carbon offsets to equal the fuel used on all flights in its network.42 However, carbon offsets are not compliant with the Paris Agreement (*see Box 1*).[43]

In 2019, **Lufthansa** and **Swiss International Air Lines** began offering passengers the option to reduce their carbon footprints by selecting sustainable aviation fuel when booking flights.[44] However, customer willingness to pay for voluntary aviation offsets remains low, and thus emission reductions from offsets are also limited.[45]

It is critical to complement "*Improve*" strategies in the aviation sector with appropriate "*Avoid*" and "*Shift*" measures.[46] Technology improvements and improved air traffic management will still result in an increase in aviation emissions. Thus, it is urgent to also implement measures that avoid unnecessary air travel and shift demand to more sustainable modes.[47]

The optimisation of complementary transit modes such as high-speed rail is reducing the demand for air travel in some countries, but additional investments and incentives are needed to make a global impact. Collaborative planning between aviation and rail systems (including high-speed and overnight rail services) can help drive the use of these more energy-efficient modes for shorter trips, meet greenhouse gas reduction targets and reduce costs in emission trading schemes (*see Section 3.4 on Passenger and Freight Railway*).

Flygskam (Swedish for "flight-shame", which describes unease about flying by environmentally conscious travellers) emerged as a reaction to the failure of governments to regulate the aviation industry, and the resulting increase in emissions.48 In **Sweden**, the movement led to seven consecutive months of reductions in the number of air travel passengers and to a total annual decline of 4% in 2019.[49]

- A flight-shame analysis by **Citigroup** suggested that rising attention to the climate impacts of flying could create growing pressure for airlines to offset emissions, and thereby raise industry costs; the analysis noted that carbon offsets cannot be correlated to real emission reductions from aviation.[50]

In 2020, **Sweden** proposed launching sleeper train services to **Belgium** and **Germany** to reduce dependence on aviation and minimise travel impacts.[51]

Revenues from **France**'s eco-tax on flights are to be spent on boosting local train services.[52]

Box 2. Impacts of the COVID-19 pandemic on aviation

The impacts of the pandemic on international flight capacity ranged from an estimated 37% reduction in Africa to 72% in Asia, although this near-term drop in flights is not expected to greatly alter emission trajectories. The global airline industry is being reshaped by the pandemic, which will likely affect air travel provision and consumer behaviour for years to come. Impacts to aviation during 2020 included a global reduction in airline capacity from 55% to 64%, an overall reduction in passengers from 1.18 billion to 1.39 billion, and gross operating losses of USD 214 billion to USD 252 billion (*see Figure 6*).

Economic recovery packages are reshaping discussions among airlines and governments on bailouts, taxes, fuel mandates and sustainability conditionalities. Green and equitable recovery packages to rationalise subsidies and internalise aviation externalities can help to create more efficient aviation policies and infrastructure in line with climate action goals. In many countries, governments supported the aviation industry with direct and indirect subsidies as well as special regulations.

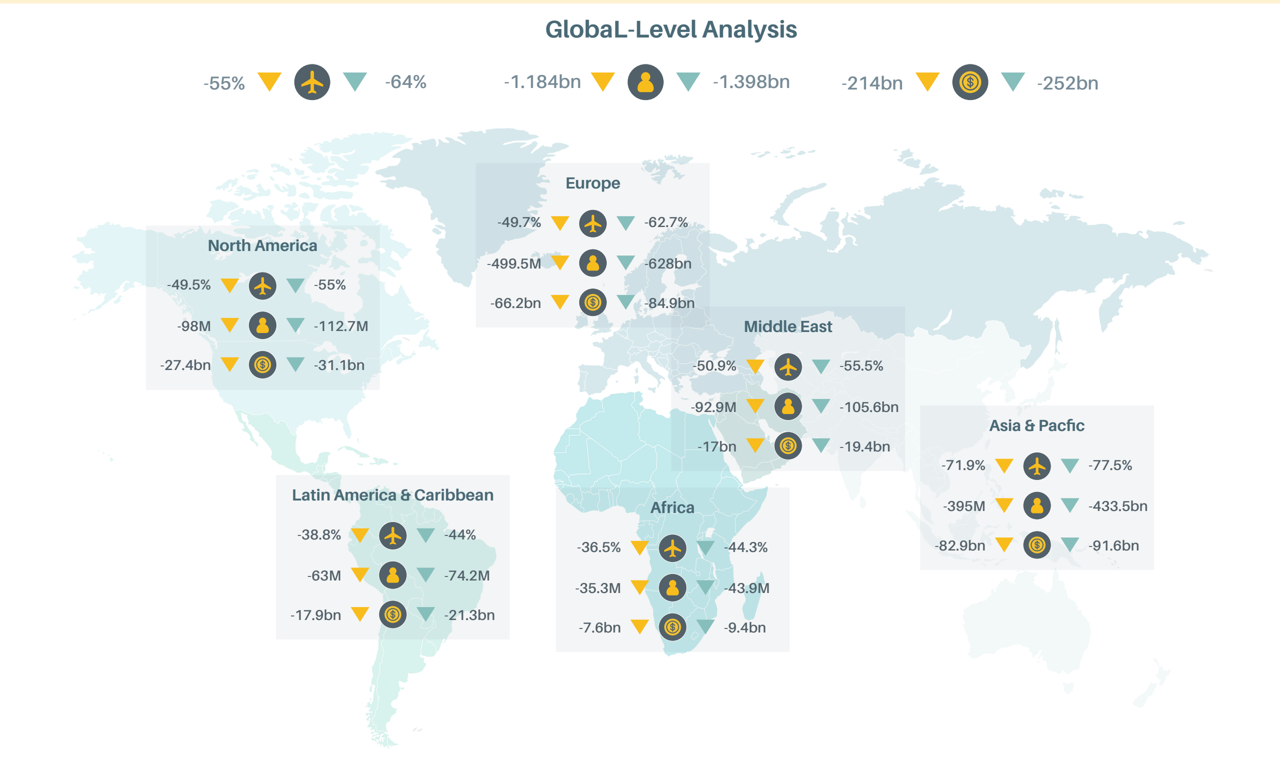
- **Austrian Airlines** was granted a EUR 600 million (USD 730 million) bailout in July 2020, subject to the airline reducing its total emissions 30% below 2005 levels by 2030.
- In **France**, a EUR 7 billion (USD 8.5 billion) state loan for **Air France** approved in May 2020 was contingent on the airline becoming more eco-friendly, including cutting domestic flights in favour of rail.
- However, other governments provided support to the airline industry without environmental conditions (e.g., **Germany**'s EUR 8 billion (USD 9.7 billion) package), missing an opportunity to improve sustainability.

