P.O. Box 1209
Seattle, Washington 98111
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206.787.3000

APPROVED MINUTES
COMMISSION REGULAR MEETING

April 14, 2026

The Port of Seattle Commission met in a regular meeting Tuesday, April 14, 2026. The meeting was held at the Port of Seattle Headquarters Building Commission Chambers, located at 2711 Alaska Way, Seattle Washington, and virtually on Microsoft Teams. Commissioners Cho and Felleman were absent and excused from attendance.

1. CALL to ORDER

The meeting was convened at 10:30 a.m. by Commission President Ryan Calkins.

2. EXECUTIVE SESSION pursuant to RCW 42.30.110

The public meeting recessed into executive session to discuss three items regarding Litigation/Potential Litigation/Legal Risk per RCW 42.30.110(1)(i) for approximately 60 minutes, with one of those items regarding National Security per RCW 42.30.110(1)(a)(i), and another regarding the Sale or Lease of Real Estate per RCW 42.30.110(1)(c), with the intention of reconvening the public session at 12:00 p.m. Following the executive session, the public meeting reconvened at 12:07 p.m. Commission President Calkins led the flag salute.

3. APPROVAL of the AGENDA

The agenda was approved as presented without objection.

4. SPECIAL ORDERS OF THE DAY

There were no Special Orders of the Day presented.

5. EXECUTIVE DIRECTOR'S REPORT

Executive Director Metruck previewed items on the day's agenda and made general and meeting-related announcements.

At this time, Executive Director Metruck recognized Port of Seattle Police Department Chief Michael Villa in his retirement and for his years of service and accomplishments while in the position.

Members of the Commission congratulated Chief Villa; thanked him for emulating Port values in his department and throughout all areas of his work; and talked about improvements made during his tenue.

Chief Villa spoke regarding the team effort and strong partnerships needed to improve quality of life and safety; thanked the Commission and the Executive Leadership team for their partnership; and expressed his appreciation for the opportunities.

6. COMMITTEE REPORTS

Committee Strategic Advisor Erica Chung provided the report.

Audit Committee
The Audit Committee met on March 19, 2026, with Commissioner Felleman chairing the meeting and with Commissioner Calkins and Public Member Sarah Holmstrom in attendance. Internal Audit Director Glenn Fernandes and his team presented audit information on the following Performance Audits: (1) Accounts Receivable Management for Fisherman's Terminal; (2) the Public Art Program; and (3) the Planewear Tenant Reimbursement Agreement. Members of the Committee discussed the audits and heard Management's responses and actions to the audits. In addition, Director Fernandes provided the 'Director's Annual Communication' and separately, the committee approved an update to the 2026 Audit Plan.

Highline Forum
The Highline Forum met on March 25, 2026, with Tukwila Council President Armen Papyan chairing the meeting. The main focus of the meeting was regional and local planning for the 2026 FIFA World Cup, with Tukwila and other South King County cities sharing updates on their community events and preparations. The Port highlighted work at SEA Airport to support expected travelers and gave an update on Upgrade SEA projects. Aviation staff also provided a brief StART update, including upcoming work on the Sustainable Airport Master Plan environmental review.

Sustainability Environment and Climate Committee
Commissioners Calkins and Felleman convened the Sustainability Environment and Climate Committee on March 31, 2026. There were two items for discussion and briefing: an update on Aviation and Maritime Building Energy Program and a debrief of the Port's Sustainable Maritime Fuels Summit held on March 17-18.

7. PUBLIC COMMENT

- The following person spoke regarding climate impacts of the Seattle cruise business and encouraged the Commission to look at her data on the Seattle Cruise Control website: Elizabeth Burton.
- The following person spoke in opposition to the cruise sector and climate impacts: Stacy Oaks.
- The following person spoke in opposition to climate pollution caused by the cruise sector and aviation fuel use; noted impacts on near airport communities and health statistics for people living in those areas; and opined that the other way to address these concerns is through decreased cruise and flights: Breck Lebeque *(written comment also submitted)*.
- In lieu of spoken comment approximately 51 emails titled "Seattle: Stop Cruising Towards Climate Collapse" with additional emails being sent under a changed title and modification of

some text by the sender with their own statements to support the base messaging, with authors expressing distress regarding climate impacts of the Seattle cruise sector; emissions caused from cruise and flight operations; more sailings added to the schedule; and the need to decrease cruise and flight operations until effective solutions are in place, were submitted by: Peggy Printz; Jared Howe; Sophia Keller; Barbara Phinney; Vanessa Jamison; Andrea Chin; Alexandra Harmon; Elaine Hickman; Vivien Sharples; Sara Bliss; Brie Gynclid; Jason Li; Charles Raymond; Wendy Ashmun; Derek Gendvil; Robin Briggs; Laura Gibbons; Jen Bowen; Tom Sheehan; Jean Myers; AJ Cho; Couren Smith; Jonathan Hartman; Laura Theodorson; Graham Golbuff; Ann Dorsey; Blaine Snow; Lauren Tozzi; Gabby Connors; Florie Rothenberg; Nicole Iorio; Linda Carroll; Susan Heif; Donna Snow; Miranda Marti; PJ Phillips; Marii Herlinger; Bria Hedahl; Zain Orion; Arun Ganti; 350 Tacoma; Beth Glosten; Jim Bernthal; Julia Buck; Jan von Lehe; Cheryl Lawrence; Greg Stinson; Peter Sakura; Rick Harlan; and Rusty and Candice West.

- In lieu of spoken comment, written comment related to the opening of cruise season and concern of the harms of cruise on the community's health, the environment, and the climate and encouraging the reduction in, and elimination of, cruise sailings were submitted by: Iris Antman.
- In lieu of spoken comment, written comment regarding the environmental toll of cruise operations, including spikes in cancer rates in port cities, noting the importance of taking action to mitigate the cost of cruise and encouraging the Port to design a better system and policies were submitted by: Grace Norman.
- In lieu of spoken comment, written comments in support of Agenda Item 11a, the City of Bellevue Grand Connection Tax Increment Area and affordable housing, car-free transportation, and equitable access to opportunity and open space for those in the area were submitted by: Patrick Bannon, President and CEO, Bellevue Downtown Association; and Lee Lambert, Executive Director, of the Cascade Bicycle Club.
- In lieu of spoken comment, written comment regarding support of affordable quality healthcare for all airport workers was submitted by: Brandon Johnson.

[Clerk's Note: All written comments are combined and attached here as Exhibit A.]

8. CONSENT AGENDA

[Clerk's Note: Items on the Consent Agenda are not individually discussed. Commissioners may remove items for separate discussion and vote when approving the agenda.]

8a. Approval of the Special Meeting Minutes of March 10, 2026; March 12, 2026 State of the Port; March 12, 2026, Retreat; and the Regular Meeting Minutes of March 24, 2026.

8b. Monthly Notification of Prior Executive Director Delegation Actions March 2026.

Request document(s) included an agenda memorandum for information only.

8c. Adoption of Resolution Nos. 3845, 3846, and 3847: Subordinate Lien Master Resolution Authorizing Revenue Bonds of the Port District to Be Issued in Series to Finance Any Legal Purpose of the Port District; Resolution No. 3846, Amending Resolution No. 3777, Which Amended Resolution No. 3456 Commercial Paper

Authorization; and Resolution No. 3847, Amending Resolution No. 3598, Authorizing the Issuance and Sale of Subordinate Lien Revenue Refunding Bonds, Series 2008.

8c-1. Resolution No. 3845: A Resolution Authorizing Revenue Bonds to Be Issued in Series to Finance any Legal Purpose of the Port; Providing a Subordinate Lien Upon Revenues for the Payment of Such Bonds; and Making Covenants and Agreements in Connection with the Foregoing.

8c-2. Resolution No. 3846: A Resolution Amending Resolution No. 3456, as Previously Amended by Resolution No. 3777, Authorizing the Issuance and Sale of Subordinate Lien Revenue Notes (Commercial Paper) in Series from Time to Time in an Aggregate Principal Amount Not-to-Exceed $400,000,000; Amending Definitions, Requirements with Respect to the Subordinate Lien Bond Fund, Provisions Permitting the Issuance of Additional Bonds, Bond Covenants, Defaults and Remedies, Permitted Amendments, and Related Provisions; and Making Technical Amendments.

8c-3. Resolution No. 3847: A Resolution Amending Resolution No. 3598, Authorizing the Issuance and Sale of Subordinate Lien Revenue Refunding Bonds, Series 2008 in the Aggregate Principal Amount Not-to-Exceed $201,000,000, for the Purpose of Refunding Certain Outstanding Subordinate Lien Revenue Bonds of the Port; Amending Definitions, Requirements with Respect to the Subordinate Lien Bond Fund, Provisions Permitting the Issuance of Additional Bonds, Bond Covenants, Defaults and Remedies, Permitted Amendments, and Related Provisions; and Making Technical Amendments.

Request document(s) included an agenda memorandum, resolution 1, resolution 2, resolution 3, and presentation.

8d. Adoption of the 2026 Local and Regional Government Policy Priorities, for Staff to Engage with Local and Regional Officials and Other Partners in Support of These Priorities.

Request document(s) included an agenda memorandum and presentation.

8e. Authorization for the Executive Director to Enter into an MOU with Western Washington Cement Masons and Plasterers Union Local 528, Representing Cement Masons at Port Construction Services, Amending the Terms of the Collective Bargaining Agreement to include Plasterers.

Request document(s) included an agenda memorandum and agreement.

8f. Authorization for the Executive Director to Increase the Project Authorization for the Places of Worship Sound Insulation Project and to Advertise and Execute a

Construction Contract for One Place of Worship Property in the Requested Amount of $2,960,000, for a Total Program Authorization of $13,897,000. (CIP #C200098).

Request document(s) included an agenda memorandum and presentation.

8g. Authorization for the Executive Director or Delegate to Authorize Spending $6,318,000 of Environmental Remediation Liability Costs for the Disposal of Legacy Contaminated Soil from the Terminal 5 Upland Projects Authorized Under the Terminal 5 Berth Modernization Management Reserve (CIP #C800988) and the Terminal 5 Modern 3rd Lease Amendment Capital Improvement Plans. (CIP #C801340)

Request document(s) included an agenda memorandum and presentation.

8h. Authorization for the Executive Director to Authorize Additional Funding in the Amount of $500,000 for Close-Out Cost for the Fishermen's Terminal Maritime Innovation Center and Site Improvements Projects. (CIP #C801084 and C801211)

Request document(s) included an agenda memorandum and presentation.

8i. Commission Adoption of Order 2026-06: An Order Providing for Performance Rating for Executive Director.

Request document(s) included an Order.

The motion for approval of consent agenda items 8a, 8b, 8c, 8d, 8e, 8f, 8g, 8h, and 8i carried by the following vote:

In favor: Calkins, Hasegawa, and Mohamed (3)
Opposed: (0)

9. UNFINISHED BUSINESS

There was no Unfinished Business presented.

10. NEW BUSINESS

10a. Number Not Used.

10b. Industrial Development Corporation Annual Meeting – Approval of Minutes, Designation of Officers, and Annual Report for 2025.

Requested document(s) included a packet and meeting minutes.

Presenter(s):
Ian Burke, Senior Financial Analyst, Corporate Finance and Budget

Clerk Hart read Item 10b into the record.

Commission President Calkins noted that the IDC is a separate financing entity and the Commission acts as Directors when holding the Annual Meeting of the IDC.

[Clerk's Note: At this time, the Commission meeting recessed, and the Industrial Development Corporation convened its annual meeting of 2026. Director Calkins called the meeting to order at 12:47 p.m.]

Executive Director Metruck introduced the item and presenters.

APPROVAL OF MINUTES

The minutes of the April 22, 2025, Annual IDC Meeting were approved as presented, without objection.

DESIGNATION OF OFFICERS

Director Calkins read the slate of 2026 Directors into the record.

A motion, made by Director Hasegawa, for approval of the slate of 2026 Industrial Development Corporation Directors, carried by the following vote:

In favor: Calkins, Hasegawa, and Mohamed (3)
Opposed: (0)

The designated Directors for the IDC are as follows: Director Calkins, Director Cho, Director Felleman, Director Hasegawa, and Director Mohamed.

Ian Burke, Senior Financial Analyst, provided the annual report of the Industrial Development Corporation (IDC). The report addressed activity and status of the IDC in 2025.

[Clerk's Note: Director Calkins adjourned the annual meeting of the IDC without objection and the regular business meeting of the Port of Seattle Commission reconvened at 12:52 p.m.]

11. PRESENTATIONS AND STAFF REPORTS

11a. City of Bellevue Grand Connection Tax Increment Area Briefing.

