Policy Brief

Airports and aviation emissions

The Airport Tracker as a tool for data-driven advocacy

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Key Messages

The aviation sector remains a major contributor to climate change and air pollution. Emissions are regaining their upward pre-pandemic trends consuming ever more of the shrinking climate budget.

This brief presents findings from the second update to the Airport Tracker: a global inventory of the environmental impact created by the world's 1300 busiest airports.

The updated Airport Tracker now includes 2023 data on the number of flights and emissions of CO_2 and local air pollutants for passenger, freight and private jet flights.

A relatively small number of airports in each market have an extremely outsized impact.

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Contributors and the Airport Tracker Project

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The Airport Tracker (www.airporttracker.org) project visualises the climate and air quality impact of the world's largest airports. We make this data available to help those working to limit the aviation sector's negative impacts and to provide transparency, accountability and comparability for global airport infrastructure-related emissions. The data provides policy-makers and campaigners with robust estimates of the climate and air quality impacts of existing airport capacity to inform discussions around proposed capacity expansions, and to better understand how the aviation industry can align with a climate-safe world.

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Abbreviations and acronyms

CO	Carbon Monoxide
CO_2	Carbon Dioxide
GHG	Greenhouse Gas
HC	Hydrocarbons
ICAO	International Civil Aviation Organization
LTO	Landing and Take-Off
NDC	Nationally Determined Contribution
NO_X	Nitrogen Oxides
$PM_{2.5}$	Particulate Matter 2.5
RPK	Revenue Passenger Kilometers
SAF	Sustainable Aviation Fuel

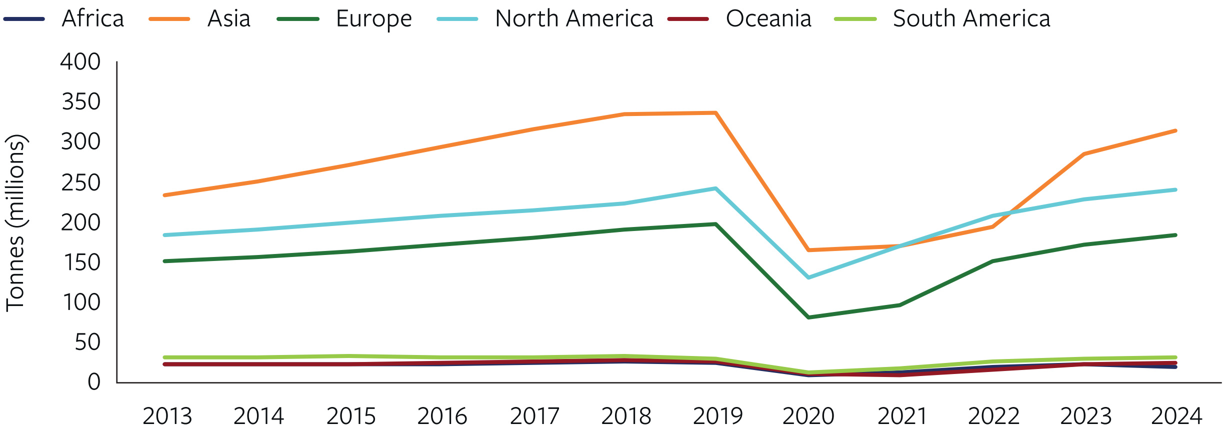
1 Aviation, climate and inequality: the case for better data

1.1 Aviation's climate footprint

When the Paris Agreement was adopted in 2015, governments around the world committed to limiting global warming to below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C (UNFCCC, 2015). We are well off track, with current policies projected to bring warming of 2.8°C (UNEP, 2025). While the Paris Agreement does not explicitly address international aviation, countries have an obligation to include carbon dioxide (CO_2) and non-CO_2 emissions from aviation in their Nationally Determined Contributions (NDCs) (Transport & Environment, 2021a; 2025b).

The aviation sector accounts for approximately 2.5% of global energy-related CO_2 emissions. If its non-CO_2 climate impacts are considered, it has been responsible for around 4% of global warming to date (Ritchie, 2024). This may seem modest compared to sectors such as electricity and heat and road transport, which were responsible for 30% and 12% respectively of global greenhouse gas emissions in 2021 (Ge, Friedrich and Vigna, 2024). However, unlike sectors that have begun to decarbonise and shift towards lower-carbon pathways, emissions from aviation have risen steadily following the Paris Agreement. The sector was hit hard by travel restrictions during the Covid-19 pandemic, leading to reduced emissions from 2020-2022. Despite some suggestions of fundamental market shifts eroding some sectors of demand – e.g. business travel (Julsrud and Kallbekken, 2025), by 2024 total aviation emissions were approaching pre-pandemic levels across all regions (Figure 1).

Figure 1 Annual CO_2 emissions from commercial aviation by region (millions of tonnes)



Source: OECD, processed by Our World in Data

Note: Includes emissions from both domestic and international aviation. International aviation emissions are assigned to the country of departure.

While emissions from aviation are rising again, several other key sectors are reducing their emissions. Among hard-to-abate sectors, between 2023 and 2024 the aviation sector saw the largest percentage increase in activity (10.4%) and emissions (6.4%) (Table 1; World Economic Forum, 2025).

Table 1 Change in activity and emissions across hard-to-abate sectors (2023–2024)

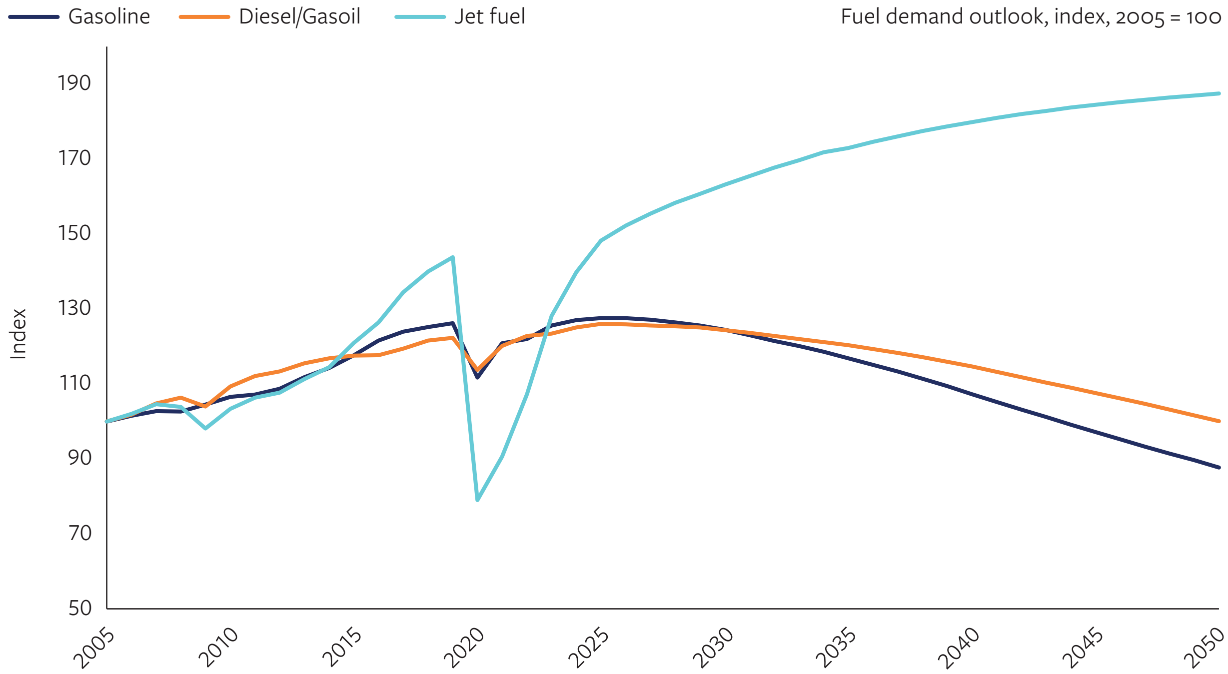
Sector	Activity	YoY change in activity (2024 vs 2023)	Emissions (Gt CO_2) and YoY change (2024 vs 2023)
Aviation	8.8 trillion revenue passenger-km (actual passenger traffic carried)	+10.4%	1.108 (+6.4%)
Shipping	121.7 trillion tonne-km (annual distance covered)	+5.5%	0.847 (+2.7%)
Trucking	35.1 trillion tonne-km (annual distance covered)	+1.3%	1.968 (+0.6%)
Steel	1,883 million tonnes (annual production)	-1.1%	2.750 (-0.4%)
Aluminium	113 million tonnes (annual production)	+4.6%	1.162 (+4.1%)
Cement	3,950 million tonnes (annual production)	-3.9%	2.324 (-3.5%)
Primary chemicals	754 million tonnes (annual production)	+3%	0.971 (+2.3%)
Oil and gas	Oil: 103 million barrels per day Gas: 411 billion cubic feet per day (annual production)	Oil: +4% Gas: +1.5%	5.100 (-6.4%)