The large impact of the COVID-19 pandemic on commercial aviation operations is likely to reduce the prioritisation of aviation policies on climate change – which were increasing before the pandemic – in favour of maintaining air connectivity for economic activity.[53] Despite the reduced emissions due to policies restricting air travel, the pandemic has put some aviation-related climate policies at risk.

The price of carbon in the EU's Emission Trading Scheme (which covers aviation) dropped almost 40% in March 2020 to a near two-year low of just above EUR 15 (USD 18) per tonne of CO_2, before bouncing back to EUR 22 (USD 26) per tonne by June 2020. Moreover, the proposal to the ICAO to use CO_2 emissions levels of 2019 (rather than averaging 2019-2020 levels) as the CORSIA baseline will have negative impacts for the adoption of ambitious climate targets.

Source: See endnote 3 for this section.

Figure 6. Impacts of the COVID-19 pandemic on international passenger traffic, 2020



Initiatives supporting low carbon aviation

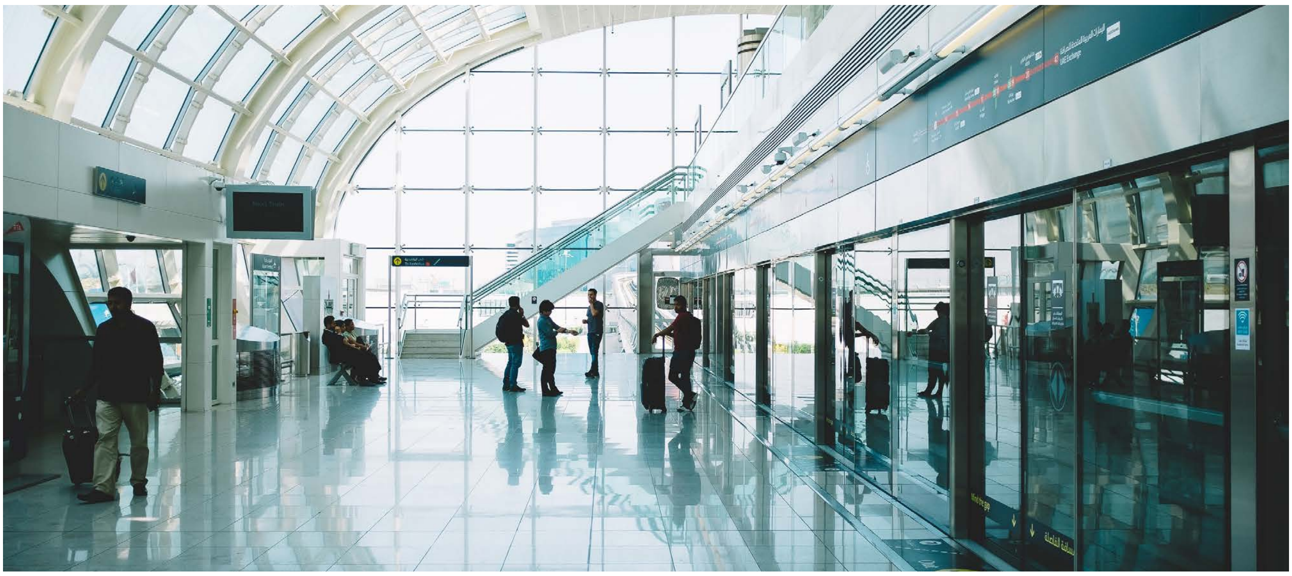
- The **International Coalition for Sustainable Aviation**, representing millions of non-profit organisations, works to reduce pollution from air travel and is the only environmental civil society group accredited as an observer by the ICAO.[54]
- The **International Council on Clean Transportation** works to ensure that environmental policy for the aviation sector is informed by high-quality, transparent analysis of the environmental performance of aircraft and airlines, a goal pursued through research on aircraft technology, airline fuel efficiency, environmental standard design and the use of alternative fuels in aviation.[55]
- **Sustainable Aviation**, launched in 2005, is a world-first long-term strategy that brings together major UK airlines, airports, manufacturers, air navigation service providers and key business partners to ensure a cleaner, quieter, smarter future for UK aviation.[56]
- **Transport & Environment** campaigns with members of the International Coalition for Sustainable Aviation and others to call for ambitious global and regional targets to reduce emissions from aviation, for full inclusion of aviation in the EU's strategy to meet its reduction targets and for removing exemptions on fuel taxation and value-added tax for airlines in the EU.[57]

Key indicators

	2018*	2019*	Change
Policy Landscape Indicators			
Carbon-neutral airports (and above) (# of airports)	62 (2019)	64 (2020)	+3.2%
Market Development Indicators			
Passenger-kilometres flown (millions)	8,329,776	8,679,621	+4.20%
Available seat-kilometres (millions)	10,174,828	10,519,174	+3.38%
Passenger load factor (%)	81.9%	82.5%	+0.73%
Freight and mail tonne-kilometres (millions)	262,333	253,982	-3.18%
Available freight tonne kilometres (millions)	532,000	543,717	+2.20%
Freight load factor (%)	49.3%	46.7%	-5.27%

(*) Data are for the indicated year unless noted otherwise.