Presentation document(s) included an agenda memorandum and presentation.

Presenter(s):
Nate Caminos, Director of Government Relations, External Relations
Samantha St John, East King County Community and Govt Relations Manager, External Relations
John Flanagan, State Government Relations Manager, External Relations

External Presenters: Deputy Mayor Dave Hamilton, City of Bellevue; John Resha, Chief Financial Officer, City of Bellevue; Bob Stowe, Consultant, Stowe Development & Strategies

Clerk Hart read Item 11a into the record and Executive Director Metruck introduced the item.

Bellevue City representatives' presentation addressed:

- the Grand Connection Crossing project promoting connectivity and livability;
- connecting key regional growth centers;
- accessibility by light rail from SEA and Seattle, including downtown cruise ship terminals;
- investment in active transportation and open spaces projected to boost retail and tourism;
- increased leisure visits and increased employment in the tourism industry;
- facilitating both transit-oriented and trail-oriented development;
- funding commitments related to tax increment financing;
- the Tax Increment Financing Model;
- the proposed Tax Increment Area and map showing the boundaries;
- financial impacts for the Port; and
- next steps including Commission action by early May; Bellevue City Council's consideration of action also on May 19, 2026, to establish the area; and funding decisions for the Tax Increment Financing Area being part of the city budget process later this fall.

Members of the Commission thanked the Bellevue City representatives for their presentation and for thought leadership in the project and partnership with the Port.

Discussion ensued regarding:

- relevance of the Port to the Eastside;
- investment now growing the tax base in the long run;
- planning for density;
- ways to lift up the maritime and aviation sectors through this project;
- benefits for communities around the development; and
- increasing value of properties and reducing congestion on roads.

Executive Director Metruck also expressed his appreciation for the partnership with the city of Bellevue.

12. QUESTIONS on REFERRAL to COMMITTEE and CLOSING COMMENTS

No closing comments were presented

13. ADJOURNMENT

The meeting adjourned at 1:17 p.m.

Prepared:

Michelle M. Hart, Commission Clerk

Minutes approved: April 28, 2026

Attest:

Sam Cho, Commission Secretary

Outlook

[EXTERNAL] Cruise - season opening

From Iris Antman <antwomaniris@gmail.com>
Date Mon 4/13/2026 11:37 AM
To Commission-Public-Records <commission-public-records@portseattle.org>

WARNING: External email. Links or attachments may be unsafe.

Dear Port Commissioners and staff,

I'm writing to voice my ongoing concern about the harms of cruise for our community's health and its negative environmental and climate impacts.
I understand that the cruise business in Seattle is a huge revenue source but the other side of the ledger is never truly taken into consideration.
This cruise season will add 3 million tons of climate pollution harming our water, air and marine life, and increasing warming, thus facilitating wildfires and heat domes. At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030 resulting in catastrophic and irreversible damage.

Shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is NOT a climate solution. It eliminates less than 1% of a cruise's climate emissions from the entire voyage. And the Port's 2026 budget cites continued interest in expansion of cruise which is so short sighted. And LNG is also not a solution, even the IMO says it's not a clean fuel.

The common economic model favors short term gain over long term planning. And so over the past 150 years we have degraded the environment and decreased biodiversity to a dangerous degree. Even though the evidence is clear, we continue to struggle to transition to clean energy systems. In Seattle, where the impacts of a warming climate have been moderate so far, it is easy to put one's head in the sand. Please consider the children, your children and future generations who will struggle to live on a warming planet and all that that engenders.

It's time to reduce cruise sailings not increase them. It's time to end the cruise business in Seattle. It's time to stand up to mainstream trends and look reality in the face and act accordingly.

With respect and encouragement to do the right thing.
Sincerely,
Iris Antman

Outlook

[EXTERNAL] Support for City of Bellevue Grand Connection Tax Increment Area

From Patrick Bannon <patrick@bellevuedowntown.com>
Date Mon 4/13/2026 11:42 AM
To Commission-Public-Records <commission-public-records@portseattle.org>

1 attachment (357 KB)
Port of Seattle TIF Letter_04_13_2026.pdf;

Dear Commission President Calkins and Members of the Port of Seattle Commission:

As Co-Chair of the Friends of the Grand Connection, a coalition that supports the development of the City of Bellevue's Grand Connection Crossing project, I am writing to request the Port of Seattle's support for establishing the City of Bellevue's TIF District. This transformative infrastructure will be situated at the critical intersection of affordable housing, car-free transportation, and equitable access to opportunity and open space.

Please see the attached letter, and thank you for your consideration.

Patrick

Patrick Bannon | President & CEO | Bellevue Downtown Association
patrick@bellevuedowntown.com | m: 206.992.4534 | o: 425.453.3113

Friends of the Grand Connection

The Honorable Ryan Calkins
President, Port of Seatle Commission
2711 Alaskan Way
Seattle, WA 98121

Dear Commission President Calkins and Members of the Port of Seattle Commission:

On behalf of the Friends of the Grand Connection, a broad-based group of 60+ community members and organizations, we are writing to urge your support of the City of Bellevue's Tax Increment Financing District ("TIF District"). The state legislature authorized this district for one purpose: to help fund the Grand Connection Crossing Project over I-405. This regional project will result in numerous region-wide public benefits for the diverse communities of the Eastside, as well as everyone working or visiting the area, directly benefiting King County as a whole. We also want to acknowledge and thank the Port of Seattle for its early leadership and investment in the 42-mile Eastrail corridor, which laid the foundation for this Grand Connection Crossing project.

The City of Bellevue's Grand Connection is a major initiative to create a multimodal corridor that will connect Meydenbauer Bay Park through downtown Bellevue to King County's Eastrail. A key feature will be a new pedestrian and bicycle crossing over I-405 to bridge the physical divide created by the freeway. The project will prioritize universal design principles to ensure accessibility for people of all ages and abilities. This Crossing project is estimated to cost $230M and will require multi-tiered funding sources. The TIF District is a critical element of the financing plan. Once completed, the project will significantly and meaningfully advance the following major countywide goals.

This regional project will catalyze the following regional benefits and promote equity for everyone living and working in King County:

Housing. The Grand Connection Crossing will catalyze and support the redevelopment of the Wilburton area of Bellevue, which the City has designated for significant new transit-oriented development and related investments, including adopting new policies that will dramatically increasing the availability of affordable housing, all of which will improve equity on the Eastside. This area could accommodate approximately 15,000 new housing units, including affordable housing units to help Bellevue reach its ambitious affordable housing targets, which amount to the largest increases outside of Seattle. This represents a generational opportunity to address massive housing gaps in our region. The Crossing will provide a safe and car-free option for residents to access jobs and amenities in Downtown Bellevue.

Public Transportation. This project will result in a signature piece of infrastructure that provides a safe, equitable, convenient route for people to walk, ride, and roll cross I-405, connecting downtown Bellevue, the Eastside's largest jobs center, with the 42-mile Eastrail and the wider regional trail network, at the central point of Sound Transit's new downtown Bellevue Light Rail station The Crossing leverages the region's $265M investment of Eastrail in the last 15 years, further improving equitable connectivity between trail and transit infrastructure and the diverse communities of Bellevue, Kirkland, Woodinville, Snohomish, Redmond and Renton. The users of Eastrail will have a significantly improved experience with the Grand Connection Crossing.

Economic Development. This project will also be a major boon to the region's economic development. Based on a recent economic study commissioned by the City of Bellevue, the project could catalyze 2.1 million square feet of development, resulting in over 4,000 new jobs, and generating $1.1 billion of economic activity, while also raising new tax revenue for the city, county and state. The Crossing project will also generate significant construction jobs and related tax revenue. The Grand Connection Crossing will advance equity by removing barriers to opportunity for historically underserved communities. By providing a safe, car-free crossing over I-405, the project will ensure that residents without vehicle access can reach jobs, services, and childcare in Downtown Bellevue.

Considering the significant region-wide benefits in housing, transportation, economic development, and equity, unlocked by the Grand Connection Crossing project, we urge your participation in Bellevue's TIF District.

Sincerely,

Patrick Bannon, Co-Chair
Friends of the Grand Connection
President & CEO, Bellevue Downtown Association

Pearl Leung, Co-Chair
Friends of the Grand Connection
Senior Manager, Public Policy, Amazon

amazon

baylis ARCHITECTS

Bellevue CHAMBER

Bellevue Downtown Association

The Bellevue Foundation

BelRed ARTS DISTRICT

BOYS & GIRLS CLUBS OF BELLEVUE

CIRC

Clover Capital Commercial Real Estate

EASTRAIL PARTNERS

KidsQuest Children's Museum

KGIP

Lime

Microsoft

MG2

Friends of the Grand Connection Individuals

John Chelminiak, Community Leader, Former Mayor of Bellevue

Carolynn Ferris, Community Leader, Past Chair, Imagine Housing

Bill Finkbeiner, Community Leader, Former State Senator

Jennifer Fischer, Community Leader, Executive Director Bellevue LifeSpring

Stacy Graven, Community Leader, Past Chair, Eastrail Partners

Ross Jacobson, Community Leader, Former Bellevue Downtown Association and Bellevue Chamber of Commerce Board Chair

Outlook

[EXTERNAL] Public Comment: Dignity at SEA

From Johnson Brandon <brandonjohnsonm@gmail.com>
Date Tue 4/14/2026 5:55 PM
To Commission-Public-Records <commission-public-records@portseattle.org>

WARNING: External email. Links or attachments may be unsafe.

Dear Commissioners,

I am writing to demand justice and dignity for airport workers at SEA. Specifically, the Port must ensure:

1. Affordable, quality healthcare for all airport workers.
2. An end to using police presence to intimidate workers and organizers.
3. Full access via Port badges for shop stewards to enforce labor contracts.

Our community deserves better. We expect the Commission to take immediate action.

Sincerely,
Brandon Johnson

Sent from my iPhone

Outlook

Re: [EXTERNAL] Support for City of Bellevue Grand Connection Tax Increment Area

From Commission-Public-Records <commission-public-records@portseattle.org>
Date Mon 4/13/2026 3:45 PM
To Lee Lambert <leel@cascadebicycleclub.org>

Good afternoon,

We are in receipt of your written comments for the April 14, Meeting. These will be distributed to commissioners and attached to the approved minutes.

Best Regards,

Commission Public Records

From: Lee Lambert <leel@cascadebicycleclub.org>
Sent: Monday, April 13, 2026 3:13 PM
To: Commission-Public-Records <commission-public-records@portseattle.org>
Subject: [EXTERNAL] Support for City of Bellevue Grand Connection Tax Increment Area

WARNING: External email. Links or attachments may be unsafe.

Dear Commission President Calkins and Members of the Port of Seattle Commission:

I am writing on behalf of a coalition of nonprofit organizations that support the development of the City of Bellevue's Grand Connection Crossing project. This transformative infrastructure initiative is situated at the critical intersection of affordable housing, car-free transportation, and equitable access to opportunity and open space. These priorities reflect shared commitments to fostering inclusive, sustainable, and connected communities.
In Service,

--

Lee Lambert
Executive Director
Pronouns: he, him, his

mobile (253) 861-8977
direct (206) 620-1540
office (206) 522-3222 x 540

cascade BICYCLE CLUB

The Honorable Ryan Calkins
President, Port of Seatle Commission
2711 Alaskan Way
Seattle, WA 98121

Dear Commission President Calkins and Members of the Port of Seattle Commission:

As a coalition of organizations committed to advancing equity and working towards progressive outcomes in King County, we write to express our strong support for the City of Bellevue's Grand Connection Crossing project. This transformative infrastructure with beneficial region-wide impacts sits at the critical nexus of affordable housing, car-free transportation, and equitable access to opportunities and open spaces—priorities we all share.

Significant New Affordable Housing
Bellevue has made a bold commitment to affordable housing, targeting 5,700 units of new income-restricted housing serving households at 0-80% of area median income by 2036, the largest such commitment made by a city outside of Seattle. The Grand Connection Crossing will unlock the full potential of these housing opportunities in the Wilburton neighborhood, where it intersects with the 42-mile Eastrail trail, and where the city has implemented mandatory affordable housing requirements. The result is one of the most ambitious affordable housing strategies in the region, with emphasis on serving households earning less than 50% AMI—those least served by the private market. The Grand Connection Crossing bolsters housing developers' reasons for building in Bellevue, by accelerating housing development during this challenging economic period.

Car-Free Transportation, Equity and Access to Opportunity
The Grand Connection Crossing will provide a safe, vehicle-free connection over I-405, linking King County's second largest job center, downtown Bellevue, with the 42-mile Eastrail corridor. This car-optional infrastructure is essential for future Wilburton residents and Eastrail users from communities throughout the region - from Woodinville to Renton and South King County - to access employment, services, childcare, and amenities in downtown Bellevue without requiring vehicle ownership.

