RDC

Aviation Emissions Report
July 23

Emissions analysis for largest markets - July 23 vs prior years

25 largest markets by total emissions

Date Origin Country	July 2019 Total CO2 (Tonnes)	July 2022 Total CO2 (Tonnes)	July 2023 Total CO2 (Tonnes)
United States	16,623,695	13,859,813	15,294,178
China	8,332,309	6,253,490	8,130,814
United Kingdom, UK	3,197,799	2,433,190	2,871,199
India	1,737,695	1,616,831	1,912,653
Japan	2,357,818	1,275,604	1,895,024
Germany	2,256,590	1,657,087	1,852,641
Spain and Canary Islands	1,980,187	1,701,311	1,848,868
United Arab Emirates	1,992,208	1,471,302	1,821,452
France	1,877,694	1,487,019	1,669,221
Canada	1,850,554	1,401,181	1,625,308
Russian Federation	1,846,281	1,484,446	1,549,504
Turkey	1,374,638	1,399,455	1,538,864
Australia	1,748,546	1,111,014	1,493,625
Italy	1,353,964	1,041,863	1,237,136
Brazil	1,345,861	1,128,552	1,204,706
Mexico	1,057,347	1,017,200	1,050,682
Republic of Korea	1,217,668	589,907	993,630
Indonesia	1,154,741	742,204	904,260
Qatar	808,901	737,905	874,979
Singapore	974,666	593,722	832,614
Thailand	1,168,569	509,117	808,609
Saudi Arabia	675,323	683,667	751,850
Netherlands	881,144	691,640	749,098
Vietnam	614,491	545,794	648,311
Greece	559,783	623,960	636,035

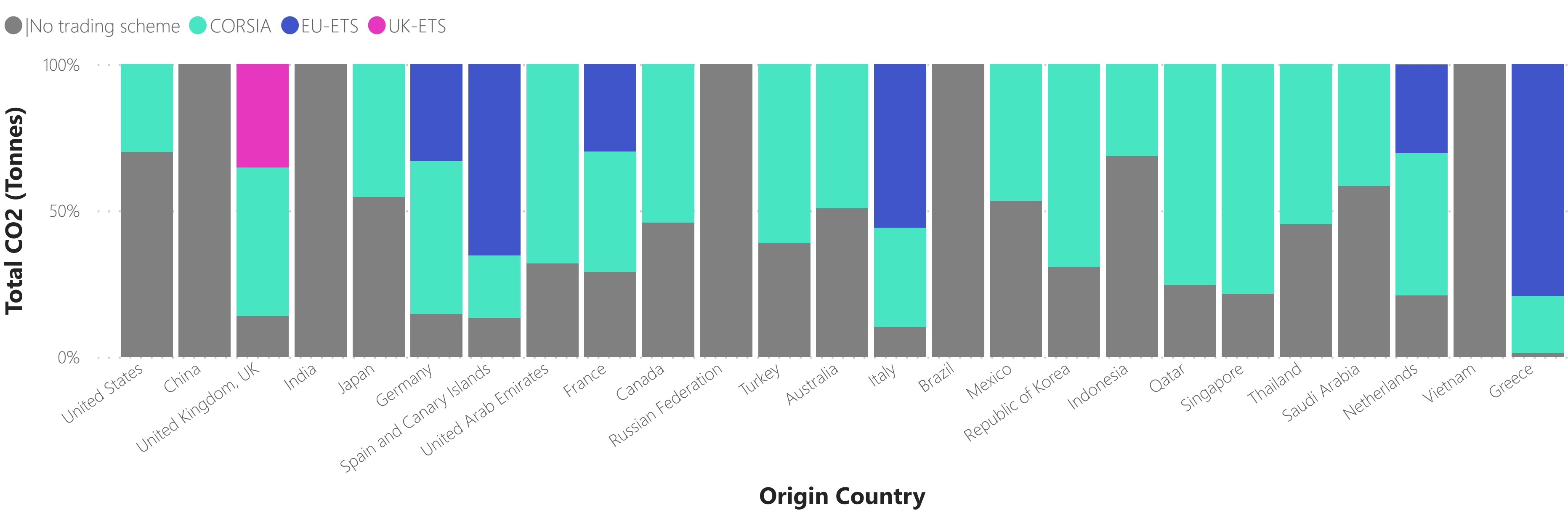
Change in Emissions - Current month vs prior years