Source: See endnote 58 for this section.



In Practice: Additional Policy Measures

Policy targets set

Sustainable aviation fuels

- Aspirational biofuel mandates – such as 30% targets proposed by Finland and Norway – are being complemented by advances in electricity-based fuels.[59]
- Electro-fuels could help to lower aviation emissions if strict sustainability criteria are observed, but they are significantly more expensive than fossil fuels and thus require sustained policy support.[60]
- In 2019, **British Airways** announced plans to build a plant to transform plastic waste into sustainable fuel, with a goal to reduce greenhouse gas emissions 70%.[61]
- **Boeing** flew a 787 Dreamliner delivery flight for EgyptAir powered entirely by agriculturally sourced biofuel, travelling more than 10,000 kilometres from Seattle to Cairo in July 2019.[62]

Air network efficiencies

- In 2018, the **African Union** launched the Single African Air Transport Market, which could help improve the efficiency of intra-continental trips and avoid inefficient routings to Africa via Europe.[63]
- While more efficient routing leads to shorter flight times, it may also lead to more flights, as airlines have incentives to keep planes in the air for as long as possible. To achieve positive impacts, routings must be climate efficient as well as time efficient.[64]

Airport expansion planning

- In 2019, France's environment authority asked planners of the **Marseille** airport expansion to reconcile increased flights with the country's national target for net zero emissions by 2050.[65]
- The proposed expansion of **London Heathrow** airport was ruled unlawful in February 2020 for its alleged failure to consider Paris Agreement commitments; this ruling was subsequently overturned by the UK's supreme court in December 2020.[66]
- Planned expansions at **Bristol**, **London Stansted** and **Rome Fiumicino** airports have been cancelled due to environmental concerns and opposition related to the need to achieve climate commitments.[67]
- While some cities scaled back airport expansion plans (including **Leeds**, **New York** and **Paris**), a number of other cities continued expansion plans and projects (including **Belgrade**, **Helsinki** and **Taipei**), blunting the emission reduction impacts of revised or cancelled expansion efforts.[68]

Policy measures implemented

Electrification

- In 2019, Scandinavian regional airline **Widerøe** partnered with **Rolls Royce** to electrify the airline's regional fleet of more than 30 planes by 2030.[69]
- In 2019, the **US** Department of Energy pledged up to USD 55 million to develop low-cost electric engine technology/powertrain systems.[70]
- The first fully electric commercial aircraft, a six-seated seaplane, completed a 15-minute test flight in Canada in 2019.[71]
- In 2020, the European Aviation Safety Agency granted the first certification for an electric aircraft, a two-seater capable of up to 80 minutes of flight, built by a Slovenia-based aerospace company.[72]
- Germany's Aviation Research Program has dedicated EUR 25 million (USD 30 million) between 2020 and 2024 to hydrogen technologies to develop hybrid-electric aviation.[73]

"Carbon-neutral" airport facilities

- In 2019, airport facilities in **Quito** (Ecuador), **San Diego** (California, USA) and 11 airports in **Europe** became newly accredited "carbon-neutral" airports, bringing the global total to 62 airports in 2020, up 27% from 2018.[74]

Annex: Methodological Note

Data usage

Time period for data:
The report strives to utilise the most recent publicly available data and information just prior to the time of publication (as of 31 May 2021). The figures in the report were developed between September and December 2020 using the most recent data available.

Secondary data:
SLOCAT relies on secondary data and information collected and provided by SLOCAT partners and other entities and does not make use of any internal modelling tools.

Data on sustainable mobility: A call to action

The report benefits directly from data collected by a wide range of stakeholders working in different areas of transport.

Data are important for providing a comprehensive picture of the status of sustainable, low carbon transport and are essential for both policy and investment decision making. In these times of change, it is critical to upgrade data and policy collection and interpretation capacities to better understand progress and the hurdles that must be addressed.

The data limitations mentioned below are not new. Obtaining regular, reliable and public data across regions and transport modes remains an outstanding issue. When an increasing number of stakeholders are collecting data and policy information, more and better open-access data and capacity building efforts for data interpretation are supported by many multi-stakeholder partnerships in the sustainable, low carbon movement.

If you share our passion for open-access data and knowledge towards greater impact on policy and investment decision making worldwide and/or would like to contribute data or knowledge to our collective efforts on this report, **please reach out to the research team in the SLOCAT Secretariat at tcc-gsr@slocatpartnership.org**.

Specific data used in this report

Data on emissions

The data in this edition of the report point to the direct carbon emissions from transport activity; they do not cover the indirect emissions and land-use impacts associated with certain modes of transport. The report primarily utilises CO_2 emission data compiled in the Emissions Database for Global Atmospheric Research (EDGAR) from the Joint Research Centre of the European Commission, as this represents the most recent, comprehensive dataset on transport CO_2 emissions. However, this global dataset does not convey in full detail the unique situations of individual countries.