For families and individuals without cars, this crossing removes a fundamental barrier to economic opportunity. It enables residents of affordable housing to reach jobs, education, healthcare, and essential services through active transportation—walking, biking, and rolling, as well as the four light rail stations that connect with Eastrail. This also advances the County's visionary regionwide planning policies, adopted in 2021, that direct concentrations of housing and employment growth to high opportunity communities and cities, in a manner that fosters greater equity across King County, by reducing displacement and addressing racially and ethnically disparate health outcomes, and promoting access to opportunity.

Access to Outdoors and Regional Trail Networks
Beyond economic access, the Crossing serves as a linear park and opens connections to 175 miles of regional trails, including the east-west Mountains to Sound Greenway trail, the Cedar River, Green River and Lake to Sound trails in Renton and South King County, and 520 Trail corridors and beyond. This enhances King County's regional trail network and provides equitable, connected access to outdoor recreation and green space for communities that have historically faced barriers to enjoying these public amenities.

A Regional Equity Investment

The Grand Connection Crossing represents a regional equity investment that benefits all of King County. By connecting affordable housing with jobs, transit, services, and outdoor spaces through car-free infrastructure, this project embodies the values we share, while advancing and reinforcing newly adopted County equity policies: ensuring that all residents, regardless of income, can access opportunity and live healthy, connected lives.

While this project is located in the City of Bellevue, its benefits will be felt regionwide, and are consistent with the Port's goals to promote equity and access. We urge the Port of Seattle to support this critical project and help make this vision of an equitable, connected region a reality.

Sincerely,

Outlook

[EXTERNAL] Testify today please

From Breck Lebegue <brecklebegue@gmail.com>
Date Tue 4/14/2026 8:58 AM
To Commission-Public-Records <commission-public-records@portseattle.org>

4 attachments (5 MB)

Degrowth-Of-Aviation_2019.pdf; Private Jets Climate Effect.pdf; Red Line Aviation Manifesto.docx; Port of SeattleTestimony 4-14-26.docx;

Good morning Sir/Ma'am;
I would like to testify briefly today at the port meeting on the topic of the health and climate effect of increased aviation fuel use at SEA.
Supporting documents are attached. Please distribute to the commissioners.
My intended testimony is the last document attached. I would like to read it aloud to the commissioners.
thank you.
Ever-Warmer Regards,
Breck Lebegue MD MPH
Co-Chair, Climate and Health Task Force
WA Physicians for Social Responsibility
www.wpsr.org/transportation
www.wpsr.org/climate
brecklebegue@gmail.com
Steilacoom WA 98388
210-414-8419
"Never doubt that a small group of thoughtful, committed citizens can change the world.
Indeed, it is the only thing that ever has."
Margaret Mead

DEGROWTH OF AVIATION

REDUCING AIR TRAVEL IN A JUST WAY

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INTRODUCTION

In July 2019, the Stay Grounded Network met in Barcelona to discuss how to counter the massive growth in the aviation sector. A new movement for degrowing aviation and fostering climate justice was born. The results of the conference and further discussions fed into this report, outlining numerous measures to reduce air travel in a just way.

Flying has become increasingly cheaper in recent decades, allowing increasing numbers of people to make flying part of their lifestyle. Still, less than 10% of the world's population has ever been on a plane.[1] Avoiding an unmanageable climate crisis will require unprecedented efforts to cut fossil fuel use in half in less than 15 years and eliminate their use almost entirely in 30 years.[2] Meanwhile, the aviation industry is planning for a massive expansion. Current or planned measures do not address the root of the problem, which is the growth of the aviation sector. Rather, they shift the discussion away from the fact that we need to radically reduce aviation, especially in countries of the Global North. This is a necessary step to reach a just and ecological mobility system (see **Info Box 2**).

While it is key to point out the pitfalls and disadvantages of the current 'green growth' attempts, there has not been enough investigation about strategies to degrow aviation. What are the necessary steps for the social-ecological transformation? What advantages do the different measures have, and which obstacles and problems might they involve? Do they really bring about more justice? Is one strategy best, or is it necessary to implement a combination of measures? With those questions arisingin the growing movement questioning aviation, the Stay Grounded Network (see **Info Box 1**) organised an international conference on *Degrowth of Aviation* in Barcelona in July 2019. For three days, about 150 participants from over 15 countries explored, discussed and mobilised on these issues without a single flight taken, since people from far away had the possibility to join online. Choosing Barcelona for the conference venue was not a coincidence. Barcelona is a city with rising opposition to both airport expansion and mass tourism. Involving organisations that work actively to reduce not only flying, but also tourism, allowed for a fruitful interaction of these two movements. Most participants at the conference had a background in climate justice movements, initiatives against airports and noise, or groups fostering alternatives, and many of them work in NGOs, universities or trade unions. It was quite a unique moment to gather as a new movement for degrowing aviation and fostering climate justice.

The main part of the conference was spent discussing measures that could help to reduce aviation in seven parallel working groups: taxes, frequent flyer and air miles levies, limits of short-haul flights, moratoria on airports, institutional travel policy changes, alternatives to aviation, and degrowth of tourism. The results of the conference fed into this report. However, at the conference, it was impossible to cover all potential measures. Some remaining approaches are therefore briefly treated in chapter 8 of this report. Some of the measures not covered in the conference (including emissions trading, offsetting, biofuels, synthetic fuels and improvements in engine efficiency) were excluded from the outset as being unjust, creating more problems than they solve, or not having the capacity to bring about the needed systemic changes (see **chapter 1**).

Several core questions accompanied the discussions in the working groups:

- What role can price instruments play when trying to degrow aviation? What kind of taxation system would be socially just?
- Where do we need regulatory instruments like limits to the numbers of flights, moratoria on airport projects or closing certain airports? Should we even consider banning flights on certain (shorter) routes? Could such regulatory instruments be added to taxation mechanisms?
- Does it make more sense to work bottom-up (individual behaviour change, voluntary changes of travel policies, grassroots pressure from below) or top-down (policy changes)? How can they play together in order to achieve systemic change?

- What alternatives to flying exist and what is needed to improve them?

- What role does tourism play in the discussion about degrowth of aviation? Do we need caps on tourism, and if yes, how will that work?

Some of the discussed measures might work within the current economic system. Some of them might challenge its foundations. Some measures touch upon the question of whether individual liberty should be restricted at the point where it violates the liberty of others. Measures must include considerations about the differences between countries in the Global North and the Global South, and what kind of role international agreements and solutions must play. Currently, international aviation politics is dominated by the lobby of the aviation industry who will never support strategies for limiting or degrowing aviation. However, degrowing aviation is the only way to sufficiently cut its emissions. Therefore, the grassroots and civil society movements will have to push for the solutions needed to reach a just and climate friendly mobility system. The more concrete we can imagine a just and environmentally sound future, the more likely change will occur (see **Info Box 4**).

With the conference and with this report, the Stay Grounded Network aims to fill the gap and incentivise more discussions about possible steps and visions. However, the report is not a manifesto or a readymade strategy. All of the presented measures have their advantages and disadvantages. The following report is merely a contribution to the discussion, knowing that it would be fatal to rely on politicians who do not grasp the urgency of radical change in the transport sector, or an industry which will never voluntarily give up its privileges and power. We hope the report can feed into academic research and civil society campaigns. In particular, we hope it provides useful arguments for those campaigning for a degrowth of aviation.

We wish you an interesting and inspiring read!

[1] Scott et al. (2012)

[2] IPCC (2018)

INFO BOX 1: STAY GROUNDED

Stay Grounded is a global network consisting of more than 150 member organisations. These include local airport opposition initiatives, climate justice groups, NGOs, trade unions, academics, groups fostering alternatives to flying, and organisations that support communities struggling against on-the-ground offsetting projects or biofuel plantations. The network started to form in 2016, the year in which a very weak global strategy to target aviation's climate impact (CORSIA) was launched (see **chapter 1**):

At different airports around the world, protests were organised simultaneously, and it became clear that building alliances is hugely important in order to exchange experiences, support each other, come out of the shadows and involve more stakeholders. It showed that local airport struggles (often framed as 'not in my backyard' conflicts) are not single cases, but that they are connected with the massive growth of aviation, the unfair subsidies of its industry and the proposal of false solutions like offsetting and agrofuels.

A modal shift of mobility can only be achieved by involving more and more groups and individuals to build pressure from below both locally and on a bigger scale by resisting, transforming and creating alternatives. In 2018, the network went public with a website, another series of global coordinated airport actions, and a position paper defining *13 Steps to Rapidly Reduce Aviation and to Build a Just Transport System*. This paper is being supported by more than 200 organisations.

Find out more at: **www.stay-grounded.org**

1.
REDUCING EMISSIONS FROM AVIATION = REDUCING AVIATION

Berlin - Brussels, a very common route. But policy makers, lobbyists and tourists all travel by plane. It is normal, and there is no good alternative. One initiative is demanding the reopening of a night train between those cities, which would be 200 times more climate friendly.[1] Sometimes, degrowth of aviation could be as easy as that. Sometimes it might be more complicated. The fact is that green flights are and will continue to be an illusion, and there is no other way forward than reducing aviation.

Aviation is the mode of transport with the biggest climate impact by far (see **Diagram 2**). Yet, air travel is growing faster than any other sector. While global CO_2 emissions increased by an estimated 25% from 1990 to 2010, the CO_2 emissions from international aviation rose by more than 70% in the same period.[2] Within the European Union, as elsewhere, emissions from aviation grew more rapidly than those from other sectors of the economy.[3] If it was up to the industry, this trend would continue: the number of aircrafts and the number of passenger-kilometres flown is expected to double over the next 20 years. This entails more than 1,000 infrastructure projects around the world and many associated conflicts (see **Diagram 3**). The international aviation industry anticipates annual growth of 4.3% throughout the next decades.[4] This could cause greenhouse gas emissions from aviation to increase four to eightfold by 2050.[5]

How have such enormous growth rates been possible? One reason is that the costs of air travel are 60% lower today than they were in 1970. Costs have been cut through low-cost carriers, wage dumping, efficiency gains, and, above all, sector deregulation from the 1980s onwards.[6] States massively subsidise the industry: aviation kerosene is the only fossil fuel apart from maritime heavy oil that is usually not taxed. Many governments abstain from levying value-added tax on tickets and property tax on airports. In the European Union alone, the losses in state revenue due to the subsidies to the aviation sector amount to 30 to 40 billion euro annually.[7] Also, aircraft manufacturers and airlines benefit from major subsidies.[8] Everyone—including those who do not fly—pays for these subsidies, ensuring that the mode of transport of the better-off remains cheap.