Source: World Economic Forum (2025)

1.2 Drivers of aviation emissions

Aviation is almost exclusively powered by fossil fuels: in 2024, oil accounted for 99% of total aviation fuel consumption (IEA, 2025b). Thus, any growth in demand in the near term at least is intrinsically linked to an increase in fossil fuel consumption and GHG emissions. In the medium term, the growth in aviation fuel consumption is on a markedly different trajectory to other fossil fuel users: in the road transport sector, for example, decarbonisation measures such as electric vehicles and high-speed rail are starting to limit demand growth (IEA, 2025a). Figure 2 shows that aviation has been a key driver of overall oil demand growth since the Paris Agreement, and is projected to become even more so in the future (IEA, 2025a; 2025b).

Figure 2 Projected growth in fossil fuel-based jet fuel



Source: IATA (2025a)

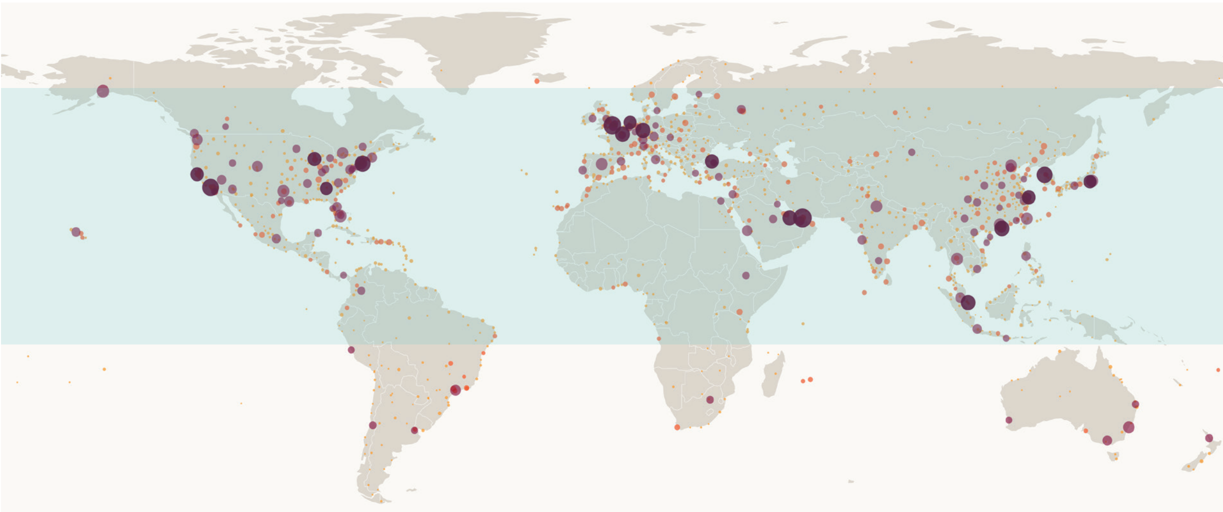
The sector's own high-growth scenario projects passenger demand could increase by 3.3% annually, from 9.0 trillion revenue passenger-kilometers (RPKs) in 2024 to 21.9 trillion RPKs in 2050 (IATA, 2026). Between now and 2050, aviation is projected to consume 15% of the remaining carbon budget associated with 1.7°C of warming (Zheng et al., 2025).

1.3 Aviation's unequal impacts

These global trends and drivers of aviation emissions tell only part of the story. The sector is also both a source and a creator of substantial environmental inequalities.

In terms of global climate, the emissions per region in Figure 1 and the distribution of airports in Figure 3 show how aviation's climate footprint is extremely unequally distributed across populations and regions. There is also substantial inequality across passengers and types of travel. Just 1% of the world's population is responsible for 50% of global emissions from commercial aviation (Gössling and Humpe, 2020).

Figure 3 Most major international airports lie within a clustered band running from North America to China



Source: Airport Tracker

Inequality is even sharper for the private aviation sector, i.e. private jets and turboprops (Sitompul and Rutherford, 2025). Although, at 4% of civil aviation activity in 2022, it is a relatively small contributor to the sector's overall activity (ibid.), private aviation is extremely carbon-intensive, emitting between five and 14 times more CO_2 per passenger than commercial flights (Transport & Environment, 2021b). Put another way, a four-hour private aviation flight is almost equal to the annual emissions of an average EU citizen (Transport & Environment, 2021b). This is particularly concerning as emissions from this sector are growing faster than those from commercial aviation (Transport & Environment, 2021b). Yet, private aviation has often remained largely invisible in climate debates and policy discussions, in part perhaps because until recently there have been limited GHG emissions inventories for this type of flying. A small minority of high net worth travellers are driving the increase in private aviation (Transport & Environment, 2021b).

Alongside the unequal contribution to global climate change, aircraft landing and take-off cycles (LTO) also generate highly localised air and noise pollution in and near airports (ICAO, 2025). While local authorities implement stricter air quality controls on sectors like road transport, aviation's emissions of air pollutants like nitrogen oxides (NO_X) and particulate matter ($PM_{2.5}$) remain largely overlooked. Since the people that live near airports are unlikely to be those who fly extremely often, these local impacts mirror global climate inequalities, where those least responsible are often the most affected.

1.4 The need for airport-level data

These global and local patterns highlight three aspects of aviation's climate and air pollution footprint: it is large, it is growing and it is unequal. However, understanding these trends at an aggregate level is not sufficient to inform effective action: we need to look deeper to identify where emissions are concentrated, and how they are shaped by specific infrastructure and operational decisions, to target mitigation strategies and inform local and national policy.

Historically, efforts to address these impacts and align the sector with global climate goals have been limited by a lack of transparent, publicly accessible emissions data at the airport level. This has constrained the ability of policy-makers, campaigners, industry representatives and other stakeholders to fully assess the impact of the aviation industry's growth and how airport infrastructure decisions around expansion may lock in future emissions (Pickard and Gençsü, 2021). Closing this information gap is particularly urgent given the long-lived nature of airport infrastructure.

Since launching in 2021 (presenting 2019 data), the Airport Tracker has sought to address these transparency gaps by providing a robust, publicly accessible evidence base on aviation emissions at the airport level. The latest update (with 2023 data) establishes a new post-pandemic baseline for aviation emissions, and includes more pollutants and more aircraft types. This policy brief provides context to the online tool and exploratory analysis of the newly available data. Section 2 examines how airports, in particular airport expansion, play a central role in shaping aviation's climate and air pollution impacts. Section 3 then outlines the Airport Tracker's evolution and presents this latest (third) update. Section 4 draws on this updated dataset to highlight key findings, including how emissions are distributed across regions, airports and flight types, and where impacts are most concentrated.

2 Airports: drivers of emissions and points of intervention

Airports are critical in shaping aviation activity, and thus the trajectories of GHGs, local air pollutants and noise emissions over decades. Absent measures to mitigate these harms (none exists at anywhere near the scale or efficacy to decouple activity from pollution), any expansion of airport capacity will drive growth in GHGs, and local air and noise pollution. This is why airport expansion is a key barrier to addressing the climate impact of aviation (Becken, 2025), both today and far into the future. To accommodate the projected growth in flight activity, airport authorities seek to add and expand terminals and runways. For example, in 2017 423 airports and 121 additional runways were planned or under construction (Stay Grounded, 2022). Put simply, existing airports facilitate demand growth (few operate at full capacity), while airport expansion drives this even further (Transport & Environment, 2025b). Investments in new runways, terminals and supporting infrastructure have a knock-on effect that drives increases in passenger, freight and private jet activity, and being long-lived assets, expanded capacity locks in higher levels of traffic and emissions for decades. Expansion also deepens reliance on oil-based fuels, further exposing countries to volatile energy markets – an increasingly significant risk in a period of heightened geopolitical instability.