EDGAR provides estimates for fossil CO_2 emissions from all anthropogenic activities with the exception of land use, land-use change, forestry and the large-scale burning of biomass. The main activities covered are CO_2 emissions emitted by the power sector (i.e., power and heat genertion plants), by other industrial combustion (i.e., combustion for industrial manufacturing and fuel production) and by buildings and other activities such as industrial process emissions, agricultural soils and waste. Transport activities covered within EDGAR include road transport, non-road transport, domestic aviation, and inland waterways on a country level, as well as international aviation and shipping.[1]

For the world, regions and countries, the CO_2 emission data (provided by EDGAR) span through 2019. In a few places in the report, CO_2 data for 2020 are shown to illustrate the impact of the COVID-19 pandemic; however, these data are based on a different methodology than the EDGAR dataset and should not be compared directly with the data from previous years.

The latest CO_2 emission data for individual transport modes are for 2018 and have been compiled only at the global level. For passenger and freight transport, the data on global CO_2 emissions are for 2017, as this is the latest year with robust data. Data on passenger activity (passenger-kilometres) and freight activity (tonne-kilometres) – provided mainly in the country fact sheets – are based on the latest available year, as indicated in the report analysis.

Information on greenhouse gas emissions – provided in CO_2 equivalent (CO_{2eq}) – include not only CO_2 but also methane, nitrous oxide, and industrial gases such as hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride.[2] These data are less up-to-date. As of 31 May 2021, data on greenhouse gas emissions were not readily available for the period 2019-2020. In some cases, additional data sources were used to provide detailed information about other climate pollutants besides CO_2.

All data on CO_2 and other greenhouse gas emissions, as well as CO_{2eq}, are provided in metric tonnes.

Data on car ownership

Information on car ownership rates is based on a global dataset from the International Organization of Motor Vehicle Manufacturers (OICA), with the latest release (as of 31 May 2021) dating from 2015.[3] Although newer information is available for some individual countries, using these data would hinder accurate global comparisons. Data on passenger and commercial vehicle sales were available only up to 2019.

Policy landscape data

The policy-related information presented in this report is not intended to be comprehensive. The data for the policy landscape indicators provided in Section 3 were gathered through desk research unless otherwise indicated. Barriers to accessing such information include language and limited availability of information through online media (e.g., websites, press releases and news articles).

Data in country fact sheets

Information in the fact sheets is based on desk research and on contributions from the national focal points. The data were collected to the best of the authors' knowledge and based on data availability, and thus may not be complete or show the most recent status. When no information was available for a given indicator, the term "Not available" is used.

Data gaps

Major data gaps exist in areas where there is no globally accepted data collection methodology. For example, the mapping of cycling and walking infrastructure is not currently done in all regions. Also, the modal share can be surveyed through different methods, leading to inconsistencies in available data. In addition, data on paratransit (informal transport), a predominant form of transport in many parts of the world, are largely lacking. This results in an incomplete picture of the impact of transport on climate change and sustainable development.

Methodological approach

Countries and regions

The report follows the M49 Standard of the United Nations Statistics Division.[4] In total, 196 countries have official United Nations membership and are also party to the United Nations Framework Convention on Climate Change. The available data have been put in a common structure for the United Nations member countries, regions and income groups to enable a consistent assessment. Income groups are based on the World Bank's classification of 2019.[5]

Economic calculations

The per capita and gross domestic product (GDP) calculations are based on the United Nations World Population Prospects 2019 and on World Bank GDP data using constant 2010 USD.[6]

Spatial and temporal scales

The geographic scale (global, national, city-level, etc.) as well as time scale (annual, monthly, daily) used in this report depends largely on the available dataset, as noted in the relevant figures and text. The detailed data forming the basis of the calculations and analysis are provided in the SLOCAT Transport Knowledge Base.[7]

Criteria for selection

The report covers policies, targets, emission reductions (achieved or envisioned) and market measures. To merit inclusion in the analysis, the policies, projects and trends must have been announced or completed between 2018 and 2020. Significant developments from January through May 2021 were included when deemed relevant, with the understanding that the next edition of the *Transport and Climate Change Global Status Report* will cover a period starting in 2021.

Pre- and post-COVID-19 pandemic trends

The year 2020 was pivotal for the world, and the COVID-19 pandemic has had substantial impacts on many of the transport trends monitored in this report. This edition attempts to differentiate between long-term trends and impacts due to the pandemic. To the extent possible, the analysis notes "pre-pandemic" (up to the end of 2019 or latest by February 2020) and "during pandemic" trends (starting in March 2020 until the end of 2020), as in some cases the pandemic led to reversals in long-term trends, at least for a specific period of time. In each section, a box describes the impacts that the pandemic has had on specific regions and sub-sectors.

Assembling the report

Global Strategy Team

This edition of the report was guided by a global strategy team consisting of 20 experts in the field who provided inputs over the span of six meetings between September 2019 and October 2020. Additionally, small group consultations were organised in February 2021, following the peer review process.

Authors and contributors

The report was collaboratively drafted by 22 authors and contributors from 16 organisations, led by the SLOCAT Secretariat. This includes additions and high-level inputs from the copy editor and from the special advisor who also co-authored the Executive Summary. Authors researched and compiled relevant facts and figures for the five sections of the report, including the Focus Features, with supporting review and inputs from several other organisations.

Peer review: A peer review process was carried out from 18 December 2020 to 20 January 2021 with 1,700 comments received from 74 reviewers. Each comment was individually reviewed by the SLOCAT Secretariat and considered in finalising the report.

National focal points: The report benefited from the contributions of voluntary national focal points, or experts from various regions and countries who have been essential to overcome language and information barriers. A public call for participation to provide information on policies and data resulted in several hundred initial registrations. Out of these registrations, 78 national focal points provided inputs through a first survey from 24 January to 3 February 2020; and through a second survey (focused on the country fact sheets) from 6 to 30 August 2020. All national focal points that contributed to the surveys are listed in the Acknowledgements.