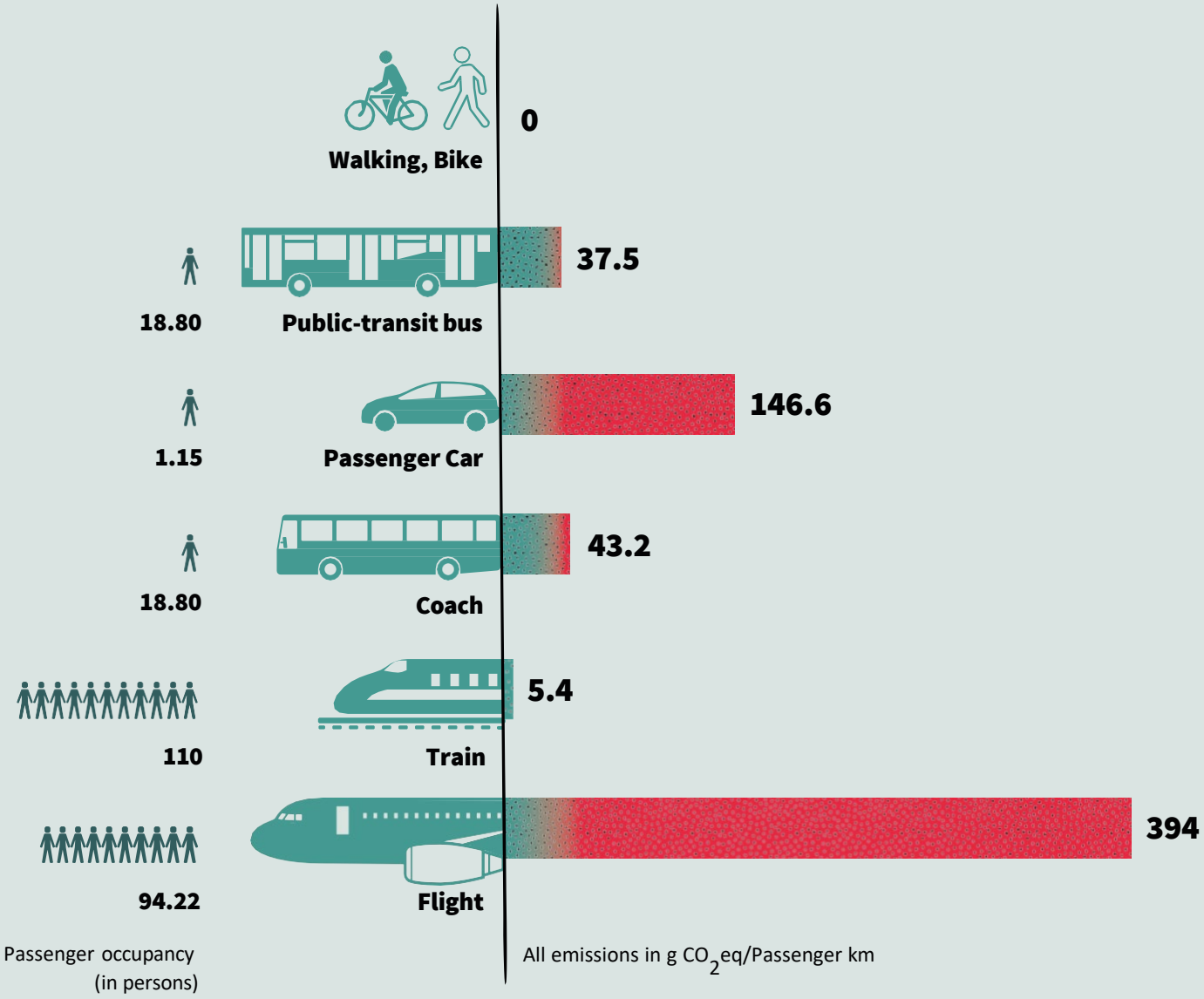
Industry representatives like to point out that emissions from aviation account for only 2% of global CO_2 emissions, and that international flights account for only 1.3%, but they conveniently omit several facts:

First of all, the share of emissions from the aviation sector is increasing rapidly. In a report to the European Parliament, the research organisation Öko-Institut warned in 2015 that CO_2 emissions from international aviation may

Diagram 1: Climate Impact of Different Modes of Transport

Source: UBA Austria 2019

The data refer to Austria (as of 2017). They are calculated taking into account average passenger occupancy in each mode of transport. The Austrian Environment Agency uses a factor of 2.7 to account for the non-CO_2 related climate impacts of aviation. The emission factors are shown per person and per kilometre. They do not show that the climate impact also depends upon the route and altitude of a flight. Short-distance flights are particularly harmful per unit of distance travelled since the emissions of the kerosene-intensive climb are disproportionately high. Still: the longer the flight, the greater the impact.



reach a share of 22% of global emissions by 2050.[9] An even larger share is probable for the aviation industry in other countries: projections for the United Kingdom indicate that if the goal of limiting global warming to 1.5 degrees is taken seriously, and the controversial expansion of London's Heathrow Airport continues, aviation will consume up to 71% of the country's available CO_2 budget in 2050.[10] Secondly, aviation's contributions to climate change are not just a matter of CO_2. If other factors contributing to climate change are taken into account—such as induced cloudiness, ozone, contrails, water vapour and soot—aviation's contribution to human-induced climate change doubles at the very least. A 2005 estimate stated that civil aviation's climate impact amounted to around 5% (see more about accounting for emissions in **chapter 8**).[11] Thirdly, only a small number of (frequent) air travellers are responsible for this 5%, since most of the world's population has never set foot on an airplane (see **Info Box 2**). Finally, one should also keep in mind that these figures only cover civil aviation--but there is limited information on emissions from military aviation available (see **chapter 8**).

The impacts of aviation also go beyond climate change. The extraction and transport of the fuels needed contribute to the broader environmental crisis through degradation of ecosystems, geopolitical conflicts and wars. Huge amounts of materials, such as metals and cement, will be consumed if the plans to build hundreds of airports and double the fleet of civil aircraft over the next 20 years, from 21,633 to 43,560, are carried out.[12]

Unfortunately, that is not all: people living near airports are exposed to higher health risks. High blood pressure and heart disease are some of the effects associated with aircraft noise and high particulate levels in ambient air,[13] and additional airports and runways will degrade ever more habitats of people, animals and plants. At the same time, the economic impacts on host regions are not always positive. Negative examples include transport infrastructure and hotel chains displacing small shops and farmers, while real estate prices rise.[14] Water reserves dwindle under the dual pressure of climate crisis and tourism. While landfills grow, the local culture becomes an attraction and a commodity.[15] This all leads to mounting protests in regions inundated by mass tourism (see **Info Box 3**).

INFO BOX 2: CLIMATE JUSTICE

Air traffic is a major obstacle to climate justice. While it might seem normal to fly in countries of the Global North, this 'normality' has only existed in the last two decades, and is only reserved for the privileged. Worldwide, less than 10% of the population has ever taken a flight. Flying is at the core of an 'imperial mode of living',[1] a form of production and consumption that is only possible because it is at the expense of others: residents exposed to noise and particle pollution from planes, local ecosystems, future generations and those in the Global South who are already bearing the brunt of the impacts of climate change. People do not enjoy this lifestyle out of malice or ignorance, but because it has been ingrained in the institutions and infrastructures that surround us. Such conditioning is hard to overcome, especially because the effects of such a lifestyle are not obvious.

The term 'environmental justice' aims to show that environmental problems are closely connected with society, that nature is a part of us and we are a part of it. What we do to nature, we do to our livelihood, or rather to the livelihood of others. The social movements for Environmental and Climate Justice demand an end to how we have been treating our environment and society.

Climate Justice means that the Global North and the global wealthy are now responsible for a larger share of the effort to combat the climate crisis and to mitigate the consequences. This includes financial payments for liability and redress. Funds for this could be raised by imposing a levy on frequent flyers and other harmful activities. But climate justice is more than a monetary or legal process. Achieving Climate Justice requires societies to prioritise a 'good life for all' above 'a better life for the few'. This includes justice among all—now and for future generations. It also implies the struggle against all forms of discrimination based on gender, origin, 'race', class, religion, or sexual orientation. And finally, Climate Justice means that people from the Global South have a right to resist neo-colonial climate policies like geo-engineering, biofuels and offsetting (see **Info Box 5**). It is not an option to continue flying and paying others in the Global South (where such measures are cheaper) to repair the problem by planting trees or being excluded from their forests.

[1] Brand and Wissen (2018)

GREEN FLYING IS AN ILLUSION

In response to the growing critique, the aviation in-dustry and the UN agency ICAO (International Civil Aviation Organisation) have announced their inten-tion to make international aviation greener in the fu-ture. The proclaimed goal is *carbon neutral growth* from 2020 onwards, defined in the program CORSIA (Car-bon Offsetting and Reduction Scheme for Internatio-nal Aviation). It consists of mainly two elements: first, efficiency improvements and new technologies (like ‚green fuels'), and second, carbon offsetting. In addition to international aviation, this strategy can also be recognised at airport and airline level, as well as in almost any climate sector.

The goal of technological fixes

Future technical improvements for aircraft and operations have been identified, and should continue to be researched. One example is how slightly changed flight

paths might reduce the creation of contrails.[16] However, these attempts will be insufficient to overcome aviation's emissions problems: Step-changes in aviation technology are uncertain and will not come into effect until decades from now, which the industry admits.[17] Lifting a huge engine into the air is simply much more energy intensive and complicated than moving a vehicle on the ground. For example, electric flying is not possible for passenger or freight engines because of the weight of batteries. The forecasted efficiency gains in fuel use are far exceeded by historic, current and planned growth rates of air travel and air freight.

One main greening strategy is the push for alternative aviation fuels: On the one hand, biofuels made from plants like palm oil are being fostered by the industry. However, this could drive a massive increase in deforestation and peat drainage and thereby cause vast carbon emissions. In order to avoid this and associated land grabbing, human rights violations and loss of food sovereignty, resistance to biofuels needs to be prioritised. Synthetic fuels made from electricity (Power to Liquid) are technically feasible,[18] but they would have to be produced using surplus renewable energy, and we are a long way from even producing enough renewables for transport on the ground, agricultural production and heating. Aiming for unrestricted growth of renewables can also lead to immense problems, be it large hydroelectric dams causing biodiversity loss, or neocolonial mega solar or wind parks on indigenous territory in the Global South.

Offsetting instead of reducing emissions

As technological solutions are limited, the ICAO climate strategy relies almost entirely on offsetting carbon. Instead of reducing emissions, airlines can offset them by buying carbon credits from others – like reforestation projects or hydro-electric dams that claim to lead to emissions savings. Airports often try to legitimise their destruction of ecosystems by offsetting the biodiversity loss. The study *The Illusion of Green Flying* [19] demonstrates the many short-falls and problems associated with offsets and concludes that they serve as a cheap licence to continue polluting. Simultaneously, offsetting—besides often being subjected to fraud and strange calculations—has shown to have many perverse effects, especially in the Global South, including land grabbing, displacement of local communities, and more (see **Info Box 5**).

All in all, the minor efficiency gains and emissions savings delivered by the aviation industry's own measures will not prevent the massive rise in emissions that the envisaged growth rates will produce. For decades to come, 'decarbonised' air traffic or 'carbon neutral growth' will therefore remain an illusion. Instead, the mounting demand for biofuels, energy and offsetting credits represents a serious risk. The result might be amplified injustice, new ecological problems and conflicts, which is why climate justice can only go along with a reduction of energy use and aviation.

DEGROWTH: WHAT IS IT AND WHY IS IT NECESSARY FOR AVIATION?

The debate surrounding environmental problems induced by aviation and flying suffers from many of the same myths as the general discourse on green policy: it avoids the issues of reduction in activity or consumption levels, and puts all hopes into technical solutions in combination with economic instruments to 'correct prices'. However, as ecological economists have long pointed out, emissions are pervasive because all production processes require material and energy inputs, producing emissions and waste products as an outcome.[20] None of the technological solutions suggested by the aviation industry can change this. This understanding of biophysical reality, and of the biophysical basis of the economy, is central to the idea of degrowth.

At the same time, degrowth is about much more than just a simple decrease in consumption, living standards or material throughput of the economy. The concept also encompasses a critique of the whole modern culture of development, that is, a belief that more is always better. A core concept is *sufficiency*. Degrowth is a movement that questions growth-society and searches for ideas and practices about what might constitute a good life and a good society, without aiming to prescribe any specific solutions. Diversity and a plethora of approaches are envisioned.[21]

The concept of 'degrowth' (*décroissance*) was born in France in the 1970s as a cultural critical parallel to the more technocratic *Limits to Growth*-debate taking place internationally. 'Degrowth' as a concept was born at a time when international development aid was taking off, and the Western, individualist and consumerist lifestyle was heavily promoted as a modern ideal in developing countries. Today, it must be understood first and foremost as a project for a radical social-ecological transformation.[22]

The discussion around degrowth of aviation encompasses two things: the simple and basic message of reduced flying to reduce environmental impacts, and at the same time, a questioning of the modern cultural-economic model in which flying and hypermobile, busy lifestyles have become the norm, both privately and at work. Thus, discussing degrowth of aviation must include more than simple measures to reduce the immediate emissions from aviation. To address the problem on a larger scale, there is a requirement to challenge and reconsider the wider development and economic model of which it is a part.

BEYOND FALSE SOLUTIONS

Having outlined the impossibility of green flying and the need instead for a reduction of aviation, if the measures are to have any effect on climate change, we will now discuss different alternative measures in detail, including how to implement effective action. If the proposals from

the aviation industry itself are not convincing, then what are the strategies or measures that could work to reduce aviation? There need to be – and there are already – alternative paths, as highlighted by initiatives that tackle the causes of climate change at their roots and seek effective climate action. Many suggestions already exist, but need to be examined in detail. What we need is debate and implementation of measures that have an actual effect in terms of reducing the problems we are facing. This was one of the purposes of the conference in Barcelona in 2019.

The next chapters describe in-depth a range of measures that can be much more effective than the ones proposed by ICAO. Knowing that there are no magic solutions, the chapters discuss the pros and cons of each policy in terms of its effect on emissions reductions, its feasibility of being introduced, as well as its possible contribution to broader systemic change, including social justice.