In 2023, investment in airport projects was dominated by China, India and in particular the US (which was responsible for 22% of global investment in airports that year) (Becken, 2025). Taking these national statistics with examples of individual major airport expansion projects in countries like the UAE and the UK (Table A1.1) reveals the industry's push to even further entrench the global inequality in airport infrastructure and the contradiction in some governments' acknowledgement that airport emissions should be brought within broader climate goals while continuing to advance large-scale airport expansions.

Many industry airport expansion plans are fiercely contested by environment campaigners and some politicians, especially in Europe. Recent examples include:

- In France, the planned construction of a fourth terminal at Paris Charles de Gaulle Airport was cancelled by the government because it did not comply with climate and environmental protection objectives (Garric and Mandard, 2021).
- In the UK, the proposed third runway at the country's largest airport, London Heathrow, has been under consideration for more than a decade (Toth, 2025), with repeated challenges based on noise and air quality impacts and alignment with present and future GHG emissions reduction targets (London Assembly, 2025).[1]

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1 Analysis suggests that Heathrow's expansion will counteract any benefits achieved by the government's Clean Power Plan (CPP) within five years (Chapman, 2025). More broadly, proposed expansions at Heathrow, Gatwick and Luton would require a forest twice the size of London to offset the resulting emissions (Carbon Brief, 2025).

- In Spain, plans to expand Barcelona's El Prat Airport have faced major opposition on grounds of climate justice, public health, regional inequality and environmental damage (Stay Grounded, 2025). They have consistently been rejected by the local government (Polo, 2025).
- In the Netherlands, there is a long-running legal dispute over limiting the number of flights arriving to and leaving Amsterdam Schiphol Airport to reduce local environmental impacts (Gallagher, 2022; Meijer, 2024; DutchNews, 2026).

These cases illustrate the growing tension between airport expansion and climate and environmental commitments, and often between a pro-expansion aviation industry and national governments, and concerned local councils.

Airport operators are increasingly highlighting plans to monitor and mitigate their GHG emissions. While overdue, this push for transparency and clear awareness of their climate impacts from airport operators is welcome (its lack was a major reason for launching the original Airport Tracker). However, these plans overwhelmingly focus on actions like electrifying airport ground vehicles, improving terminal energy efficiency or sourcing renewable energy.[2] These types of actions tackle Scope 1 and 2 GHG emissions,[3] which typically constitute less than 10% of an airport's total climate impact (ACI, 2024). Most airport GHG plans largely ignore the 90% of climate impacts generated by Scope 3 emissions, in particular from aircraft burning aviation fuel (Figure 4). The industry-backed Airport Carbon Accreditation initiative reports that, as of March 2026, 650 airports had been accredited.[4] However, of these, just 30 achieved Level 5 Airport Carbon Accreditation, i.e. airports that have a plan to achieve net zero Scope 3 emissions by 2050.[5] That only 2.3% of airports included in the Airport Tracker have a plan to reduce GHG emissions is the result of significant delay by the industry to recognise its impact. Despite the GHG Protocol (the global authority on GHG accounting) publishing its Corporate Value Chain (Scope 3) guidance on how to monitor, report and reduce emissions in 2011,[6] Level 5 accreditation was only launched in December 2023.[7]

Finally, the economic rationale traditionally used to support airport expansion is also weakening. Emerging evidence shows that the benefits of increased air connectivity are more uneven than previously assumed. In Europe, for example, air connectivity drives GDP growth in only a limited number of regions (Chapman and Pot, 2025). These insights point to a gap in current aviation policy. Since technological solutions remain uncertain and the economic case for expansion is weakening, airports will increasingly come into focus as cities and other local authorities work to reduce emissions across all sectors. Regulators should acknowledge that managing airport capacity is one of the few strategic levers capable of ensuring aviation contributes meaningfully to achieving a net-zero society.

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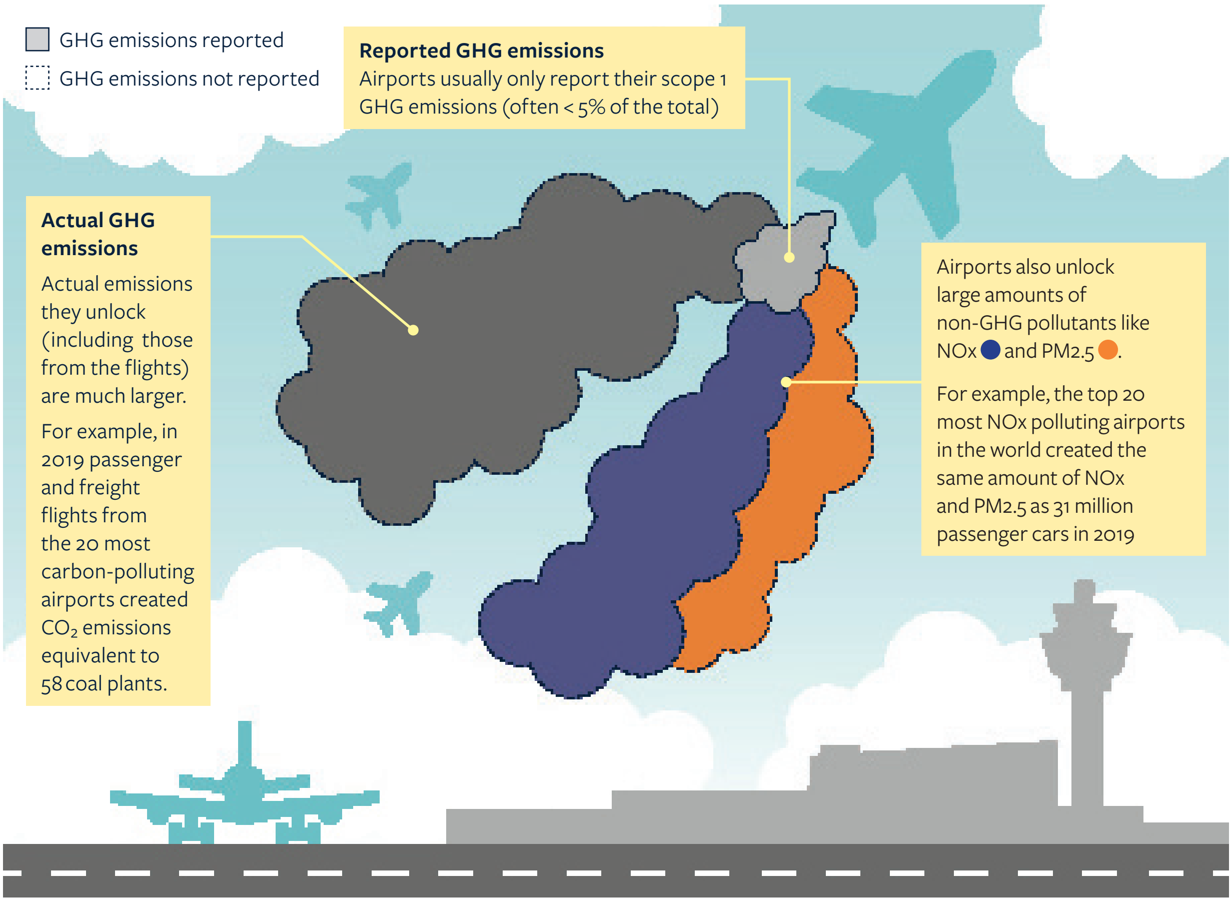
2 For example, the plans for JFK's new Terminal One include a 13,000 solar panel array (Port Authority, 2024).
3 Scope 1 refers to emissions from airport-owned or controlled sources, and Scope 2 refers to indirect emissions from the consumption of purchased energy (ACA, 2020).
4 www.airportcarbonaccreditation.org/accredited-airports/
5 www.airportcarbonaccreditation.org/about/7-levels-of-accreditation/level-5/
6 https://ghgprotocol.org/blog/looking-back-15-years-greenhouse-gas-accounting
7 www.airportcarbonaccreditation.org/about/the-story-so-far/

Figure 4 Airports' climate local air quality impacts are rarely fully reported



Source: Steadman and Pickard (2024)

Box 1 'Sustainable' aviation fuels cannot justify airport expansion

Many airports and national governments argue for airport expansion on the assumption that future fuels and technologies, such as 'Sustainable' Aviation Fuels (SAFs), hydrogen-powered aircraft and electric aircraft, will mitigate these emissions. The climate impact of these assumptions – like the UAE's voluntary target of 1% of aviation fuel supplied to national airports by 2031 to be 'sustainable' (UAE Ministry of Energy and Infrastructure, 2023) – needs to be critically assessed. Equal focus should be paid to the barriers to scaling up alternative fuels, such as high production costs and price premiums, limited policy support, weak long-term offtake commitments, bankability challenges and constraints on feedstock availability and sustainability (Ashrafkhanov and Collett-White, 2025). With this in mind, the UK's mandate for 10% of aviation fuel to be 'sustainable' by 2030 (UK Department of Transport, 2024) seems wildly optimistic given that today the figure is just 1.2% (Sulley, 2025). Equally, the sector's growth will outpace any savings that SAF will generate (Transport & Environment, 2025c). As a result, relying on these uncertain solutions to offset the emissions consequences of expansion is increasingly risky.