Endnotes

3.10 Aviation

1 International Civil Aviation Organization (ICAO) (2018), "Solid passenger traffic growth and moderate air cargo demand 2018", 31 December, https://www.icao.int/Newsroom/Pages/Solid-passenger-traffic-growth-and-moderate-air-cargo-demand-in-2018.aspx.

2 H. Fearnehough, C. Warnecke and T. Day (2019), "Robust eligibility restrictions for offset credits are needed for CORSIA to truly compensate for the growth in aviation's carbon emissions", New Climate Institute, 25 February, https://newclimate.org/2019/02/25/robust-eligibility-restrictions-for-offset-credits-are-needed-for-corsia-to-truly-compensate-for-the-growth-in-aviations-carbon-emissions-2.

3 ICAO (2020), *Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis*, Air Transport Bureau, Montreal, https://www.icao.int/sustainability/Documents/COVID-19/ICAO%20COVID%202020%2005%2025%20Economic%20Impact.pdf. Box from the following sources: ICAO, "Economic impacts of COVID-19 on civil aviation", https://www.icao.int/sustainability/Pages/Economic-Impacts-of-COVID-19.aspx (accessed 31 May 2021); reshaping discussions from A. Murphy, Transport and Environment, personal communication with SLOCAT Partnership on Sustainable, Low Carbon Transport, August 2020; International Institute for Sustainable Development (2020), "Climate conditions for Austrian Airlines bailout", 1 July, https://www.iisd.org/sustainable-recovery/news/climate-conditions-for-austrian-airlines-bailout; E. Bannon (2020), "Austrian Airlines 'bailout' climate conditions explained", Transport and Environment, 30 June, https://www.transportenvironment.org/publications/austrian-airlines-bailout-climate-conditions-explained; BBC News (2020), "Coronavirus aid: Air France 'must cut domestic flights to get state loan'", 4 May, https://www.bbc.com/news/world-europe-52527517; C. Farand (2020), "German environment minister defends airline bailout, promises green recovery", Climate Home News, 27 April, https://www.climatechangenews.com/2020/04/27/german-environment-minister-defends-airline-bailout-promises-green-recovery; M. Abate, P. Christidis and A. J. Purwanto (2020), "Government support to airlines in the aftermath of the COVID-19 pandemic," *Journal of Air Transport Management*, Vol. 89, Elsevier Ltd, https://doi.org/10.1016/j.jairtraman.2020.101931. Figure 6 from ICAO, "Economic impacts of COVID-19 on civil aviation", op. cit. this note.

4 L. Phillips (2020), "Airlines brace for climate strings attached to coronavirus bailouts", Politico, 17 April, https://www.politico.eu/article/airlines-brace-for-climate-strings-attached-to-covid19-coronavirus-bailouts; E. Bannon (2020), "Air France's bailout 'climate conditions' explained", Transport and Environment, 3 June, https://www.transportenvironment.org/publications/air-frances-bailout-climate-conditions-explained.

5 Box from the following sources: ICAO, "2. What is CORSIA and how does it work?", https://www.icao.int/environmental-protection/Pages/A39_CORSIA_FAQ2.aspx (accessed 31 May 2021); L. Harper (2020), "CORSIA airline emissions baseline to exclude 2020 data, says ICAO", Flight Global, 1 July, https://www.flightglobal.com/strategy/corsia-airline-emissions-baseline-to-exclude-2020-data-says-icao/139081.article.

6 Figure 1 from ICAO, op. cit. note 1; International Air Transport Association (IATA) (2019), *World Air Transport Statistics 2019*, Geneva, https://go.updates.iata.org/l/123902/2019-06-13/839xw4.

7 Ibid.

8 Ibid.

9 J. Teter (2020), *Aviation*, International Energy Agency (IEA), Paris, https://www.iea.org/reports/aviation.

10 E. Bannon (2016), "Airbus ruling shows it's high time to stop the aviation subsidies binge, says NGO", Transport and Environment, 22 September, https://www.transportenvironment.org/press/airbus-ruling-shows-it%E2%80%99s-high-time-stop-aviation-subsidies-binge-says-ngo.

11 E. Bannon (2019), "Leaked European Commission study on aviation taxes", Transport and Environment, 13 May, https://www.transportenvironment.org/publications/leaked-european-commission-study-aviation-taxes.

12 Renewable Energy Policy Network for the 21st Century (REN21) (2020), *Renewables 2020 Global Status Report*, Paris, https://www.ren21.net/wp-content/uploads/2019/05/gsr_2020_full_report_en.pdf.

13 Z. Radosavljevic (2017), "E-fuels may be an option for aviation but not road transport, study finds", EURACTIV, 1 December, https://www.euractiv.com/section/aviation/news/e-fuels-may-be-an-option-for-aviation-but-not-road-transport-study-finds; J. Larsson et al. (2019), "International and national climate policies for aviation: A review," *Climate Policy*, Vol. 19/6, Taylor and Francis Ltd., pp. 787-99, https://doi.org/10.1080/14693062.2018.1562871.

14 A. Murphy (2020), *Making Aviation Fuel Mandates Sustainable*, Transport and Environment, Brussels, https://www.transportenvironment.org/sites/te/files/publications/2020_12_Aviation_SAF_mandates_rating_final.pdf.

15 C. Mestre (2020), *RED II National Implementation: How Member States Can Deliver Sustainable Advanced Transport Fuels*, Transport and Environment, Brussels, https://www.transportenvironment.org/sites/te/files/publications/2020_01_REDII_general_implementation_briefing.docx_.pdf.