FURTHER READING

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Demaria, F. et al. (2013). What is Degrowth? From an Activist Slogan to a Social Movement. In: Environmental Values 22 (2), pp. 191-216. https://www.ingentaconnect.com/content/whp ev/2013/00000022/00000002/art00005

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[1] Tagesspiel (2019)
[2] Öko-Institut (2015: 12)
[3] EEA (2019)
[4] ATAG (2016: 18), ICCT (2017: 1)
[5] European Commission (2017)
[6] ATAG (2016: 22)
[7] Korteland and Faber (2013)
[8] Gössling et al. (2017)
[9] Öko-Institut (2015: 28)
[10] Carbon Brief (2016)
[11] Fahey and Lee (2016)
[12] ATAG (2016: 66)
[13] Schlenker and Walder (2016)
[14] Bridger (2015)
[15] The Guardian (2017), TWN (2017)
[16] Mannstein (2019)
[17] Heinrich-Böll-Stiftung (2016), Der Standard (2019)
[18] Malins (2017)
[19] Stay Grounded (2017)
[20] Spash and Smith (2019)
[21] See e.g. Kallis et al. (2015) or Demaria et al. (2013)
[22] Muraca (2013)

Penguins, being "cool birds that stay on the ground", block a hallway at the Tegel Airport in Berlin in November 2019. See https://tinyurl.com/sldzmrl
Photo credits: Leonhard Lenz

INFO BOX 3: TOURISM AND AVIATION— A COMBINED PROBLEM

Expansion of aviation and the massive growth in tourism are closely linked. In 2018, more than half of all international plane travels were related to tourism.[1] Tourism as a whole is a trillion-dollar industry growing at an annual rate of 3-5%[2]—and so is its environmental impact which is already significant.[3] The carbon footprint of the sector grew from 3.9 to 4.5 Gt CO_2 between 2009 and 2013, representing 8% of global greenhouse gas emissions.[4] Transportation makes up the largest part of tourism's carbon footprint. Apart from its impact on climate change, tourism also negatively affects the local environment in terms of degradation of biodiversity, soil health, water availability and quality, and high levels of noise.

Tourism is sold as a product which allows people to displace themselves from one location to the other, while offering the 'comfort' to stay in their own bubble. Tourism often serves as a means to escape the workplace and stressful routine, to quickly relax in order to be fit for work again. The tourist industry has become increasingly efficient at pre-packaging this experience for its customers. Instead of getting to know the world, tourists book the cheapest flight or flight-hotel packages, most often to mass tourism destinations, including all-inclusive mega resorts. It is socially accepted to forget the fact that tourists are visiting a space where local people live their daily lives. The profit-motive has transformed and is transforming local environments from being 'attractive to live in' to 'comfortable for tourists'. This often leads to displacement of local residents from beaches, forests, cities and other public spaces. Even seemingly individual low-budget trips with Airbnb can cause detrimental impacts in the housing market.

Barcelona—the host of the 2019 *Degrowth of Aviation Conference*—represents a sad illustration of both the environmental and social consequences of tourism and its exponential growth. The growth of tourism in Barcelona cannot be explained without the expansion of high-speed transport infrastructure—both train and aviation—making Barcelona one of the main tourist destinations in the Mediterranean. Up to 82% of tourists in Barcelona arrive by plane.[5] Moreover, the port of Barcelona attracts a large amount of cruise ships and ranks highest in Europe by number of passengers (about 2.7 million in 2018). The municipality of Barcelona registered 31 million overnight stays and 23 million visitors in 2016,[6] an increase of more than 800% since 1990. The Stay Grounded Coalition in Barcelona identified some of the impacts in a joint statement. Gentrification, a result of real-estate speculation and Airbnb, makes it hard for local citizens to find affordable housing. Low-income groups are forced out of the city and their neighbourhoods, leading to long ways to work, and are often unproportionally exposed to high levels of airport noise and pollution. Gentrification further results in the substitution of local commerce.

On the Balearic Islands, which served as a huge Spanish ‚laboratory tourist experiment' starting in the 1950's[7] and since been exported elsewhere in Spain, the impacts of an economic model relying exclusively on tourism is increasingly felt and questioned. Affordable housing has decreased while precarious jobs have increased. Serious water scarcity is looming and the natural landscape has been destroyed or degraded. In a manifesto titled *Without limits there is no future*, a multitude of regional organisations called for a reshaping of tourism and for a diversification of the economy, for sustainability and more local democracy, and more specifically, for slowing down and stopping large infrastructure projects.[8]

In the Global South, tourism is often linked to displacement of local communities, labour precariousness and poor working conditions. It has been argued that tourism functions as a placebo by failing the promises of bringing 'development' and social well-being to local communities.[9] The image of tourism as a sustainable form of development must therefore be questioned, along with the more general concept of 'development'.[10] In the end, the issue boils down to how a community can *live from tourism* instead of *letting tourism live from it*. So while it might be clear that tourism needs to take place with fewer flights, there is also a need to both reshape tourism and to reduce tourism overall (see **chapter 6**.)

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[1] DGAC (2017), UNWTO (2019)
[2] UNWTO (2016), World Travel & Tourism Council (2017)
[3] Gössling (2002)
[4] Lenzen et al. (2018)
[5] Rico (2019)
[6] Ajuntament de Barcelona (2017)
[7] Buades (2006)
[8] Without limits there is no future (2006)
[9] Blázquez Salom and Cañada (2011)
[10] Konstantinus (2018)

2.
ELIMINATING TAX EXEMPTIONS: KEROSENE & TICKET TAX, VAT & CARBON TAX

Flying is virtually tax-free in large parts of the world despite the massive cost aviation causes to the environment and society. While most forms of transport are subject to excise duty, value added tax, and other levies, flying continues to be subsidised with dozens of billions of euro every year through tax exemptions. This chapter will discuss the potential of taxation as an instrument to curb flight traffic, and strategic pathways to achieve this in practice.

For historical reasons, aviation has enjoyed tax benefits that are exceptional compared to other areas of society.[1] This can partly be attributed to the international character of aviation as opposed to the national character of taxation. The 1944 Chicago Convention was the foundational international agreement on aviation, seeking to facilitate and expand aviation. It prohibits the imposition of taxes on fuel already onboard an aircraft when it lands. Over time, this convention gave rise to the practice of exempting all aviation fuel from both taxation (excise duty) and value added tax (VAT), sometimes formalised through bilateral air service/transport agreements. This principle has been upheld in cross-border aviation (if not at the domestic level) to this day. It is important to note that the Chicago Convention does not explicitly prohibit the taxation of all aviation fuel—that is a widespread misconception. The Convention as such only applies to fuel that is already on board at landing, but says nothing about fuel taken on board before departure.[2]

Introducing adequate taxation in the aviation sector on par with other modes of transport could effectively reduce demand, while generating significant revenue streams that could be directed towards more sustainable modes of transport. Such taxation could take several forms. Some commonly proposed taxes include: a tax on kerosene comparable to other fuels, the collection of VAT, a general and economy-wide carbon tax, and ticket taxes (passenger taxes) that can be varied according to distance travelled or other factors. The revenues of such taxes depend on many factors. A recent study commissioned by the European Commission[3] estimates that introducing a kerosene tax (at 0.33 €/litre) in Europe would generate €17bn in fiscal revenue, while VAT (at 19%) would raise €30bn Europe-wide. It is estimated that due to the increase in cost of flying, such a kerosene tax would reduce CO_2 emissions by 11%, while VAT (at 19%) would do so by 18%.

The landscape of existing aviation taxation is fragmented. About a dozen countries collect a kerosene tax (excise duty) for domestic flights, including the United States, Canada, Australia and Japan. Tax rates are usually very low, such as 0.01€/litre in the US and 0.02€/litre in Australia. In comparison, the agreed minimum for a kerosene tax in Europe—if it were introduced—would be significantly higher, at 0.33 €/litre following the EU Energy Tax

Directive. While no EU member state collects a kerosene tax for domestic flights at this point, the majority raise VAT at effective rates ranging from 3% (Luxembourg) up to 27% (Hungary) of the ticket price.[4]

Given the constraints on collecting a kerosene tax and VAT in cross-border aviation (see above), taxes on international connections are usually levied as ticket taxes, i.e. as a fixed amount per passenger and departure. Such ticket taxes exist in many countries, including a number of EU states. They are often progressive with regard to distance and class, and generally range from below 1 euro (Thailand, all international flights) to more than 170 euro (UK, long distance, any class above lowest).

In light of this fragmented landscape, the best way to compare the aviation tax rates among nations is to use the overall tax rate of each, which combines the various kinds of taxes applied to flights in a given country. This overall tax rate can be calculated as a weighted average for domestic and international flights, taking into account both the difference in taxation and passenger numbers between the two. Such a comparison shows that the level of taxation is particularly high in the United Kingdom (on average ca. 40€ per passenger and flight), with a number of countries lying in the range of 15-20€ (including Canada, the US, and a number of EU states). Comparatively high tax rates, that only apply for international departures, are in effect in Australia (40€), Mexico (30€), and Brazil (30€).

THE ADVANTAGES OF TAXATION

The introduction of meaningful taxation in the aviation sector comes with a range of advantages. Increases in ticket prices are expected to curb demand[5] and the current expansion of aviation, which could initiate contraction of the aviation sector. At the same time, this addition to air travel cost would immediately boost the competitiveness of alternative forms of transport such as rail and bus, which (in Europe) are generally taxed at standard VAT rates (although some countries apply an exemption or reduced rates). Even merely levelling the VAT playing field with an aviation tax would generate a significant income stream that could be used to fund transformation of the transport sector towards more sustainable modes (and not be 'ring fenced' for more spending on aviation). Alternatively, taxes could be redistributed to bolster social justice at national or even global levels (e.g. through the Green Climate Fund). Whether such an earmarking ('hypothecation') of tax revenues can be legally anchored depends on the national context, but the general practice is not unheard of in many countries (e.g. for road upkeep).

Taxing aviation is a realistic and feasible measure: aviation taxes already exist in many domestic contexts, and the instrument is well-known and well-studied. It can also be expected to have relatively broad backing among the public and even political parties, as taxing aviation effectively amounts to bringing the sector in line with existing practice in other sectors (creating a 'level playing field'). One potential downside to consider is that this notion may undermine the idea that states should actively support more sustainable modes of transport, especially rail transport. A kerosene tax has the particular advantage that, in principle, it could cover all forms of aviation (including freight, private as well as commercial aircraft, and the military) and its effect increases proportionally to the distance travelled. Taxing kerosene would give aircraft manufacturers an incentive to improve fuel efficiency, which would not be the case with other types of taxes or a frequent flyer levy (see next chapter).

While aviation taxes generally apply equally to any citizen who flies, one social justice argument claims that frequent flyers mainly consist of middle and high income households. Considering that in many countries most of the population flies rarely or never, as opposed to a minority who are frequent flyers, aviation taxes are socially progressive in practice. The 'Yellow Vests' protests in France are a case in point: in the context of their protests, it has been argued that kerosene taxes represent a more socially just alternative to motor fuel tax increases.

CARBON TAX: THE DIFFERENCE TO AVIATION SPECIFIC TAXES

Carbon taxes are widely discussed and agreed upon by mainstream economists as an efficient and effective climate mitigation measure. The original idea of a carbon tax was to put a price on greenhouse gases emitted by sectors such as industry and transport, in order to internalise the social costs—or the so-called 'negative externalities'—that CO_2 causes. The tax hence serves as an economic incentive for companies and consumers to opt for low carbon alternatives.

The approach has several problems. One is the difficulty of considering and pricing all of the damage caused by burning fossil fuels—like biodiversity loss, negative social consequences, health impacts and in general a very insecure future. There is also the ethical question surrounding whether or not to put a price on for example human life or the 'damage' of species extinction. But most importantly, should we not rather avoid the damage overall?

Due to the rapid progress of the climate crisis, there has been a move away from focusing on internalising the externalities, and instead a debate about how high the carbon price must be in order to achieve the necessary reductions (as defined by the scientists). Today, carbon prices are often way too low to have a significant emission reduction effect. To be effective, the price needs to be high—120 € per tonne or more.[6]

In practice, carbon taxes are often levied on fossil fuel products, sometimes as one element of several that together constitute the total tax rate. The CO_2 tax can be

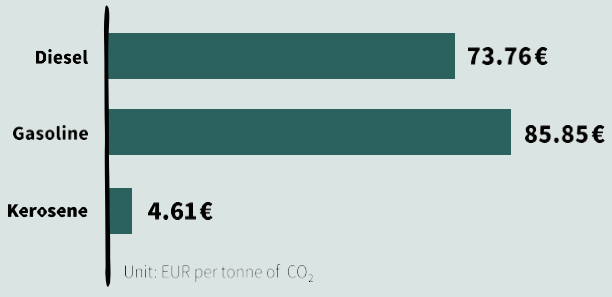
explicit or implicit (i.e. used as an argument for the tax in the first place). Therefore, it often not easy to distinguish between CO_2 taxes on fuel and other fuel taxes. Sometimes it might even give a better picture to consider the two together (see **Diagram 2**).