3 The evolution of the Airport Tracker

The combination of growing scrutiny of airport expansion and a lack of industry transparency on airports' environmental impacts highlights a broader need for reliable airport-specific emissions and pollution data. The Airport Tracker was developed to meet this need (see Box 1).

Box 2 The Airport Tracker: a tool to support the transition to a sustainable aviation sector

The Airport Tracker (airporttracker.org) is an interactive web-based tool that provides publicly accessible data on the environmental impacts of airport infrastructure and aircraft departing from airports around the world.

The first version of the Tracker, launched in 2021, showed CO_2 emissions from 99% of all passenger flights in 2019, with flights assigned to the airport they departed from. For the 1,300 largest airports globally, it presented a breakdown of total passenger-related emissions and emissions intensity for short-, medium- and long-haul flights. The analysis revealed that just 20 airports were responsible for 27% of CO_2 emissions from air passenger transport, and that 44 airports each generated more CO_2 over the course of a year than a coal-fired power station (Pickard and Gençsü, 2021).

The second edition, launched in 2024, expanded the Airport Tracker to include CO_2 emissions from freight movements alongside passenger traffic. It also incorporated the local air pollutants NO_X and $PM_{2.5}$ to provide to provide a broader picture of aviation's environmental footprint. We identified the airports that produced the most CO_2 emissions from freight and found that the 20 most polluting airports generated 87,000 tonnes of NO_X. London, Tokyo and Dubai were the cities most exposed to air pollution from aviation (Steadman and Pickard, 2024).

This brief accompanies the third edition of the Airport Tracker, which has been updated again to provide a more comprehensive picture of airport-related emissions. It focuses on 2023 data, which reflects the post-pandemic realities of the aviation industry and its resumption of year-on-year growth.[8] Table 2 summarises the key data updates introduced in this version and why they are important.

8 This latest update includes methodological enhancements to how the environmental impact of each flight was calculated, before the data was aggregated at the airport level. The approaches are similar, but the change in methodology means that the new data cannot be directly compared with that presented in previous editions. For more information on the enhanced methodology used in this update see the updated methodological note at www.airporttracker.org.

Table 2 What's new in the third Airport Tracker update

Phase 1 (2021)	Phase 2 (2024)	Phase 3 (2026)	Why this update is important
2019 data	**2019 data**	**2023 data:** Provides a credible post-pandemic benchmark for future trend analysis.	Ensures relevance and credibility among users such as researchers, activists and media, reflecting current trends in travel patterns, airport expansions and other policy developments.
Passenger flight CO_2 emissions	**Passenger and freight flight CO_2 emissions**	**Enhanced calculations for passenger, freight and private jet flight CO_2 emissions; and number of flights:** Including upstream (production) emissions and using flight-trajectory data provides more comprehensive CO_2 estimates. Adding private jets exposes a previously hidden segment of aviation.	Enhances transparency on who is responsible for emissions and provides campaigners with data on private aviation. This is particularly important for high-traffic executive airports and major hubs with large private jet operations.
	NO_X and $PM_{2.5}$	**NO_X, $PM_{2.5}$, hydrocarbons (HC) and carbon monoxide (CO):** Provides a more comprehensive picture of local air pollutants.	Increases awareness and transparency of local air pollution data, helping to quantify public health impacts and support advocacy by neighbourhood groups.

Together, these updates provide a comprehensive and up-to-date picture of airport-related climate and air quality impacts, strengthening the evidence base for policy action and public accountability. Including the latest emissions data, private jet operations and additional local air pollutants significantly expands the Airport Tracker's scope and enhances its relevance and credibility. Against the limited transparency provided by airports themselves, these improvements ensure that campaigners and other stakeholders can better understand the full environmental footprint of airports.

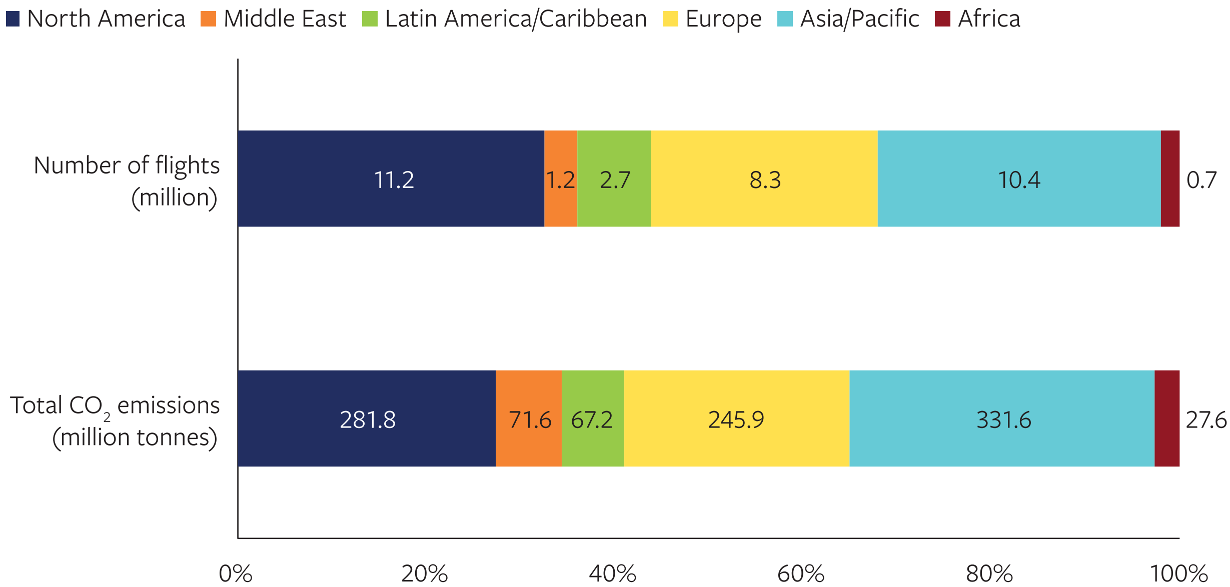
4 Structure of aviation emissions: what the data reveals

The updated Airport Tracker data offers new insights into how aviation emissions are structured across the global airport network. This section outlines key patterns.

4.1 Global distribution of emissions

Figure 5 shows the regional breakdown for the total number of flights (34.6 million) and total CO_2 emissions (1,026 million tonnes) in 2023 for the 1,300 airports included in the Airport Tracker. If aviation were a country, it would be the fifth largest national emitter.[9] Asia-Pacific (32% total emissions; 30% total flights), North America (27%; 33%) and Europe (24%; 24%) dominate, with each responsible for more than Latin America, the Middle East and Africa combined.

Figure 5 Regional breakdown of number of flights and CO_2 emissions, 2023



Looking at national breakdowns illustrates how the global aviation industry is highly concentrated in a small number of countries. Airports in the United States (25% total emissions, population 337 million) and China (13%, population 1.4 billion) are together responsible for nearly 40% of total CO_2 emissions. Airports in the remaining 18 of the 20 highest-emitting countries are each responsible for 1–4% of total emissions, together equalling the emissions from the United States

9 Compared to data from the Global Carbon Budget (Friedlingstein et al., 2025).

and China. The majority of these 20 countries are high-income, with only five classified as upper middle income (China, Türkiye, Brazil, Mexico and Thailand), and one (India) classified as lower middle income. Meanwhile, airports in the other 173 countries combined total 22% of global airport CO_2 emissions.