16 Aviation Benefits Beyond Borders (2019), "Finland to join Nordic forefront in reducing emissions in aviation", 3 June, https://aviationbenefits.org/newswire/2019/06/finland-to-join-nordic-forefront-in-reducing-emissions-in-aviation; E. Huuhtanen (2019), "Investigation: new biofuel law puts palm oil products in your tank that Neste fights to claim as waste", News Now, 21 February, https://web.archive.org/web/20201112003056/https://newsnowfinland.fi/news-now-original/investigation-new-biofuel-law-puts-palm-oil-products-in-your-tank-that-neste-fights-to-claim-as-waste.

17 Connexion (2020), "France to oblige airlines to use green but expensive biofuel", 12 December, https://www.connexionfrance.com/French-news/France-to-oblige-airlines-to-use-green-but-expensive-biofuel.

18 German Federal Ministry for Economic Affairs and Energy (2020), *The National Hydrogen Strategy*, Berlin, https://www.bmbf.de/files/bmwi_Nationale%20Wasserstoffstrategie_Eng_s01.pdf.

19 C. Buyck (2019), "Sweden makes a sustainability leap", AIN Online, 13 June, https://www.ainonline.com/aviation-news/air-transport/2019-06-13/sweden-makes-sustainability-leap.

20 Teter, op. cit. note 9.

21 Ibid.

22 Ibid. Figure 2 from Climate Action Tracker (CAT) (2020), "International aviation", 23 July, https://climateactiontracker.org/sectors/aviation.

23 Ibid.

24 Figure 3 from Wikipedia Commons (2020), "File: Aviation efficiency (RPK per kg CO2).svg", 13 December, https://commons.wikimedia.org/w/index.php?curid=97500452, and from Figure 2 in D. S. Lee et al. (2021), "The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018," *Atmospheric Environment*, Vol. 244, Elsevier Ltd, p. 117834, https://doi.org/10.1016/j.atmosenv.2020.117834.

25 K. Seymour et al. (2020), "Fuel estimation in air transportation: Modeling global fuel consumption for commercial aviation," *Transportation Research Part D: Transport and Environment*, Vol. 88, Elsevier Ltd, p. 102528, https://doi.org/10.1016/j.trd.2020.102528; ICAO (2019), *2019 Environmental Report: Aviation and Environment - Destination Green, The Next Chapter*, Montreal, https://www.icao.int/environmental-protection/Documents.

26 Figure 4 from Wikipedia (2021), "Fuel economy in aircraft", 9 May, https://en.wikipedia.org/wiki/Fuel_economy_in_aircraft.

27 European Commission (2020), *Updated analysis of the non-CO2 climate impacts of aviation and potential policy measures pursuant to EU Emissions Trading System Directive Article 30(4)*, Brussels, https://eur-lex.europa.eu/resource.html?uri=cellar:7bc666c9-2d9c-11eb-b27b-01aa75ed71a1.0001.02/DOC_1&format=PDF.

28 R. Teoh et al.(2020), "Mitigating the climate forcing of aircraft contrails by small-scale diversions and technology adoption", *Environmental Science and Technology*, Vol. 54/5, pp. 2941-50, https://doi.org/10.1021/acs.est.9b05608.

29 European Commission (2019), *The European Green Deal*, Brussels, https://ec.europa.eu/info/sites/default/files/european-green-deal-communication_en.pdf.

30 European Commission , "EU Green Deal – Revision of the Energy Taxation Directive", https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12227-Revision-of-the-Energy-Tax-Directive- (accessed 31 May 31 2021).

31 FFC Aviation, "French eco tax" https://www.fccaviation.com/regulation/france/eco-tax (accessed 31 May 2021); H. Brandler (2021), "France and its new environmental eco tax on aviation", Business Traveller, 20 January, https://www.businesstraveller.com/features/france-and-its-new-environmental-eco-tax-on-aviation.

32 L. Ash (2019), "Germany's increased aviation taxes are set to come into force In April 2020", Simple Flying, 16 October, https://simpleflying.com/germany-aviation-tax-april-2020; Zoll, "Tax rates", https://www.zoll.de/DE/Fachthemen/Steuern/Verkehrsteuern/Luftverkehrsteuer/Grundsaetze-Besteuerung/Steuersaetze/steuersaetze_node.html (accessed 31 May 2021).

33 Majorca Daily Bulletin (2020), "Spanish government to introduce air transport tax", 20 February, https://www.majorcadailybulletin.com/news/international/2020/02/29/63393/spanish-government-introduce-air-transport-tax.html.

34 Le News (2020), "Swiss parliament votes in favour of flight tax", 6 December, https://lenews.ch/2020/06/12/swiss-parliament-votes-in-favour-of-flight-tax.

35 S. Laville (2020), "UK climate assembly: Tax frequent flyers and ban SUVs as part of Covid recovery", *The Guardian* (UK), 10 September, https://www.theguardian.com/world/2020/sep/10/uk-climate-assembly-economic-recovery-from-covid-must-tackle-global-heating.

36 Box from M. Cames et al. (2016), *How Additional Is the Clean Development Mechanism? Analysis of the Application of Current Tools and Proposed Alternatives*, Öko-Institut e.V., Berlin, https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf, and from Transport and Environment, "Flying and climate change", https://www.transportenvironment.org/what-we-do/flying-and-climate-change (accessed 31 May 2021).

37 IATA, "Working towards ambitious targets", https://www.iata.org/en/programs/environment/climate-change (accessed 31 May 2021); Airlines for America, "A4A's Climate Change Commitment", https://www.airlines.org/a4as-climate-change-commitment (accessed 31 May 2021).