This year vs last year	This year vs 2019
10%	-8%
30%	-2%
18%	-10%
18%	10%
49%	-20%
12%	-18%
9%	-7%
24%	-9%
12%	-11%
16%	-12%
4%	-16%
10%	12%
34%	-15%
19%	-9%
7%	-10%
3%	-1%
68%	-18%
22%	-22%
19%	8%
40%	-15%
59%	-31%
10%	11%
8%	-15%
19%	6%
2%	14%

Percent of Emissions covered by Compliance Programmes

July 2019 % covered	July 2022 % covered	July 2023 % covered
-	28.77%	29.95%
-	-	-
34.11%	90.30%	86.05%
-	-	-
-	34.00%	45.41%
33.55%	88.18%	85.35%
61.99%	88.66%	86.60%
-	67.98%	68.09%
28.54%	72.50%	70.86%
-	54.21%	54.12%
-	-	-
-	63.33%	61.14%
-	45.21%	49.20%
50.98%	93.94%	89.71%
-	-	-
-	45.87%	46.63%
-	67.17%	69.28%
-	21.55%	31.40%
-	74.97%	75.42%
-	83.93%	78.45%
-	56.21%	54.66%
-	34.86%	41.64%
26.67%	80.60%	79.01%
-	-	-
76.57%	99.25%	98.73%

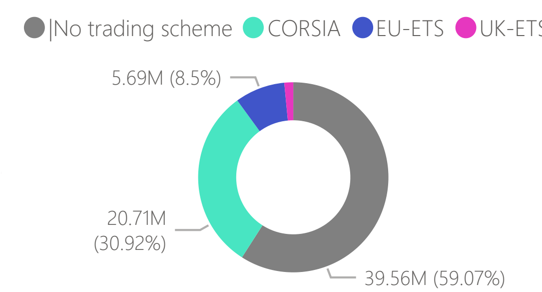
25 largest markets - emissions by Compliance Programme (current month)



Global emissions (tonnes)

66.98M

Emissions by compliance programme



Emissions analysis for largest markets - YTD to Jul 23 vs prior years

25 largest markets by total emissions

YTD Period / Origin Country	YTD 2019 Total CO2 (Tonnes)	YTD Last Year Total CO2 (Tonnes)	YTD This Year Total CO2 (Tonnes)
United States	105,756,245	86,468,023	96,426,604
China	53,619,770	35,750,704	48,535,605
United Kingdom, UK	19,468,597	12,997,514	16,740,495
India	12,321,778	10,625,210	13,479,880
Japan	15,712,694	7,464,521	11,901,449
United Arab Emirates	12,933,218	8,875,363	11,795,379
Germany	13,880,018	8,992,216	10,546,682
Spain and Canary Islands	11,230,480	9,188,962	10,479,279
France	11,177,530	8,007,668	9,508,249
Australia	11,771,806	6,207,387	9,503,208
Canada	10,784,473	7,050,903	9,170,589
Turkey	7,566,131	7,025,376	8,407,909
Brazil	9,000,617	7,043,445	8,308,404
Russian Federation	10,720,395	7,867,522	8,038,035
Mexico	7,000,416	6,588,185	7,142,859
Italy	7,481,986	5,046,890	6,415,986
Indonesia	7,599,041	4,758,786	6,146,097
Republic of Korea	8,003,125	2,964,897	6,143,347
Thailand	8,588,935	2,790,404	5,557,516
Qatar	5,422,620	4,673,389	5,436,835
Singapore	6,681,650	3,075,498	5,373,815
Saudi Arabia	4,972,153	3,881,873	5,101,810
Netherlands	5,445,065	3,973,054	4,510,356
Vietnam	3,988,741	2,770,791	3,953,447
Malaysia	4,689,225	1,820,257	3,361,315