Table 3 Airport-level CO_2 emissions by country from all flight types in 2023

Rank	Country	CO_2 emissions (million tonnes)	% of total	Cumulative %
1	United States	259.4	25%	25%
2	China	138.2	13%	39%
3	United Kingdom	38.5	4%	43%
4	Japan	32.0	3%	46%
5	United Arab Emirates	31.1	3%	49%
6	Germany	29.0	3%	52%
7	India	27.6	3%	54%
8	Spain	24.7	2%	57%
9	France	23.6	2%	59%
10	Australia	22.0	2%	61%
11	Canada	22.0	2%	63%
12	Türkiye	20.9	2%	65%
13	South Korea	19.8	2%	67%
14	Russia	18.4	2%	69%
15	Brazil	17.8	2%	71%
16	Italy	16.1	2%	72%
17	Mexico	15.5	2%	74%
18	Singapore	14.3	1%	75%
19	Qatar	14.0	1%	77%
20	Thailand	13.7	1%	78%
Rest of world		226.9	22%	100%

4.2 Airport-level emissions

The concentration of emissions is even sharper when viewing individual airports. In 2023, total passenger, freight and private jet flights from the 20 highest-emitting airports created 280 million tonnes of CO_2 emissions, 27.3% of emissions from all 1,300 airports covered in the Airport Tracker. Eighteen of the 20 are in high-income countries, with eight in the United States alone.

This concentration is illustrated in Figure 5 for all flights and for individual sectors. Here, we see that just 100 airports are responsible for approximately two-thirds of total emissions (both for all flights and for passenger flights). In the freight sector, just 17 airports are responsible for half of all freight emissions, while 100 airports are responsible for 89% of the total.

The 20 highest-emitting airports overall and by sector are shown in Tables 4 and 8 respectively. Further detail on the 20 most-emitting airports by region are available in Appendix 2, Tables A2.1 to A2.6.

Given the need to reduce CO_2 emissions across all sectors of society to reach net zero, it is useful to compare these airport-level emissions to those created in other sectors. In previous versions of the Airport Tracker we compared airports to coal-fired power stations (average emissions of 4 million tonnes CO_2 per year). Using this metric, each of the airports listed in Table 4 equates to at least two coal-fired power stations and five airports each created emissions equivalent to four coal-fired power stations.

Another way to communicate the scale of airport-generated emissions is to compare them to those reported by major international cities (Table 5). Here we see that each airport is responsible for many times the emissions of relatively low-emitting cities like Stockholm and Miami, and that more than half of the airports on the list created more than twice the emissions of Paris, with three (Dubai, London Heathrow and Los Angeles) creating more than triple Paris' emissions. Tables 4 and 5 also show that the emissions of LAX alone were equivalent to 62% of all other emissions from the city of Los Angeles in 2023.

Figure 6 Cumulative emissions with increasing number of airports

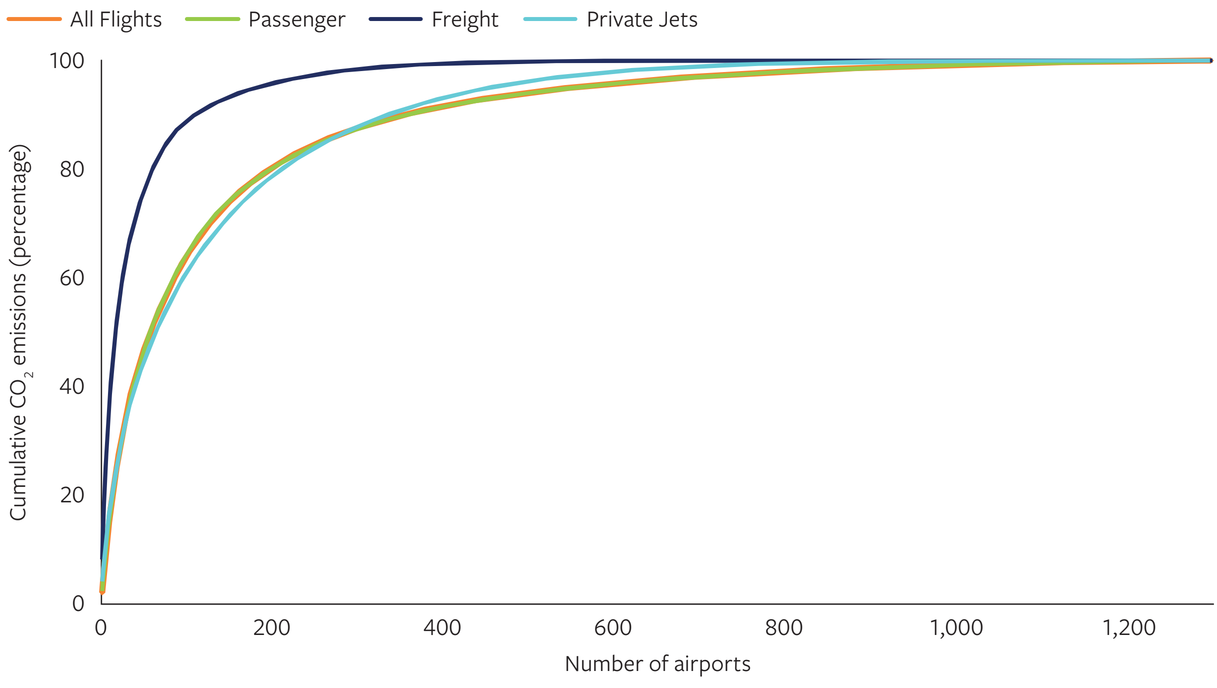


Table 4 The 20 airports with the largest CO_2 emissions from all flight types in 2023

Rank	Airport Name	Country/ Territory	ICAO Region	Total CO_2 emissions (million tonnes)
1	Dubai	United Arab Emirates	Middle East	23.2
2	London Heathrow	United Kingdom	Europe	21.0
3	Los Angeles	United States	North America	18.8
4	Seoul Incheon	South Korea	Asia/Pacific	16.8
5	New York John F. Kennedy	United States	North America	16.8
6	Hong Kong	China	Asia/Pacific	15.1
7	Paris Charles de Gaulle	France	Europe	14.7
8	Frankfurt	Germany	Europe	14.4
9	Singapore Changi	Singapore	Asia/Pacific	14.3
10	Doha Hamad	Qatar	Middle East	14.0
11	Istanbul	Türkiye	Europe	12.8
12	Shanghai Pudong	China	Asia/Pacific	12.4
13	Chicago O'Hare	United States	North America	12.4
14	San Francisco	United States	North America	11.9
15	Amsterdam Schiphol	Netherlands	Europe	11.0
16	Tokyo Haneda	Japan	Asia/Pacific	10.8
17	Atlanta Hartsfield-Jackson	United States	North America	10.6
18	Anchorage	United States	North America	9.9
19	Miami	United States	North America	9.7
20	Dallas/Fort Worth	United States	North America	9.4

Table 5 City-scale emissions, 2023

City	Non-aviation GHG emissions (million tonnes CO_2e)
Stockholm	1.1
Miami	3.1
Paris	6.2
Dar es Salaam	9.0
Buenos Aires	11.3
Rotterdam	16.3
Bengaluru	19.7
Los Angeles	30.5

Note: City emissions are calculated as BASIC+ Emissions minus emissions associated with aviation (Code II.4.3). Source: C40 CCLG (2025)

Another way to understand the impacts of different airports is to investigate the number of flights, as shown in Table 6. This shows that nine of the 10 airports with the most flights in 2023 were in the United States, where each had more than 230,000 flights departing annually (an average of 630 flights per day or more than 50 per hour). The higher concentration of flights compared to CO_2 is because of the United States' large domestic market and large number of relatively short flights. Alongside two other North American airports, the remaining airports on the list are exclusively located in Europe (five) and Asia Pacific (four).

Further detail on the largest airports – both by CO_2 emissions and by number of flights – disaggregated by sector is in Appendix 3, Tables A3.1 and A3.2. This data shows that international hubs are most important for passenger flights, and that US airports dominate in both freight and private jet sectors.