38 CAT (2020), "International shipping and aviation emissions goals both 'critically insufficient'", 26 June, https://climateactiontracker.org/press/international-shipping-and-aviation-emissions-goals-both-critically-insufficient.

39 ICAO, "Trends in emissions that affect climate change", https://www.icao.int/environmental-protection/Pages/ClimateChange_Trends.aspx (accessed 31 May 2021)

40 Figure 5 from Ibid.

41 R. Cooper (2020), "Delta Airlines invests $1 billion in cutting carbon emissions", Climate Action, 18 February, www.climateaction.org/news/delta-air-lines-invests-

1-billion-in-cutting-carbon-emissions; Carbon Pulse (2020), "US airline Delta halves 2019 offset purchases due to COVID-19", 31 July, https://carbon-pulse.com/105523.

42 B. Kollmeyer (2019), "Easyjet's carbon-free pledge may win more green-conscious fliers", Market Watch, 19 November, https://www.marketwatch.com/story/easyjets-carbon-free-pledge-may-win-more-green-conscious-fliers-2019-11-19.

43 Cames et al., op. cit. note 36.

44 D. Holger (2019), "Lufthansa passengers can offset travel with green aviation fuel", Market Watch, 14 November, https://www.marketwatch.com/story/lufthansa-passengers-can-offset-travel-with-green-aviation-fuel-2019-11-14.

45 R.-C. Jou and T.-Y. Chen (2015), "Willingness to pay of air passengers for carbon-offset", *Sustainability*, Vol. 7, pp. 3071-85, https://doi.org/10.3390/su7033071.

46 A. Murphy (2018), "Roadmap to decarbonising European aviation", Transport and Environment, https://www.transportenvironment.org/sites/te/files/publications/2018_10_Aviation_decarbonisation_paper_final.pdf

47 Ibid.

48 The Guardian (UK) (2020), "The Guardian view on 'flight shame': Face it – life must change", 17 January, https://www.theguardian.com/commentisfree/2020/jan/17/the-guardian-view-on-flight-shaming-face-it-life-must-change.

49 I. Hervey-Bathurst (2019), "'Flygskam' – the very real impact of climate change on Swedish airlines", Schroders, 28 May, https://www.schroders.com/en/insights/economics/flygskam-the-very-real-impact-of-climate-change-on-swedish-airlines.

50 A. Kotoky (2019), "'Flight shame' is real, will make carbon big business, Citi says", Bloomberg, 22 October, https://www.bloomberg.com/news/articles/2019-10-23/-flight-shame-is-real-will-make-carbon-big-business-citi-says.

51 C. Duxbury (2020), "Sweden looks to break out of its northern isolation", Politico, 19 May, https://www.politico.eu/article/sweden-break-out-of-northern-isolation-trains-coronavirus.

52 L. Phillips (2020), "Airlines brace for climate strings attached to coronavirus bailouts", Politico, 17 April, https://www.politico.eu/article/airlines-brace-for-climate-strings-attached-to-covid19-coronavirus-bailouts.

53 CAT (2020), "International aviation", 23 July, https://climateactiontracker.org/sectors/aviation.

54 International Coalition for Sustainable Aviation, https://www.icsa-aviation.org (accessed 31 May 2021);

55 A. Kharina, D. Rutherford and M. Zeinali (2016), *Cost Assessment of Near- and Mid-term Technologies to Improve New Aircraft Fuel Efficiency*, International Council on Clean Transportation (ICCT), Washington, D.C., https://theicct.org/publications/cost-assessment-near-and-mid-term-technologies-improve-new-aircraft-fuel-efficiency; ICCT, "Airline fuel efficiency", https://theicct.org/spotlight/airline-fuel-efficiency (accessed 31 May 2021); ICCT, "Aircraft CO2 emissions", https://theicct.org/spotlight/aircraft-co2-emissions (accessed 31 May 2021); S. E. Takriti, N. Pavlenko and S. Searle (2017), *Mitigating International Aviation Emissions: Risks and Opportunities for Alternative Jet Fuels*, ICCT, Washington, D.C., https://theicct.org/publications/mitigating-international-aviation-emissions-risks-and-opportunities-alternative-jet.

56 Sustainable Aviation, "Our mission", https://www.sustainableaviation.co.uk (accessed 31 May 2021).

57 Transport and Environment, "Flying and climate change", https://www.transportenvironment.org/what-we-do/flying-and-climate-change (accessed 31 May 2021).

58 Airport Carbon Accreditation (2021), "Accredited airports", https://airportco2.org/airports-across-the-world.html (accessed May 13, 2021); IATA (2019), *World Air Transport Statistics 2019*, Geneva, https://go.updates.iata.org/l/123902/2019-06-13/839xw4; IATA (2020), *World Air Transport Statistics 2020*, Geneva, https://www.iata.org/contentassets/a686ff624550453e8bf0c9b3f7f0ab26/wats-2020-mediakit.pdf.

59 E. C. Wormslev and M. K. Broberg (2020), *Sustainable Jet Fuel for Aviation: Nordic Perspectives on the Use of Advanced Sustainable Jet Fuel for Aviation – Update 2019*, Nordic Energy Research, https://www.nordicenergy.org/wp-content/uploads/2020/02/Sustainable-Jet-Fuel-Update-FinalNER.pdf.

60 C. C. Ambel (2017), *Electrofuels – What Role in EU Transport Decarbonization?* Transport and Environment, https://www.transportenvironment.org/sites/te/files/publications/2017_11_Briefing_electrofuels_final.pdf.

61 R. Cooper (2019), "British Airways submits proposal for plant which will turn waste into fuel", Climate Action, 23 August, http://www.climateaction.org/news/british-airways-submits-proposal-for-new-plant-which-will-turn-waste-into-f.