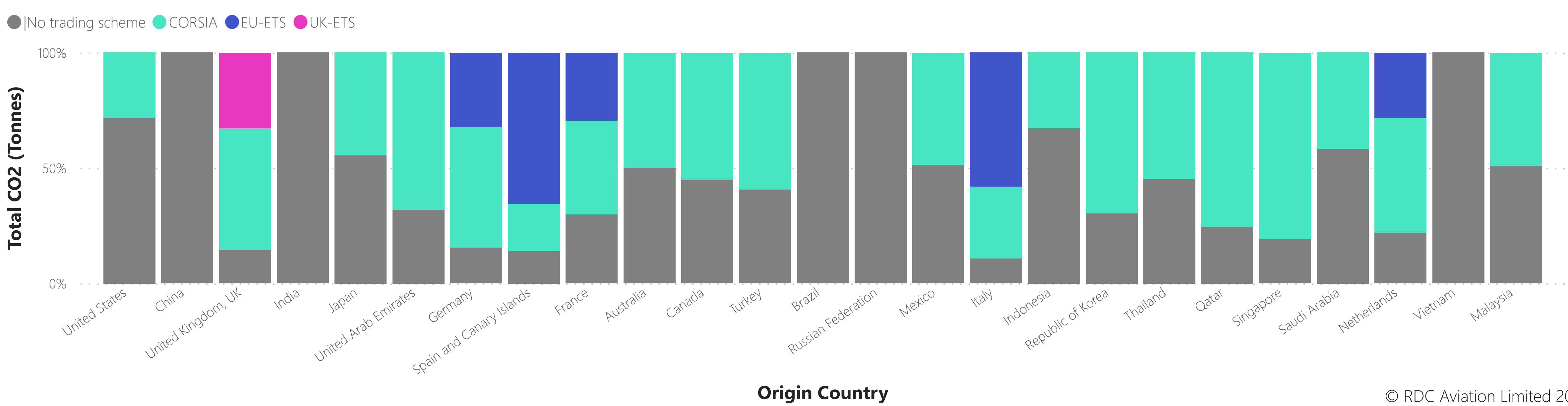
Change in Emissions - Current month vs prior years

This YTD vs Last YTD	This YTD vs YTD 2019
12%	-9%
36%	-9%
29%	-14%
27%	9%
59%	-24%
33%	-9%
17%	-24%
14%	-7%
19%	-15%
53%	-19%
30%	-15%
20%	11%
18%	-8%
2%	-25%
8%	2%
27%	-14%
29%	-19%
107%	-23%
99%	-35%
16%	0%
75%	-20%
31%	3%
14%	-17%
43%	-1%
85%	-28%

Percent of Emissions covered by Compliance Programmes

YTD 2019 Trading scheme %	YTD Last Year Trading scheme %	YTD This Year Trading scheme %
-	25.23%	28.21%
-	-	-
31.25%	88.49%	85.51%
-	-	-
-	32.29%	44.57%
-	67.31%	68.08%
33.47%	87.02%	84.42%
62.09%	87.54%	86.07%
27.67%	72.67%	70.14%
-	40.67%	49.76%
-	54.35%	54.94%
-	60.07%	59.26%
-	-	-
-	-	-
-	48.87%	48.50%
51.27%	94.59%	89.09%
-	15.73%	32.74%
-	64.77%	69.64%
-	53.42%	54.75%
-	73.81%	75.44%
-	84.01%	80.64%
-	31.03%	41.85%
24.85%	78.66%	77.91%
-	-	-
-	37.99%	49.22%

25 largest markets - emissions by Compliance Programme (current YTD)



RDC CARE Index by carrier and home continent - July 23

Top 25 European Carriers

Carrier Name	CARE Index
Marabu Airlines	7.6
TUIfly Nordic	7.5
World2Fly	7.5
SmartLynx Airlines Estonia	7.5
PLAY	7.4
Novair	7.4
French Bee	7.3
Iberojet	7.2
Wizz Air UK	7.1
Norse Atlantic Airways	7.1
Smartwings Poland	7.1
Sunclass Airlines	7.1
Wizz Air Malta	7.0
TUI Airways	6.9
La Compagnie	6.8
Norse Atlantic Airways UK	6.8
Wizz Air	6.8
Chalair Aviation	6.8
SunExpress	6.8
Enter Air	6.7
Jonika Airlines	6.7
Freebird Airlines	6.7
TUIfly Deutschland	6.6
Corendon Dutch Airlines	6.6