Table 6 The 20 airports with the most departing flights from all flight types in 2023

Rank	Airport Name	Country/ Territory	ICAO Region	Number of Flights
1	Atlanta Hartsfield-Jackson	United States	North America	391,183
2	Chicago O'Hare	United States	North America	363,173
3	Dallas/Fort Worth	United States	North America	348,035
4	Denver	United States	North America	332,071
5	Los Angeles	United States	North America	288,622
6	Charlotte	United States	North America	264,183
7	Las Vegas	United States	North America	252,170
8	Istanbul	Türkiye	Europe	249,788
9	New York John F. Kennedy	United States	North America	240,978
10	Miami	United States	North America	231,068
11	London Heathrow	United Kingdom	Europe	229,941
12	Amsterdam Schiphol	Netherlands	Europe	228,994
13	Tokyo Haneda	Japan	Asia/Pacific	228,361
14	Paris Charles de Gaulle	France	Europe	228,131
15	Delhi Indira Gandhi	India	Asia/Pacific	225,068
16	Phoenix Sky Harbor	United States	North America	222,634
17	Guangzhou Baiyun	China	Asia/Pacific	222,196
18	Newark Liberty	United States	North America	218,540
19	Shanghai Pudong	China	Asia/Pacific	215,210
20	Frankfurt	Germany	Europe	214,577

4.3 Flight types and emissions patterns

The total climate impact of a single flight depends on the distance travelled and the size (weight) of the aircraft. Thus, large aircraft flying long distances create the greatest climate impact per flight. However, smaller aircraft flying shorter distances are also an important contributor to overall emissions, not least since these often represent the types of flights where alternative choices may be possible (e.g. high-speed rail). The breakdown of these factors varies significantly between sectors. Overall, Figure 7 shows that 90% of flights and 87% of the climate impact of the 1,300 airports in the Airport Tracker was attributed to passenger flights. A small number of freight flights (4%) account for an outsized climate impact (11%). Equally, although their aggregate climate impact (2%) is small compared to commercial passenger and freight flights, the large number (6%) and extremely high carbon intensity of private jets make them a pressing concern for those focused on carbon inequality.[10] In terms of distance flown, nearly two-thirds of all flights (63%) were short haul. While just 7% of flights were long haul, these contributed 40% of total CO_2 emissions.

Figure 7 Number of flights and CO_2 by flight type

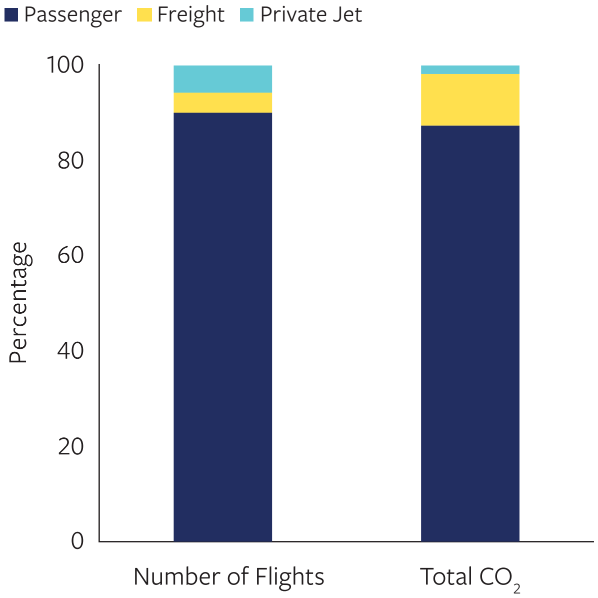
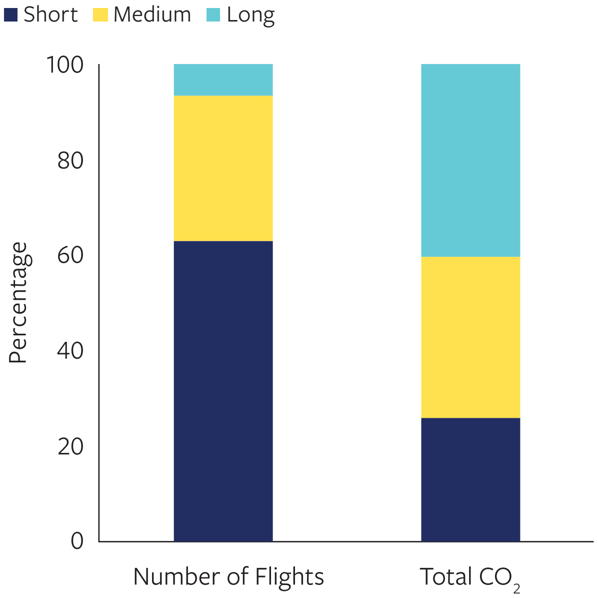


Figure 8 Number of flights and CO_2 by flight distance



4.4 Local air pollution from airports

This section details the local environmental burden of airports, in addition to their impact on global climate. The breakdown of more than 800,000 tonnes of local air pollution created by the 1,300 airports included in the Airport Tracker are shown in Table 7. This covers NO_x, total

10 For more analysis on private jets, see Sitompul and Rutherford (2025).

hydrocarbons (HC), carbon monoxide (CO) and particulate matter ($PM_{2.5}$). These pollutants have different local impacts (e.g. on human and environmental health) and are released in different proportions by different types of aircraft. We thus present them separately in Table 8, which shows the 20 airports with the highest total air pollutants in 2023 for each local air pollutant.

Table 7 Total local air pollutants from 1,300 airports

	NO_x	HC	CO	$PM_{2.5}$
LTO only, tonnes	430,402	37,116	331,046	2,099

Table 8 shows that many of the airports that are responsible for global climate impacts are also large point sources of local air pollutants.

Table 8 The 20 airports with the most local air pollutants (LTO)

	NOx		HC		CO		$PM_{2.5}$	
Rank	**Airport name**	**Tonnes**	**Airport name**	**Tonnes**	**Airport name**	**Tonnes**	**Airport name**	**Tonnes**
1	Dubai	7,577	Dubai	444	Dubai	4,404	Istanbul	25.8
2	London Heathrow	6,030	Los Angeles	340	Atlanta Hartsfield-Jackson	3,663	Dallas/Fort Worth	24.1
3	Istanbul	5,018	Teterboro Airport	316	Chicago O'Hare	3,207	Atlanta Hartsfield-Jackson	23.0
4	Los Angeles	4,866	Paris Charles de Gaulle	314	Los Angeles	3,101	Los Angeles	20.3
5	Tokyo Haneda	4,826	Istanbul	295	Paris Charles de Gaulle	3,085	London Heathrow	20.2
6	Seoul Incheon	4,800	Amsterdam Schiphol	292	Istanbul	2,948	Chicago O'Hare	19.4
7	Atlanta Hartsfield-Jackson	4,756	Chicago O'Hare	288	London Heathrow	2,829	Frankfurt	18.8
8	Paris Charles de Gaulle	4,666	Las Vegas	280	Tokyo Haneda	2,797	Denver	18.0
9	Hong Kong	4,572	Tokyo Haneda	279	Shanghai Pudong	2,740	Dubai	17.9
10	Doha Hamad	4,569	Atlanta Hartsfield-Jackson	273	New York John F. Kennedy	2,733	Charlotte	17.3
11	Singapore Changi	4,501	New York John F. Kennedy	263	Amsterdam Schiphol	2,708	New York John F. Kennedy	17.0
12	New York John F. Kennedy	4,474	Miami	258	Guangzhou Baiyun	2,665	Shanghai Pudong	16.6
13	Shanghai Pudong	4,193	Guangzhou Baiyun	253	Seoul Incheon	2,649	Tokyo Haneda	16.0
14	Guangzhou Baiyun	4,082	Seoul Incheon	250	Dallas/Fort Worth	2,632	Seoul Incheon	15.8
15	Frankfurt	4,080	Shanghai Pudong	248	Frankfurt	2,620	Orlando	15.1
16	Chicago O'Hare	3,964	Hong Kong	245	Denver	2,618	Singapore Changi	15.0
17	Beijing Capital	3,926	Frankfurt	238	Hong Kong	2,535	Shenzhen Bao'an	14.9
18	Dallas/Fort Worth	3,777	Dallas/Fort Worth	235	Beijing Capital	2,485	Paris Charles de Gaulle	14.9
19	Bangkok Suvarnabhumi	3,689	Beijing Capital	228	Miami	2,324	Beijing Capital	14.6
20	Miami	3,381	Denver	222	Singapore Changi	2,316	Guangzhou Baiyun	14.5

In some cases, the pollution created by individual airports should be combined to understand how these aggregate to impact local cities. Table 9 therefore presents data aggregated at the city level, and shows those 20 city codes with the highest total CO_2 emissions. Airport-generated CO_2 emissions in London, New York, Dubai and Tokyo were 20 million tonnes or more in 2023, and this list of 20 city codes was responsible for 32% of CO_2 emissions from all 1,300 airports. These aggregations also quantify the total emissions of local air pollutants: for example, in 2023 airports with a London city code were responsible for more than 9,500 tonnes of NO_x and 5,900 tonnes of CO, and for 556 tonnes of HC and 36 tonnes of PM 2.5.