62 A. Curran (2019), "Boeing starts offering biofuel on delivery flights", Simple Flying, 24 July, https://simpleflying.com/boeing-biofuel-delivery-flights.

63 IATA, "The Single Africa Air Transport Market (SAATM)", https://www.iata.org/en/policy/business-freedom/saatm (accessed 31 May 2021); BBC News World Service (2017), "What will fix Africa's air transport?" 28 May, https://www.bbc.co.uk/programmes/p053bmtb.

64 Institute of Atmospheric Physics, "Reduction of air traffic climate impact", https://www.dlr.de/pa/en/desktopdefault.aspx/tabid-4618/7598_read-11401 (accessed 31 May 2021).

65 M. Darby (2019), "Marseille airport expansion stalled on climate grounds", Climate Home News, 30 August, https://www.climatechangenews.com/2019/07/30/marseille-airport-expansion-stalled-climate-grounds.

66 P. Cooke (2020), "UK's Heathrow airport expansion ruled unlawful over climate change", Climate Home News, 27 February, https://www.climatechangenews.com/2020/02/27/uks-heathrow-airport-expansion-ruled-unlawful-climate-change; D. Carrington (2020), "Top UK court overturns block on Heathrow's third runway", *The Guardian* (UK), 16 December, https://www.theguardian.com/environment/2020/dec/16/top-uk-court-overturns-block-on-heathrows-third-runway.

67 M. Taylor (2021), "Expansion of English airports could threaten climate commitments – report", *The Guardian* (UK), 21 May, https://www.theguardian.com/environment/2021/may/21/expansion-of-english-airports-could-threaten-climate-commitments-report; AFP (2019), "Rome Fiumicino's fourth runway plan rejected over environmental fears", The Local, 29 October, https://www.thelocal.it/20191029/rome-fiumicinos-fourth-runway-plan-rejected-over-environmental-fears/.

68 Z. Phillips (2021), "How 7 global airport projects are faring during the pandemic", Construction Dive, 5 May, https://www.constructiondive.com/news/how-7-global-airport-projects-are-faring-during-the-pandemic/599318.

69 D. Zimmatore (2019), "Norwegian airline Widerøe teams with Rolls-Royce to research zero emission flights", Climate Action, 3 September, http://www.climateaction.org/news/norwegian-airline-widere-teams-with-rolls-royce-to-research-zero-emission-f.

70 US Department of Energy (2019), "Department of Energy announces $55 million in funding for electric aviation program", 17 December, https://www.energy.gov/articles/department-energy-announces-55-million-funding-electric-aviation-programs.

71 The Guardian (UK) (2019), "World's first fully electric commercial aircraft takes flight in Canada", 10 December, https://www.theguardian.com/world/2019/dec/11/worlds-first-fully-electric-commercial-aircraft-takes-flight-in-canada.

72 S. Morgan (2020), "Electric plane certified by EU regulator in world-first", EURACTIV, 12 June, https://www.euractiv.com/section/aviation/news/electric-plane-certified-by-eu-regulator-in-world-first.

73 German Federal Ministry for Economic Affairs and Energy, op. cit. note 18.

74 Airport Carbon Accreditation, op. cit. note 58.

Annex: Methodological Note

1 M. Crippa et al. (2020), *Fossil CO2 Emissions of All World Countries, JRC Science for Policy Report*, Publications Office of the European Union, Luxembourg, https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/fossil-co2-emissions-all-world-countries-2020-report.

2 US Energy Information Administration (2020), "Energy and the environment explained: Greenhouse gases," https://www.eia.gov/energyexplained/energy-and-the-environment/greenhouse-gases.php (accessed 14 April 2021).

3 International Organization of Motor Vehicle Manufacturers (OICA), "Definitions", https://www.oica.net/wp-content/uploads/DEFINITIONS-VEHICLE-IN-USE1.pdf (accessed 20 May 2021).

4 United Nations Statistics Division, "Standard country or area codes for statistical use (M49)", https://unstats.un.org/unsd/methodology/m49 (accessed 20 May 2021).

5 World Bank (2021), "World Bank Country and Lending Groups", https://datahelpdesk.worldbank.org/knowledgebase/articles/906519 (accessed 20 May 2021).

6 United Nations (2019), "World Population Prospects 2019", https://population.un.org/wpp (accessed 20 May 2021); World Bank, "GDP (constant 2010 US$)", http://data.worldbank.org/indicator/NY.GDP.MKTP.KD (accessed 20 May 2021).

7 SLOCAT (2021), "Transport Knowledge Base", https://slocat.net/our-work/knowledge-and-research/trakb (accessed 20 May 2021).

Tracking Trends in a Time of Change: The Need for Radical Action Towards Sustainable Transport Decarbonisation

SLOCAT Transport and Climate Change Global Status Report 2nd Edition

This report should be cited as:

SLOCAT (2021), *Tracking Trends in a Time of Change: The Need for Radical Action Towards Sustainable Transport Decarbonisation*, Transport and Climate Change Global Status Report - 2nd edition, www.tcc-gsr.com.

Data access and licensing:

The development of this report was led by Maruxa Cardama, Angel Cortez, Nicolas Cruz, Angela Enriquez, Emily Hosek, Karl Peet, Nikola Medimorec, Arturo Steinvorth and Alice Yiu from the secretariat of the SLOCAT Partnership.

For a full list of acknowledgements, please visit the the online page here.

Explore more online

Download the full report

Download the full endnotes

Contact us

SLOCAT Partnership on Sustainable, Low Carbon Transport

#TransportClimateStatus