Top 25 North American Carriers

Carrier Name	CARE Index
Canadian North	7.2
Lynx Air	7.0
Sunwing Airlines	6.9
Volaris	6.9
Air Transat	6.9
Frontier Airlines	6.8
Swoop	6.8
Flair Airlines	6.8
Spirit Airlines	6.3
Canada Jetlines	6.0
Allegiant Air	5.9
Omni Air International	5.9
WestJet	5.9
Sun Country	5.9
Aeromexico	5.6
VivaAerobus	5.6
Delta Air Lines	5.6
Alaska Airlines	5.6
Air Saint-Pierre	5.5
American Airlines	5.5
Airbahn	5.5
United Airlines	5.4
Air Canada	5.3
Avelo Air	5.3

Top 25 Asian Carriers

Carrier Name	CARE Index
Japan Air Commuter	7.1
Thai AirAsia X	6.8
AirAsia X	6.7
ZIPAIR Tokyo	6.7
Akasa Air	6.6
STARLUX Airlines	6.4
Thai Summer Airways	6.4
Trigana Air	6.3
Philippine Airlines	6.3
T'Way Air	6.3
Air Premia	6.3
Air India Express	6.2
NordStar Airlines	6.2
Tigerair Taiwan	6.2
Aero Nomad Airlines	6.1
Ural Airlines	6.1
Himalaya Airlines	6.1
Hong Kong Express	6.1
Greater Bay Airlines	6.1
Nordwind Airlines	6.1
airblue	6.1
Serene Air	6.0
Qingdao Airlines	5.9
Longjiang Airlines	5.9

Top 25 RoW Carriers

Carrier Name	CARE Index
SATENA	7.7
Wizz Air Abu Dhabi	7.0
Arajet	6.8
Bonza Airline	6.6
Flynas	6.6
flydubai	6.6
Bahamasair	6.5
Air Tahiti Nui	6.4
SalamAir	6.4
Syrian Air	6.2
TACV	6.2
El Al	6.2
LATAM Paraquay	6.1
FlyEgypt	6.1
Nouvelair Tunisie	6.0
Badr Airlines	5.9
Copa Airlines	5.9
Sudan Airways	5.9
Jazeera Airways	5.9
JetSmart Airlines S.A.	5.8
Nesma Airlines	5.8
Flybondi	5.8
flyadeal	5.7
Nile Air	5.7

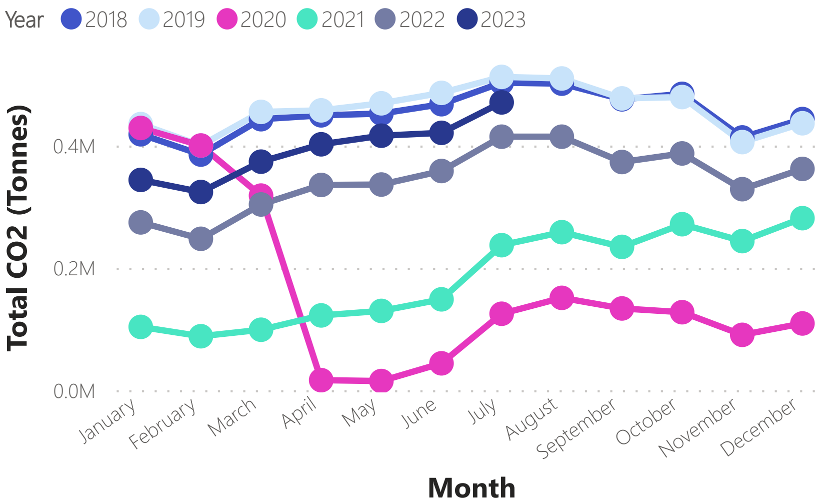
The CARE Index is a measure of airline route sustainability, based around our emissions methodology and various other factors, that has been developed to give business and consumers the best information on which to make their purchasing decisions - particularly when it comes to making more environmentally friendly choices. Most 'efficiency measures' use CO_2 per passenger, per seat or per available seat kilometre (ASK), which can be hard to understand for consumers. The CARE Index creates a score between 0 (worst) to 10 (best) for any air route, airline and aircraft combination, taking into account:

- fuel burn and efficiency of the aircraft type
- efficiency of the airline – using specific seat capacity, configuration and overall occupancy rates (load factor)
- use of Sustainable Alternative Fuels (SAF)
- if the route is part of a compliance or regulatory emissions programme such as EU ETS etc
- whether the operator offsets any emissions over and above that which is legally required

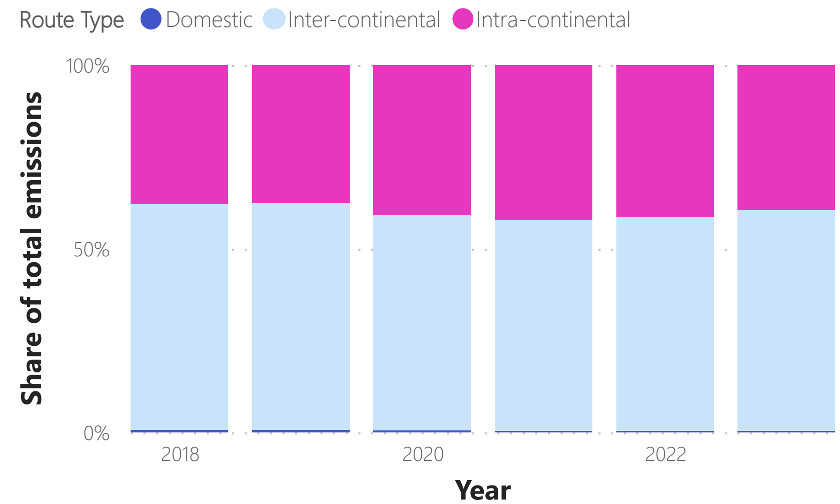
The CARE index has been designed to be a force for change, giving consumers better insight into the environmental impact of their chosen airline that will also help to shape airline sustainability strategies.

This month's focus country: Switzerland

Total CO2 (Tonnes) by Month and Year



CO2 by Year and Route Type



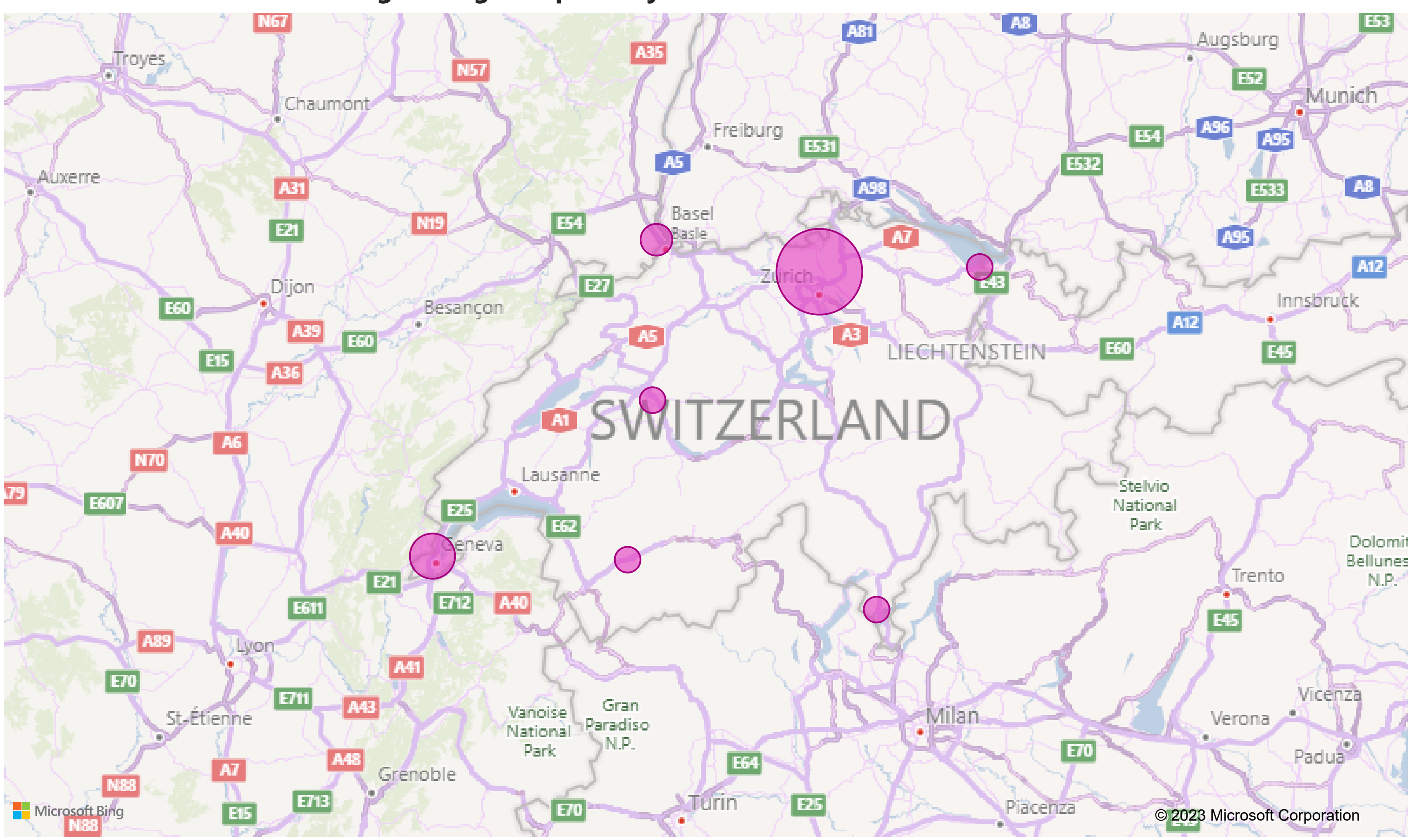
10 largest markets by seat capacity ranked by lowest Emissions per ASK - last 12 months