Table 9 The 20 cities with the highest airport emissions

Rank	Airport city code	Number of airports	Number of flights	CO_2 Total flight (million tonnes)	NO_x	HC	CO	$PM_{2.5}$
					LTO only (tonnes)			
1	London (LON)	6	547,501	29.2	9,571	556	5,910	36
2	New York City (NYC)	4	651,054	28.5	8,865	535	5,873	38
3	Dubai (DXB)	2	227,127	24.8	8,039	498	4,764	20
4	Tokyo (TYO)	2	333,164	19.8	7,501	410	4,283	24
5	Los Angeles (LAX)	2	323,307	19.1	5,083	486	3,533	23
6	Paris (PAR)	4	376,808	18.6	6,314	526	4,528	24
7	Seoul (SEL)	2	241,712	17.8	5,690	299	3,233	22
8	Shanghai (SHA)	2	347,765	16.7	6,924	390	4,368	27
9	Hong Kong (HKG)	1	138,764	15.1	4,572	245	2,535	14
10	Istanbul (IST)	2	365,004	15.0	6,276	353	3,811	30
11	Frankfurt (FRA)	2	221,794	14.8	4,197	250	2,716	19
12	Singapore (SIN)	1	164,862	14.3	4,501	188	2,316	15
13	Chicago (CHI)	2	475,277	14.1	4,949	442	4,173	24
14	Doha (DOH)	1	124,340	14.0	4,569	200	2,287	10
15	Beijing (BJS)	2	333,083	13.2	6,011	365	3,935	25
16	San Francisco (SFO)	1	189,762	11.9	3,112	184	1,906	13
17	Amsterdam (AMS)	1	228,994	11.0	3,251	292	2,708	12
18	Dallas Fort Worth (DFW)	2	469,594	10.9	4,722	456	3,749	30
19	Bangkok (BKK)	2	246,246	10.8	4,740	274	2,918	19
20	Atlanta (ATL)	2	420,658	10.7	4,884	384	3,991	25

Conclusion

This brief outlines the latest updates to the Airport Tracker. By offering a more comprehensive picture of airport-level climate and air quality impacts, the Airport Tracker and the findings presented here highlight where emissions are concentrated, how they vary across regions and types of flights, and which communities have the greatest exposure to pollution. The data reinforces that the sector remains off track to meet net-zero goals, with flights from the 1,300 airports included in the Tracker generating 1,026 million tonnes of CO_2 in 2023 which, if aviation were a country, would make it the fifth highest national emitter. It also shows that the sector's impacts are unevenly distributed as airports in just 20 countries account for 78% of global CO_2 emissions.

Airports are a crucial entry point for those seeking to align aviation with broader societal objectives. In lieu of transparent data provided by the sector itself, the Airport Tracker provides an evidence base to support advocacy across multiple fronts:

- Climate: by providing transparent, airport-level emissions data that strengthens efforts to align aviation with fair pathways to net zero, including more transparent greenhouse gas accounting at national, city and corporate levels.
- Health: by revealing local air-pollution burdens and supporting calls for cleaner air in cities and communities near major airports.
- Finance: by providing emissions data that can inform assessments of whether airport expansion plans are compatible with climate goals, helping identify where future investments may face heightened stranded-asset risks.
- Energy security: by illustrating where aviation activity, and therefore jet fuel demand, is most concentrated, offering insights that can inform debates about fossil-fuel dependence and long-term energy resilience.

These insights position airports as major drivers of aviation's impact, but also as critical leverage points for change. With better data, policy-makers, advocates and communities can pursue more informed decisions and more effective advocacy towards a just and sustainable aviation system.

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Appendix 1 Airport expansion plans

Table A1.1 Proposed airport expansions in selected major-emitting countries

Country	Proposed airport expansion projects	Expansion plans and capacity increases
UAE	A $35 billion expansion of Al Maktoum International Airport aims to transform it into the world's largest airport (Gulf News, 2025).[11]	The project includes five runways and 400 aircraft gates, increasing capacity to 124 million passengers by 2031 and eventually 260 million annually (DAEP, n.d.).[12]
India	India has doubled its number of airports in the past decade (PIB, 2024),[13] and the Adani Group plans to invest $15 billion to expand its airport network.	Planned upgrades include new terminals, taxiways and a new runway at Navi Mumbai, aiming to raise total capacity across Adani airports to 200 million passengers a year (Economic Times, 2025).[14]
United Kingdom	A £49 billion proposal to construct a third runway at Heathrow remains active despite ongoing political and legal challenges.	The 3,500m runway would enable up to 756,000 flights per year and increase total airport capacity to roughly 150 million passengers annually (Heathrow, n.d.).[15]
Spain	A €3.2 billion ($3.7 billion) expansion of Barcelona El Prat Airport has been approved, centred on extending its main runways.	The project, planned for completion by 2033, would increase capacity from 55 million to around 70 million passengers annually (Faus, 2025).[16]
China	China is developing the Guangdong New International Airport in Zhaoqing as a major new hub.	The multi-runway airport will be built for 30 million passengers annually by 2035, with capacity expected to double by 2050 (Macao News, 2024).[17]
United States	A $19 billion programme is ongoing to redevelop four terminals at New York's John F. Kennedy International Airport, including $9.5 billion to build a new Terminal One for international travel (Port Authority Builds, n.d.).[18]	Terminal One will consist of 23 gates upon project completion in 2030. By its mid-2026 opening, it will have capacity for 14 million passengers per year (CNBC, 2025).[19]

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Appendix 2 CO_2 emissions for major airports by region in 2023

Table A2.1 The 20 airports with the largest CO_2 emissions in Africa

Rank	Airport name	Country/territory	Number of flights	Total CO_2 emissions (million tonnes)
1	Johannesburg O.R. Tambo	South Africa	60,556	3.1
2	Addis Ababa Bole	Ethiopia	43,858	3.0
3	Cairo	Egypt	80,623	2.9
4	Nairobi Jomo Kenyatta	Kenya	39,266	2.0
5	Cape Town	South Africa	32,591	1.6
6	Casablanca Mohammed V	Morocco	41,264	1.5
7	Mauritius Sir Seewoosagur Ramgoolam	Mauritius	9,463	1.0
8	Lagos Murtala Muhammed	Nigeria	25,592	1.0
9	Algiers Houari Boumediene	Algeria	26,828	0.8
10	Saint-Denis Roland Garros	Reunion Island	5,833	0.7
11	Tunis-Carthage	Tunisia	27,932	0.6
12	Accra Kotoka	Ghana	8,128	0.6
13	Luanda Quatro de Fevereiro	Angola	12,167	0.6
14	Hurghada	Egypt	14,125	0.6
15	Marrakesh Menara	Morocco	25,121	0.6
16	Sharm El Sheikh	Egypt	13,051	0.4
17	Abidjan Felix-Houphouet-Boigny	Côte d'Ivoire	11,802	0.4
18	Abuja Nnamdi Azikiwe	Nigeria	20,708	0.4
19	Dar es Salaam Julius Nyerere	Tanzania	8,925	0.3
20	Kinshasa N'djili	Democratic Republic of Congo	6,274	0.3

Table A2.2 The 20 airports with the largest CO_2 emissions in Asia Pacific

Rank	Airport name	Country/territory	Number of flights	Total CO_2 emissions (million tonnes)
1	Seoul Incheon	South Korea	172,139	16.8
2	Hong Kong	China	138,764	15.1
3	Singapore Changi	Singapore	164,862	14.3
4	Shanghai Pudong	China	215,210	12.4
5	Tokyo Haneda	Japan	228,361	10.8
6	Bangkok Suvarnabhumi	Thailand	152,847	9.3
7	Tokyo Narita	Japan	104,803	9.0
8	Guangzhou Baiyun	China	222,196	8.9
9	Beijing Capital	China	187,912	8.6
10	Taipei Taiwan Taoyuan	Taiwan	100,399	8.6
11	Delhi Indira Gandhi	India	225,068	8.5
12	Sydney Kingsford Smith	Australia	154,230	8.2
13	Shenzhen Bao'an	China	193,503	6.5
14	Kuala Lumpur	Malaysia	160,628	6.2
15	Melbourne	Australia	117,683	5.5
16	Manila Ninoy Aquino	Philippines	141,812	5.2
17	Jakarta Soekarno-Hatta	Indonesia	173,942	5.2
18	Mumbai Chhatrapati Shivaji Maharaj	India	165,051	4.9
19	Beijing Daxing	China	145,171	4.6
20	Hangzhou Xiaoshan	China	148,284	4.4