For aviation, one kind of carbon tax could be on jet fuel, if it distinguishes between the differing CO_2 emissions resulting from the production and use of various kinds of fuels—kerosene, several kinds of biofuels, and electro-fuels. But as the impacts of flying are more than just the emitted CO_2, a carbon tax for aviation would have to take into account the impact of burning kerosene high up in the air (see above). If not, the tax implemented throughout all transport sectors could lead to an indirect subsidising of planes in comparison to means of transport on the ground. A carbon tax applied to tickets could also include a share of the operational and surface passenger transport CO_2 emissions of the departure and arrival airports.

Diagram 2:
Average Fuel Excise / Carbon Tax

Source: OECD (2019)

The figure shows tax rates as of 1 July 2018. The numbers are emission-weighted averages calculated across 44 OECD countries and Selected Partner Economies. They include international aviation. The effective carbon tax is the sum of fuel excise taxes (of which the statutory rates are usually expressed in common commercial units, such as litres of gasoline) and explicit carbon taxes (understood as taxes called carbon taxes where statutory rates are typically also expressed in common commercial units or per unit of CO_2 emissions).



Pricing carbon cannot be the sole mechanism, replacing other possible measures like cutting short haul flights or frequent flyer levies. A properly implemented carbon tax might, in principle, have advantages in comparison to a kerosene tax, as it could also tackle the climate impact from burning biofuels or synthetic fuels, which are by no means carbon-neutral. However, even this is not straightforward: generally carbon taxes are not applied to biofuel because carbon taxation schemes are set up mainly with the purpose of facing out fossil fuels, and also because the emissions from biofuels do not fall under the UNFCCC reporting rules (see **chapter 8**).

THE LIMITS OF TAXATION

The disadvantages of a tax-based approach fundamentally tie in with the limits of market-based approaches more generally. As airlines will likely pass the additional cost on to passengers, wealthy frequent flyers can afford to maintain their habits, while the mobility of others will effectively be reduced. Given the general political unpopularity of raising tax rates, expanding taxation in the aviation sector represents a relatively one-off measure with limited scope for successive increases to respond to the increasing urgency of the climate crisis. At the low rates that are currently discussed in Europe, a kerosene tax, a carbon tax or VAT may do little more than cancel out some of aviation's subsidies. It is unknown how flyers will react to such a modest price increase; that is, whether demand will be notably reduced. Also, the price signal of any tax can be counterbalanced by declining oil prices, due to oil price fluctuations. Although aviation taxes are not regressive as such, given that flying continues to be more widespread among higher-income households, individual low-income households (e.g. migrant workers) may still be adversely affected unless addressed through balancing measures like full or partial redistribution.

From a strategic point of view, introducing taxation for aviation falls short of offering a more profound critique of current forms of mobility both in regards to environmental sustainability and social justice, compared with, for example, the idea of a frequent flyer levy (see **chapter 8** on progressive ticket taxes). At the same time, the complexity of national and international taxation regulations make pursuing a kerosene tax a challenging target for effective grassroots activism, and risks tying up activist energy. There is also the risk that such taxes could exempt biofuels, which produce similar high-altitude climate impacts, potentially creating a dangerous incentive for their increased use. The same argument can be made for synthetic fuels (electro-fuels) that would continue to generate other greenhouse gases and contrails when used in aviation.

HOW TO ACHIEVE TAXATION OF AVIATION?

At this point in time, a consensus is emerging even among more mainstream actors that the aviation sector is undertaxed. Including a justice argument in campaigns against aviation expansion can be an important and promising strategy. While the vast number of mechanisms and models for taxation at national and international levels may be overwhelming at the outset, it is important to remember that currently there is no or very little taxation on aviation, anywhere in the world. Therefore, any form of new taxation is preferable to the status quo. With profit margins in the sector becoming ever slimmer, even modest tax rates can potentially cause a crisis and market consolidation in the sector after decades of aggressive expansion.

The undertaxation of aviation suggests merit in pursuing whatever tax schemes may be within reach in a given jurisdiction in order to create momentum. The situation in Europe shows the potential for such momentum. After aviation taxes became a key issue in recent European election debates, a coalition of like-minded states (Finland, Sweden, France, Netherlands, Luxembourg) is now advocating aviation taxes at the European level, and a European Citizen Initiative is under way.[7] A promising strategy could be to pursue ticket taxes at a national level, while building coalitions for action at regional and global levels. The advantage of ticket taxes is that they can be introduced at the national level without significant legal hurdles, and with freedom to design rates, distance bands, and other features such as including a frequent flyer levy or air miles levy. Networks between stakeholders or activists, like Stay Grounded, could play a role in this effort by facilitating the exchange of knowledge, best practices and key arguments.

This chapter illustrates that there is no silver bullet among the taxation models currently discussed—all taxation instruments are subject to trade-offs. This calls for a pragmatic approach, where the overall aim should be to pursue what is feasible and seek to create a mix of instruments. While a radical tax reform towards carbon tax-ation has recently received increased attention as an alternative to more widespread instruments, its effects and side effects will equally depend on the concrete implementation. Either way, it will be particularly important to ensure the inclusion of non-CO_2 emissions caused by aviation, as this factor is currently sidelined in the discourse. In a similar vein, any suggested tax exemptions for biofuels or synthetic fuels must be challenged. Unless these points are taken into account, a simple carbon tax model will achieve far less than targeted measures to address flying as a high-emission activity.

Overall, aviation taxes are an important opportunity to connect the struggle against the expansion of the sector with the broader movement for tax justice. Adjusting tax systems to the reality of the climate crisis both at national and global levels is vital for social justice and climate justice. The right framing is critical when discussing this strategy, e.g. by speaking about ending unfair subsidies and tax exemptions rather than discussing an additional tax burden. The industry is addressing this question with sudden concern for the mobility of less affluent segments of the population, arguing that higher ticket prices would amount to curtailing their mobility. While tax proposals should take social justice into consideration as much as possible (e.g. through a frequent flyer levy), it is advisable to put negative side effects into perspective by underlining the social injustice of the climate crisis at large. The 'social washing' strategy deployed by the airline industry can also be countered by unmasking the vast differences in flying behaviour between a minority of frequent flyers and a majority that hardly flies, which is conveniently concealed behind average figures.

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3.
MAKING EXCESSIVE FLYERS PAY: FREQUENT FLYER LEVY & AIR MILES LEVY

"The jet-setting habits of Bill Gates and Paris Hilton mean that they produce an astonishing 10,000 times more carbon emissions from flying than the average person", finds a recent study.[1] 1 % of English residents are responsible for nearly 20% of all flights abroad; 10% most frequent flyers took more than half of the flights abroad.[2] Flying shows climate injustice in its most extreme form—a few wealthy are most responsible for the harm, while large majorities worldwide never or rarely fly. Two possible measures could tackle this injustice: a Frequent Flyer Levy (FFL) or an Air Miles Levy (AML).

The taxes discussed in the previous chapter are meant to reduce aviation industry's unfair tax exemptions. The issue is that these taxes remain the same across the board, hardly affecting upper class frequent flyers. But why should a businessman on his sixth flight to his Tuscan villa in one year be taxed at the same rate as someone who flies to visit family on another continent every second year? Could the taxes be combined with a levy targeting the small, privileged minority responsible for most flights and distances? Could such a levy constrain the demand for multiple or long-distance flights?

The Frequent Flyer Levy (FFL) proposes to make each flight taken within a given time period progressively more expensive, thus incentivising fewer flights. The FFL has been promoted for many years by the UK organisation, *A Free Ride*,[3] with a campaign for 'a free flight a year', meaning a 'levy free flight'. However, if every person on Earth flew once a year, climate emissions would skyrocket. Therefore, a slightly different model is proposed in this chapter, progressively raising higher fees during a longer time period, and also imposing higher levies. One option could be to have one levy-free first flight every three or four years, the second flight would have a levy of e.g. 150 euro, and with each additional flight the levy doubles. In the best case, the rates would be different for economy than for business or first class tickets, because first class seats produce up to seven times the emissions of an economy ticket.[4]

The Air Miles Levy (AML) makes distance flown progressively more expensive and arises from an October 2019 report [5] commissioned by the UK Committee on Climate Change, which evaluated the FFL and other means for reducing aviation. The AML becomes more expensive in steps of cumulative distance flown during a 3 or 4 year period, and would also impose higher rates for business and first class, or very high ones for private jets. Carmichael explains in his report: "By factoring-in distance, the levy would be more closely linked to emissions [than

the FFL] and fall more heavily on those polluting more. It would also more effectively discourage long-haul flights: as most flying is for leisure, some shift from long-haul to short-haul destinations would be expected, delivering further emissions reductions."

Because lower income groups fly the least, the FFL or AML would mainly affect wealthier people. Depending on the level of the levy, the FFL could considerably reduce frequent flying. However, in and of themselves, these levy schemes are probably not sufficient in addressing the aviation sector's environmental impact. They must be combined with other measures discussed throughout this report. In particular, they should be combined with policies aimed at ending aviation's privileges (see **chapter 2**), and at fostering alternative transport modes, both (night) trains and climate-friendly ships for long-distance travel (**chapter 6**). The revenues obtained through the FFL or AML can be used to make climate-friendly mobility accessible for all, especially in the Global South. Also, a just transition fund could be founded for those regions who suffer from economic losses by a decreasing tourism sector (see **Info Box 3**). The levy could therefore contribute to climate justice (see **Info Box 2**).

No FFL or AML measures are currently implemented, as the few existing instruments tax every ticket/person equally. However, in other sectors some examples of progressively taxing environmentally damaging consumption do exist. One is the UK's Vehicle Excise Duty, which put an escalating tax on cars according to their carbon emissions. It was successful in encouraging car owners to buy smaller, cleaner cars (until it was changed in 2017).

ADVANTAGES OF LEVIES OF EXCESSIVE FLYING

The goal of the FFL policy is to contribute to social and climate justice. The numbers are quite clear: even with low-cost aviation on the rise, large disparities and inequalities in aeromobility exist between and within nations, along the lines of social classes, ethnicity and gender. Despite the fall in relative prices, survey data indicate that the vast majority of low-cost flights are taken by more privileged social classes.[6] Contrary to arguments from the airlines, in relative terms, the distribution of flying has not become more equitable across social class. Low-cost air travel is therefore not 'democratising aeromobility'.[7] Hence any tax on aviation would be relatively progressive, if one takes the entire population into account.[8] Globally, only 3 per cent of the population flew in 2017, and some 90% of the global population has never flown.[9] In Germany, only 8% of the entire population fly more than twice a year.[10] This means that very few frequent flyers cause an enormous amount of climate impact. These numbers demonstrate the importance of focusing on the hypermobile elite[11] in the efforts to degrow the aviation sector.

The purpose of an FFL or AML is not to try to factor in the social cost of carbon to the price of a ticket. Instead, the levies are targeted to deliver a specific outcome: reduced demand for air travel against unconstrained levels, to help restrain aviation emissions within safe limits for the climate, and to do so in a way that is just and potentially politically feasible. FFL or AML are per design more progressive policy instruments than a kerosene tax, a ticket tax or a carbon tax. One key advantage is that the levies might be more socially acceptable than general increases in taxes on aviation or kerosene, due to the disproportionate impact on wealthy frequent fliers, and thus potentially politically more attractive. A survey on public attitudes to the FFL in the UK found that a FFL is perceived to be fairer than and preferable to any of the other options for reducing air travel—although it has to be kept in mind that the FFL model in UK promotes a pretty low levy and a 'free flight a year', instead of every couple of years.

The primary focus of the FFL on the *number of flights* can be decisive for communication purposes. While in combination with other policy measures flying will become more expensive and restrictive for all, the FFL ensures that this is particularly so for frequent flyers. Low income passengers who want or need to take a long-distance flight once every couple of years—such as migrants visiting families in other continents—are not the primary target of this levy. Reducing the number of flights is also the key demand of communities impacted by noise around airports. However, the FFL falls more heavily on people taking several short-haul flights than on those taking fewer but much more damaging long-haul flights. A flight from London to Melbourne Australia has approximately 15 times the impact of a London-to-Barcelona flight.[12]

By targeting *cumulative distance flown*, the AML targets those who pollute more, so it is closely linked to emissions contributing to the climate crisis. It encourages shortening one's average travel distance, and discourages more than one long-haul flight every few years, something a straight carbon tax or FFL does not do. In this regard, the AML might be more fair in climate-terms than the FFL. A disadvantage might be that the AML might not inhibit people from taking short-haul flights which could be easily shifted to trains or buses—while longer trips that might be necessary for some who have family in other continents cannot easily be replaced because of the current lack of climate friendly and affordable ferries. Carmichael points out that with an AML, people will avoid shorter trips, in order to not rack up miles that will increase the levies charged on their longer trips. To what overall relative degree an FFL may inhibit short-haul more than an AML has yet to be studied.