Destination Country	Emissions per ASK (g)	Total CO2 (Tonnes)
Turkey	59.12	185,227
Portugal	59.96	168,801
Greece	59.97	107,588
Spain and Canary Islands	64.97	310,670
United Kingdom, UK	70.16	230,270
Italy	73.20	114,987
United States	78.67	955,806
France	86.20	100,514
Netherlands	86.69	57,207
Germany	88.16	138,459

10 largest carrier by emissions ranked by highest total emissions - last 12 months

Carrier Name	Emissions per ASK (g)	Total CO2 (Tonnes)
SWISS	77.27	1,575,607
easyJet	66.66	527,521
Edelweiss Air	71.20	411,972
United Airlines	75.49	260,430
Emirates	71.70	205,471
Helvetic Airways	81.79	106,532
Singapore Airlines	95.95	100,023
Air Canada	65.56	94,930
Thai	77.86	94,004
Qatar Airways	64.39	85,923

Largest origin airports by total emissions - last 12 months



10 most efficient routes according to RDC's CARE Index - current month

Carrier Name	Aircraft	Origin	Destination	CARE Index
Southwind Airlines	A321neo	ZRH	AYT	7.8
SunExpress	B737 MAX 8	BSL	ASR	7.6
SunExpress	B737 MAX 8	BSL	AYT	7.6
Southwind Airlines	B737 MAX 8	ZRH	AYT	7.6
SunExpress	B737 MAX 8	ZRH	AYT	7.6
SmartLynx Airlines	B737 MAX 8	GVA	ESB	7.6
Wizz Air Malta	A321neo	BSL	IAS	7.6
Wizz Air Malta	A321neo	BSL	OTP	7.6
Wizz Air Malta	A321neo	GVA	OTP	7.6
Wizz Air	A321neo	GVA	SOF	7.6

RDC is a UK-based data and technology provider to the international air transport industry. The company has over 300 clients of its **Apex** and **AirportCharges.com** products, which provide market intelligence to operators of aircraft and airports, as well as investors, OEMs and regulators.

For decades RDC have been monitoring and modelling the CO2 emissions arising from the growing aviation industry. We have the ability to calculate and report detailed airline operating expenses - including fuel burn, which in turn gives us the CO2 output from flying. For accuracy on CO2 emissions data, our accredited and independent methodology can't be beaten.

We passionately believe that business and consumers should be armed with the best information on which to make their purchasing decisions - particularly when it comes to making more environmentally friendly choices - this is why we developed our **CO2 calculator** and **CARE Index.**

Two-dimensional output *Our output*

To find out more about how RDC can deliver CO2 emissions data for your business services, get in touch with:

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