Table A2.3 The 20 airports with the largest CO_2 emissions in Europe

Rank	Airport name	Country/territory	Number of flights	Total CO_2 emissions (million tonnes)
1	London Heathrow	United Kingdom	229,941	21.0
2	Paris Charles de Gaulle	France	228,131	14.7
3	Frankfurt	Germany	214,577	14.4
4	Istanbul	Turkey	249,788	12.8
5	Amsterdam Schiphol	Netherlands	228,994	11.0
6	Madrid-Barajas	Spain	193,849	8.8
7	Munich	Germany	150,230	5.0
8	Rome Fiumicino	Italy	132,576	4.9
9	Zurich	Switzerland	121,125	4.6
10	Moscow Sheremetyevo	Russia	103,502	4.6
11	London Gatwick	United Kingdom	128,732	4.3
12	Barcelona El Prat	Spain	158,938	4.1
13	Lisbon Humberto Delgado	Portugal	112,833	4.0
14	Milan Malpensa	Italy	100,166	3.9
15	Brussels	Belgium	94,121	3.3
16	Paris Orly	France	103,340	3.3
17	Dublin	Ireland	120,070	3.3
18	Antalya	Türkiye	109,374	3.2
19	Manchester	United Kingdom	89,968	3.0
20	Vienna	Austria	117,139	2.8

Table A2.4 The 20 airports with the largest CO_2 emissions in Latin America and the Caribbean

Rank	Airport name	Country/territory	Number of flights	Total CO_2 emissions (million tonnes)
1	Sao Paulo/Guarulhos	Brazil	127,817	6.8
2	Mexico City	Mexico	173,001	4.9
3	Bogota El Dorado	Colombia	165,306	3.6
4	Cancun	Mexico	100,727	3.5
5	Santiago Arturo Merino Benitez	Chile	74,544	3.2
6	Buenos Aires Ministro Pistarini	Argentina	32,554	2.7
7	Lima Jorge Chavez	Peru	81,508	2.6
8	Panama City Tocumen	Panama	69,401	2.5
9	San Juan Luis Munoz Marin	Puerto Rico	60,144	1.6
10	Guadalajara	Mexico	68,366	1.5
11	Sao Paulo Viracopos-Campinas	Brazil	56,203	1.4
12	Rio de Janeiro/Galeao Antonio Carlos Jobim	Brazil	26,778	1.3
13	Punta Cana	Dominican Republic	28,772	1.3
14	Sao Paulo/Congonhas Deputado Freitas Nobre	Brazil	92,049	1.1
15	Brasilia Presidente Juscelino Kubitschek	Brazil	57,003	1.0
16	Tijuana	Mexico	43,471	1.0
17	Buenos Aires Jorge Newbery	Argentina	51,672	0.9
18	San Jose Juan Santamaria	Costa Rica	35,703	0.9
19	Monterrey	Mexico	51,359	0.8
20	Santo Domingo Las Americas	Dominican Republic	25,821	0.7

Table A2.5 The 20 airports with the largest CO_2 emissions in the Middle East

Rank	Airport name	Country/territory	Number of flights	Total CO_2 emission (million tonnes)
1	Dubai	United Arab Emirates	209,328	23.2
2	Doha Hamad	Qatar	124,340	14.0
3	Jeddah King Abdulaziz	Saudi Arabia	131,793	6.5
4	Abu Dhabi	United Arab Emirates	66,184	4.5
5	Riyadh King Khalid	Saudi Arabia	120,294	3.8
6	Tel Aviv Ben Gurion	Israel	74,333	3.6
7	Kuwait	Kuwait	62,090	2.4
8	Sharjah	United Arab Emirates	50,617	1.7
9	Bahrain	Bahrain	45,500	1.7
10	Muscat	Oman	49,359	1.7
11	Dubai Al Maktoum	United Arab Emirates	17,799	1.6
12	Amman Queen Alia	Jordan	37,157	1.2
13	Dammam King Fahd	Saudi Arabia	44,964	1.0
14	Beirut Rafic Hariri	Lebanon	26,828	0.8
15	Tehran Imam Khomeini	Iran	17,433	0.8
16	Medina Prince Mohammad bin Abdulaziz	Saudi Arabia	20,162	0.8
17	Baghdad	Iraq	14,488	0.3
18	Mashhad	Iran	13,118	0.2
19	Tehran Mehrabad	Iran	17,751	0.2
20	Abha	Saudi Arabia	13,599	0.2

Table A2.6 The 20 airports with the largest CO_2 emissions in North America

Rank	Airport name	Country/territory	Number of flights	Total CO_2 emission (million tonnes)
1	Los Angeles	United States	288,622	18.8
2	New York John F. Kennedy	United States	240,978	16.8
3	Chicago O'Hare	United States	363,173	12.4
4	San Francisco	United States	189,762	11.9
5	Atlanta Hartsfield-Jackson	United States	391,183	10.6
6	Anchorage	United States	98,607	9.9
7	Miami	United States	231,068	9.7
8	Dallas/Fort Worth	United States	348,035	9.4
9	Newark Liberty	United States	218,540	8.6
10	Toronto Pearson	Canada	193,848	8.1
11	Seattle/Tacoma	United States	211,640	7.3
12	Denver	United States	332,071	6.9
13	Houston George Bush	United States	212,815	6.4
14	Boston Logan	United States	188,288	6.1
15	Orlando	United States	210,728	5.4
16	Washington Dulles	United States	142,122	5.3
17	Las Vegas	United States	252,170	5.2
18	Honolulu	United States	110,829	5.0
19	Phoenix Sky Harbor	United States	222,634	4.6
20	Vancouver	Canada	116,657	4.6

Appendix 3 The 10 most-important airports by sector in 2023

Table A3.1 The 10 airports that created the most CO_2 emissions, by passenger, freight and private jets in 2023

Rank	Passenger	CO_2 emissions (million tonnes)	Freight	CO_2 emissions (million tonnes)	Private jets	CO_2 emissions (million tonnes)
1	Dubai	22.5	Anchorage	9.1	Teterboro Airport	0.7
2	London Heathrow	20.9	Hong Kong	6.9	Palm Beach	0.3
3	Los Angeles	15.3	Shanghai Pudong	4.1	Van Nuys Airport	0.3
4	New York John F. Kennedy	15.3	Seoul Incheon	3.9	White Plains Westchester County	0.3
5	Paris Charles de Gaulle	13.4	Memphis	3.9	Miami-Opa Locka Executive Airport	0.3
6	Singapore Changi	13.1	Los Angeles	3.3	Las Vegas	0.3
7	Seoul Incheon	12.9	Louisville	3.1	Dallas Love Field	0.3
8	Doha Hamad	12.3	Chicago O'Hare	2.9	Washington Dulles	0.2
9	Frankfurt	12.0	Miami	2.8	Paris-Le Bourget Airport	0.2
10	Istanbul	11.7	Cincinnati/ Northern Kentucky	2.7	London Luton	0.2

Table A3.2 The 10 airports with the most flights, by passenger, freight and private jets in 2023

Rank	Passenger	Number of flights	Freight	Number of flights	Private jets	Number of flights
1	Atlanta Hartsfield-Jackson	380,023	Memphis	69,258	Teterboro Airport	70,402
2	Chicago O'Hare	343,158	Louisville	49,488	Palm Beach	40,515
3	Dallas/Fort Worth	334,657	Anchorage	43,015	Dallas Love Field	35,181
4	Denver	324,158	Hong Kong	36,038	Van Nuys Airport	31,286
5	Los Angeles	258,091	Cincinnati/Northern Kentucky	34,924	Las Vegas	30,541
6	Charlotte	249,007	Miami	32,302	White Plains Westchester County	29,661
7	Istanbul	235,902	Leipzig/Halle	28,510	Washington Dulles	27,556
8	London Heathrow	227,532	Seoul Incheon	27,074	Miami-Opa Locka Executive Airport	27,121
9	New York John F. Kennedy	226,837	Shanghai Pudong	21,566	Scottsdale Airport	25,722
10	Tokyo Haneda	225,693	Paris Charles de Gaulle	20,992	Houston William P. Hobby	24,885

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