OBSTACLES AND CHALLENGES TO IMPLEMENTING THE LEVY

As with all other policy proposals aimed at degrowing aviation, there will be massive and coordinated opposition from the aviation industry and, in the beginning, from politicians and the general public. Regarding the FFL and AML, however, one should expect resistance from the most powerful in society, the mobile elites that do not want to give up their privileges, including many lawmakers. This is supported by studies that have shown that a large share of aviation emissions are caused by a relatively small group of highly mobile and hypermobile travellers that usually represent the political, economic and cultural elites of society.[13] There is a crucial job of raising public awareness of the fact that climate targets cannot be met without constraints on air travel, and to also build opposition against the irresponsible and powerful frequent flyers. Meanwhile, more sustainable modes of long-distance transportation must be made attractive to support a change in public opinion.

One disadvantage is that for those wealthy enough to be largely insensitive to price, neither FFL nor AML may be sufficient to reduce their flying habits. Here, another kind of regulation would be necessary, such as a general ban on short haul flights that affects all flyers equally (see **chapter 3**), or of course measures that tackle inequality and wealth as such.

One issue concerns the framing of the levy: Campaigning for 'one free flight every 3 years' might make the law more popular; however, it suggests that one flight in this period is a human right, while it is actually also too much if planetary boundaries are to be respected. Thus, in communicating a levy proposal, it is important to clearly distinguish it from and communicate in combination with the other taxes that are necessary to degrow aviation in the face of the climate crisis in general; the FFL/AML being an additional instrument aimed specifically at frequent flyers.

There are a number of challenges that need to be addressed if one wants to introduce a levy. The levy could in principle be operated in every country, ideally as a globally uniform tax. However, due to a lack of strong international institutions which could impose such a levy (there are no global taxes/levies yet), it could first be implemented in individual countries or regions, like on an EU-level. In this case the levy would be determined at the EU and collected nationally. The levy would apply to both domestic and international flights.

Tracking unique passenger characteristics to calculate the levy might require new systems. The introduction of a levy could steer a critical debate regarding data protection, as flight data would have to be stored. An alias-based system, that uses identity codes to secure comprehensive protection of data security could possibly provide a solution. A levy scheme needs to ensure that airlines' sharing of this data among themselves is restricted to levy purposes only. This could be regulated by the standard aviation authorities.

A levy might be more complex to administer than the current or alternative aviation tax arrangements. This was the pretext used by the Scottish Government when refusing to consider an FFL as an alternative to the Air Passenger Duty. Implementing a levy will entail changes to the customer journey when purchasing plane tickets, which the industry will try to resist. That is why it needs to be made as simple as possible.

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4.
SETTING LIMITS ON FLIGHTS

Setting absolute limits on aviation is theoretically the easiest and most secure way to guarantee the industry's contribution to climate mitigation targets. Arguably, such measures are also preferable from a fairness perspective, as bans do not differentiate between rich and poor, but are mandatory for everyone. While absolute environmental limits seem politically difficult, the idea of caps on short-haul flights has been gaining momentum.

From an environmental and justice perspective it is clear that the number of flights and cumulative air travel distances must be reduced to a necessary minimum as soon as possible. The remaining flights will need to be allocated in the most equitable way possible or for the greatest public good—as part of the total remaining carbon budget and in line with climate justice. On a global level, this policy could be implemented through a cap-and-share mechanism,[1] although such a global scheme is unlikely to be introduced soon. However, with the climate movement gaining momentum lately, it is arguably realistic for some limitations to be imposed on air travel, especially bans on short-haul flights.

In 2001, the EU White Paper on Transport stated, "We can no longer think of maintaining air links to destinations for where there is a competitive high-speed rail alternative." [2] Still, no caps or bans on flights exist. However, in 2019, politically relevant calls have been made for bans from several quarters. In a May 2019 debate, two candidates for president of the European Union addressed short-haul flights. Frans Timmermans (now vice president of the European Commission) called for a total ban on them, and conservative Manfred Weber instead advocated for reducing their number.[3] In March, members of the Dutch parliament demanded a ban on flights between Brussels and Amsterdam.[4] German climate expert Hans-Joachim Schellnhuber argued that prohibiting domestic flights within Germany should be one of the government's high priorities, and he proposed a per person lifetime limit of 20 flights of any length.[5] In June, several French MPs tried to amend a mobility bill to ban flights between airports if a rail link exists that takes no more than 2.5 hours longer than flying.[6]

Air travel is still primarily an elitist mode of transportation, with the biggest share of flights taken by the wealthy minority. For example, in 2018 the top 10% of frequent flyers in England took more than half of all international flights.[7] Therefore, the general public might be in favour of air travel reform. In a YouGov poll conducted in the United Kingdom in August 2019, two thirds (67%) of the people interviewed said that air travel should "definitely" or "probably" be limited to tackle the climate crisis. [8] A reduction of short-haul flights seems to be the easiest way to reduce flying between city pairs where alternative transportation options already exist or are being built. For example, the Western European railway network can replace a large proportion of short-haul flights (see **chapter 6**).

In general, different forms of limits, bans or caps on (short-haul) flights could follow in succession, among them:

- Immediate bans on flights with rail alternatives of 4-5 hours.
- Immediate bans on domestic flights, especially in smaller countries.
- Caps on the number of short-haul flights between specific airports could be an intermediate step (e.g. a maximum of two flights a day between them, instead

of seven) before making a complete ban. This would need to go along with building added capacity of alternative transport modes.

- Airport-specific caps on the number of flights, toward meeting emission targets and limits on noise, fine particulates and other air pollutants (see also **chapter 5**).

ADVANTAGES AND OBSTACLES OF CAPPING FLIGHTS

The climate advantage of alternatives like trains and buses is tremendous, and a rapid shift to them is feasible if efforts are made. Short-haul flights have poor economic profitability because of their lower occupancy rates compared to international flights. They are often continued by airlines and alliance partners in order to feed their international and intercontinental hubs, and for fear of losing their historic ('grandfathered') slots in airports (due to the 'Use it or lose it' rule). The slot regulations are not only inefficient but are also counterproductive in terms of climate protection.

A main advantage of bans on short-haul and/or domestic flights is their inherent effectiveness in reducing emissions. In addition, they are more socially just than market and price mechanisms, because their effect is universal regardless of wealth. Some use short-haul flights for routine transit, such as those living in one city and working in another, or companies with multiple locations to administer. This form of work life can be quite exhausting and hard to combine with relationships and family life, so banning such flights may help reform harmful work norms and promote alternatives such as video conferencing (see **chapter 6**).

Banning short-haul or domestic flights could cause the shutdown of many regional airports. This might also have positive economic effects, as regional airports most often make high losses and are only kept alive with subsidies (see **chapter 5**). Jobs could be created in the railway sector instead. In addition, a multimodal and sustainable approach to (public) transport is voiced in many official government papers, but not yet implemented. The shift from short-haul flights to alternatives is a low-hanging fruit of climate mitigation, but obviously still hangs too high for most of today's politicians.

The feasibility of banning short-haul flights depends on the extent and quality of a country's train and highway networks. Since those conditions vary among countries, there is no one-size-fits-all approach to eliminating these flights. Limiting domestic aviation in economically growing countries in the Global South might clash with issues of global justice and their lower historical responsibility for environmental problems like the climate crisis. Therefore, the highly industrialised countries must lead the way.

STRATEGIES TO IMPLEMENT LIMITS ON FLIGHTS

In global climate governance, aviation has continuously been omitted. Environmental caps like per capita resource entitlements or cap-and-share mechanisms have not yet been implemented, as market-based mechanisms have been the preferred tools since the beginning of neoliberalism. Nevertheless, due to the consequences of the climate crisis being increasingly felt today, as well as the climate movements getting stronger, momentum is building for measures like bans, absolute caps and cap-and-share mechanisms. Researchers, campaigners and activists should advocate for such measures as legitimate ways to tackle the climate crisis, without fear of being singled out as being radical or limiting others' freedom.

As a start, banning a few short-haul flights is a realistic goal. If it proves successful, this effort can expand rapidly, especially if there are no significant consequences for travellers. With further success, the possibility for a more general limitation of aviation may arise. Success hinges on pre-existing or planned modes of alternative transport (see **chapter 6**), as well as a cultural shift from boundless to conscious mobility.

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5.

RED LINE FOR AIRPORTS: MORATORIA ON NEW INFRASTRUCTURE AND SCALING DOWN OF AIRPORTS

Hundreds of new airports or airport expansions are planned to fuel the skyrocketing growth of aviation. Putting a moratorium on these infrastructure projects—delaying or suspending them—directly decreases aviation's capacity to grow. While a few examples of moratoria on airport projects exist, fighting airport projects could also lead to healthier neighbourhoods, and to safeguarding precious farmland or biodiversity.

The rapid growth of aviation demands new infrastructure. Simultaneously, new or bigger airports demand an increase in flights. There are 550 new airports or runways planned or being built around the world, plus runway expansions, new terminals etc, totalling more than 1200 infrastructure projects.[1] Most of them involve new land acquisition, the destruction of ecosystems, displacement of people and local pollution and health issues (noise/traffic/particles/etc.). More and more airports, especially in the Global South, are becoming 'Aerotropolis', or Airport Cities, surrounded by commercial and industrial development, hotels, shopping cities, logistic centres, roads, or connected to Special Economic Zones.[2] Airports represent a main infrastructure for the globalised capitalist economy, needed for the just-in-time production and trade of goods, work travel, the tourism business, as well as the deportation of unwanted 'travellers': illegalised migrants.[3]

Effective resistance against airport projects can prevent the negative effects and counter a lock-in to an emissions-intensive, destructive form of mobility for decades into the future. Resistance also allows abstract issues like emissions to become more tangible. Networks connecting different local struggles through shared experiences and joined forces can build strong pressure, making it easier to tackle the root causes of aviation growth and climate change.

By definition, a moratorium is an officially ordered delay or suspension of an activity or law. There have been quite successful moratoria in the past, such as the atomic moratorium in Germany,[4] the coal moratorium in the United States[5] and the international whaling moratorium.[6] An 'airport moratorium' is a building moratorium that halts the construction of a project or projects. It can be imposed by cities, towns and courts, and for a variety of reasons. Further, it can be short-term or indefinite, depending on the project and the area where it is located.[7]

Currently, there are no countries to our knowledge that have introduced moratoria on a national scale, prohibit-

ing the construction of any new airport infrastructure. However, judicial processes for establishing a moratorium against special airports on a regional scale do exist. Some examples include:

- **Munich Airport, Germany**: In a 2012-referendum, most of Munich's population voted against the construction of a new runway at the city airport. The expansion would have meant an increase from 90 to 120 departures and landings per hour. During its campaign in the Bavarian regional election, the new government promised to stop any airport expansion, and once in power it agreed on the limited-time moratorium. The Bavarian government established a five-year moratorium in 2018. Whether the moratorium will have a long-term effect or not is still uncertain.[8]

- **Vienna International Airport, Austria**: In February 2017, an Austrian administrative court blocked the construction of a third runway at Vienna's Airport because it would go against the country's commitments to the Paris Agreement, and because it would destroy too much agricultural land.[9] The court considered climate protection more important than jobs or better aviation infrastructure.[10] The airport company appealed. A few months later, the decision was ruled "unconstitutional" by the Higher Constitutional Court, and in 2018, the Federal Administrative Court permitted the expansion of the airport with a few requirements: the airport must now become carbon-neutral. This requirement, however, only covers the on-ground operations of the airport and does not include the core business of the airport—the flights. Furthermore, it includes the use of problematic offsetting (see **Info Box 5**).[11] At the time of this report there were still appeals pending against the permission to construct the runway on the European level.

- A new airport on farmland in **Notre-Dame-des-Landes, in Western France** was cancelled in 2018 following opposition since the project was first proposed in the 1970s. The resistance over many years gave rise to a new term, *Zone à Defendre* (ZAD), referring to the community living on the site. It resisted the airport project and formed a space for ecological and social experimentation.[12]

- **Idaho Falls, USA**: There was a moratorium on developing the land areas surrounding the Idaho Falls Regional Airport, but it lasted for only six months.[13]

- **New Mexico City International Airport, Mexico**: The project of a new airport in Mexico City in the dry lake bed of Texcoco was launched at the beginning of this century, but has been cancelled twice because of local indigenous and nation-wide opposition. Recently, the plans were officially cancelled for a third time after a referendum. However, on-site tests for the project continue.[14]

- In **Bangladesh**, a plan for a major airport and associated 'satellite city' in the **Arial Beel** wetlands was cancelled following protests by farmers and fisher folks concerned over the loss of their livelihoods.[15]

- In **Thailand**, provincial and forestry authorities intervened to halt construction of an airport on **Koh Phangan**, a mountainous, beach-fringed island, when it was discovered that land clearance had encroached on forest land in Than Sadet National Park.[16]

- The expansion of **Marseille Provence Airport** was stalled in 2019 by the French environmental authority who requested to revisit the Environmental Impact Assessment. The argument was that the benefits of expansion are overstated whilst the environmental impact is understated. In addition, the assessment did not demonstrate the project's compatibility with France's target to reach carbon neutrality in 2050.[17]

Given that the current climate warming produced by aviation is already too high, it is not enough to halt the construction of new airports: it is also necessary to scale down airports, especially in the Global North. If combined with the measure of reducing short-haul flights (see **chapter 4**), most of the regional airports would become unnecessary. There is an on going debate concerning whether it would be preferable to have the few remaining airports situated in the countryside, instead of in densely populated cities, where noise and particles affect more people's health and well-being.[18]

WHY TARGET AIRPORTS?

If measures like higher taxes on flights and bans of short-haul flights led to a reduction in flights, airport expansion would no longer be profitable. But we are still a long way from the implementation of such measures. Increasing public awareness, campaigns, and media attention will be necessary to reach a reduction in flights. Therefore, targeting airport infrastructure can be a very effective way to raise attention, and to halt local expansion of aviation and greenhouse gas emissions.

Local airport resistance is often organised around issues of noise and air pollution. Halting airport expansion will limit noise and air pollution for nearby residents. This accounts not only for negative health effects due to the exposure itself, but also for the health effects due to the worries about the expansion situation. The so called 'change effect' is a well-known phenomenon in noise impact research. It describes the increase of long-term noise annoyance in areas where airport expansions will be carried out. This negative health effect cannot be accounted for by the increase in noise exposure levels.[19]

In the case of moratoria, the imminent aim to stop the construction of a new runway can become a shared goal for climate activists and health-affected residents alike.

Also, affected farmers and conservationists can become allies when fighting such a project. It might be easy to get wide citizen support for questioning such harmful projects since they are usually financed through public money. Since flight routes are often led above city districts with poorer population, it is necessary to include those residents in the campaign. If done in a sensitive way, different tactics can be combined in the struggle—from judicial appeals (e.g. to meet noise limits) to civil disobedience.

Moratoria mean a direct change to a local situation, and do not necessarily involve extensive national or international legislative processes in order to be established. In this way they are practically very feasible. Furthermore, if moratoria beyond the regional level are considered, and there was e.g. an EU-wide implementation, they might lead to a decrease in competition and aspiration to expansion among European Airports. Finally, moratoria are expected to be a means that is met with less opposition from passengers using air travel.

OBSTACLES AND DISADVANTAGES OF TARGETING AIRPORTS

Despite the feasibility of moratoria on new airport infrastructure projects, there are potential barriers to consider. These involve the difficulty in accomplishing moratoria on a single airport scale due to economic competition between airports. Airport boards and the industry at large typically argue: 'if we don't expand here, another airport will expand'. This can even lead to competition between airport opponents, with some proposing the expansion of an airport elsewhere. This would be a typical 'Not in my backyard' approach. Such issues also led to the founding of the Stay Grounded network: By connecting the numerous struggles against airports, it is possible to show that airport projects should not take place—'not here, not anywhere!'.

Often, airports also try to counter critique and opposition by greenwashing their image. Hundreds of airports participate in an Airport Carbon Accreditation programme, in which they can be labelled a carbon-neutral airport without reducing a single flight.[20] The measures only target the few greenhouse gas emissions emitted on the ground, and rely extensively on offsetting emissions (see **Info Box 5**). Offsetting the affected land and biodiversity is a common strategy, albeit numerous studies show that it is impossible to compensate and create the same sort of biodiversity somewhere else.[21]

A difficult obstacle to airport moratoria or to reducing the number of airports is the opposition by workers and trade unions. Usually, alternative plans for new jobs are lacking, which is a real problem, since the structural changes needed for a climate just economy should not fall on the shoulders of the people still working in fossil economy sectors. Still, the need for jobs cannot be accepted as an argument, because in the long run, there are no jobs on a dead planet.

Opposing airports can also be quite dangerous, especially in authoritarian states, where resistance is often violently oppressed. Many airport projects in the Global South not only lead to noise and climate issues, but actually threaten livelihoods. Resistance therefore is often much more fierce, involving blockades and hunger strikes, and not counting on financial resources or media attention.

Finally, since airports are such an important infrastructure for the current economic system, it is basically impossible to reduce airports without also changing our economy towards a more regionalised economy (see **chapter 6**). This does not mean that we need to wait for systemic changes until airports can be targeted; on the contrary, airport moratoria and a reduction of airports can be an important step in the much needed social-ecological transformation process.

STRATEGIES TO LIMIT AIRPORTS

As shown above, construction of new airports or runways is happening all the time. To support the existing oppositions, we can learn from older struggles against expansions, and share experiences about communication strategies, possible allies, legal means, and action forms. Solidarity between the struggles is important, especially if affected people or activists are facing repression and criminalisation. Social media attention, investigative journalism, tracking the money flows, writing solidarity letters, or targeting decision makers with letters are some of the possible ways to do this.

In addition to the global scale, airport opposition at the local level can be an effective means to connect a variety of struggles and movements. While a moratorium can limit the CO_2 emissions of a given airport, it also relieves the residents from additional noise exposure and air pollution, and can save farmland or biodiversity from being sealed. This shared goal is an important chance to create synergies and solidarity.

Moreover, considering environment and health policies in relation to noise and air pollution can be a leverage to accomplish the implementation of moratoria. Noise abatement policies, including stronger regulations to limit aviation noise, can be an indirect approach to limit aviation. Aircraft noise is typically a common and intense issue regarding operations at existing airports and the planning, permission and construction of new airports. Imposing strict noise limitations, night flight bans or operation restrictions can limit the amount of flights.[22] The new and progressive noise guidelines of the World Health Organisation (WHO) could also be of help in working to limit airport noise. Advocating for the implementation of the WHO guideline levels for average noise exposure due to aircraft noise would lead to a radical reduction in the

Diagram 3:

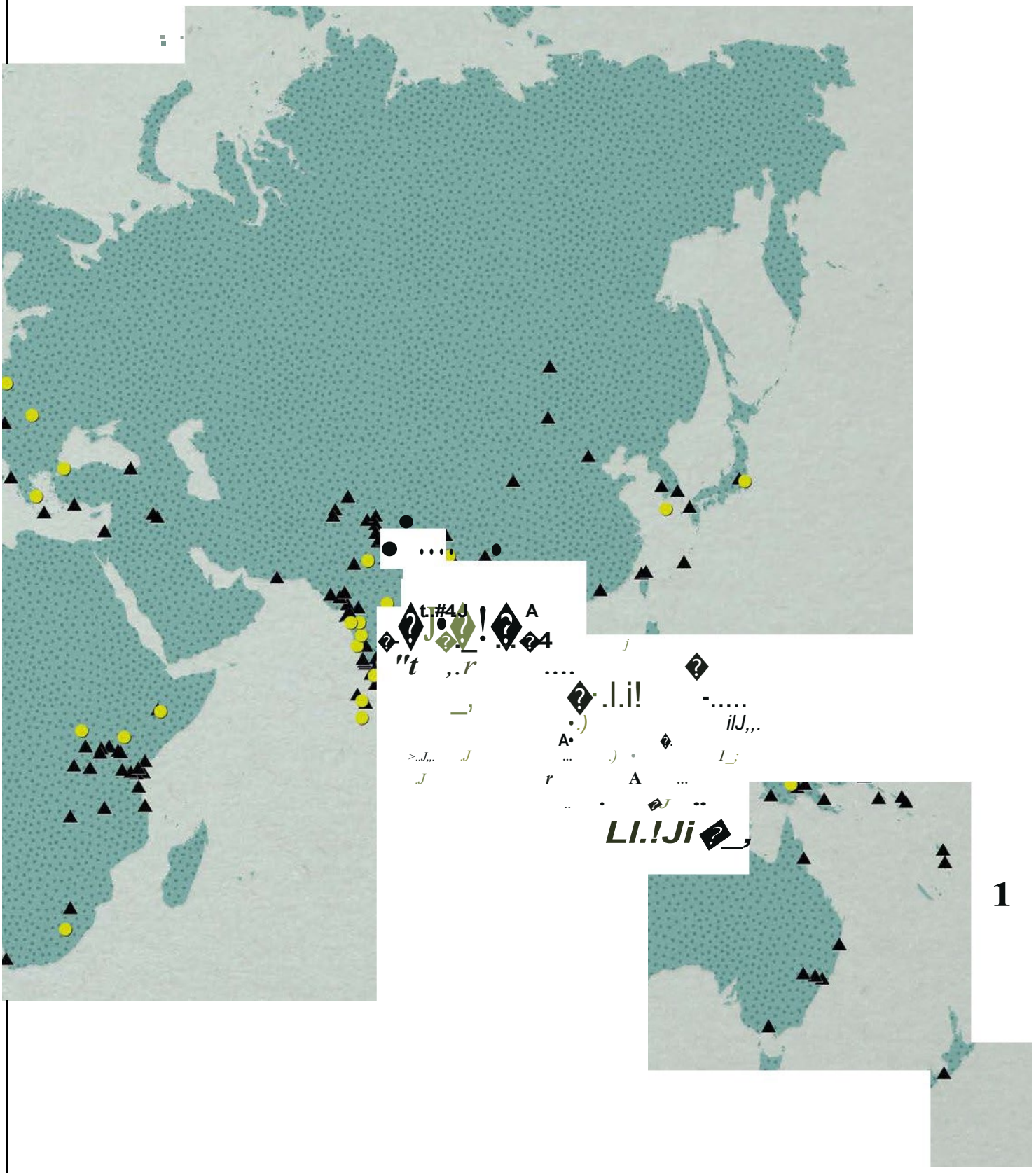
Aviation Related Conflicts

Sources: Stay Grounded (2019d),
Environmental Justice Atlas (n.d.)

The EnvJustice project of the Institute of Environmental Science and Technology at Autonomous University of Barcelona (ICTA-UAB) and the Stay Grounded network have registered more than 300 socio-environmental conflicts related to the expansion or creation of new airports or aerotropolis (airports surrounded by industrial and commercial zones). 60 of these have been analyzed in-depth. The remainder consists of airports under construction or proposed, planned, operational or cancelled airport projects that merit further investigation. The information gathered has been provided by organizations, local collectives and academics, and coordinated by Rose Bridger (Stay Grounded & GAAM - Global Anti-Aerotropolis Movement) and Sara Mingorria (ICTA-UAB).

Investigated airport conflicts

Airport cases that merit further investigation



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amount of flights. If these guidelines became the standard there would no longer be flights at night.

Citizen science is a new approach which can be used in support of noise limitation. The organisation Schiphol Watch has developed a free app with which residents can register and document aviation noise. All results are collected in a database and are being evaluated by universities. In the Netherlands, residents already approach their local and regional politicians and press members with the data.[23]

Working together with trade unions and universities in order to research alternative plans for jobs can also be important. It is a bizarre conflict to have workers' interests stand against residents' interests, when they are often the same group of people. Trying to create alliances and find commonalities (like the fight for justice, against pollution, and for better train connections) can be important steps. There are few trade unions that are progressively looking for alternative pathways—one positive example is the Public & Commercial Services Union PCS in the UK, opposing the third runway in Heathrow.[24]

Attracting media attention and motivating people to organise collectively against an airport expansion can be achieved by organising different actions. Bike demonstrations to the airport, rallies at the airport, flash mobs and creative actions including disguise or papier-mâché planes can be very effective and suitable for the very sensitive territory of an airport. Examples are people in red suits creating a 'red line for aviation growth'; 'die-ins', where people simultaneously fall on the floor and represent the violence of the climate crisis and the injustice of flying; people in penguin costumes have also appeared at airports, with penguins gradually becoming memes or mascots of the anti-flying movement, since "the coolest birds stay on the ground".

Additionally, actions of civil disobedience have taken place at airports, although there is a higher risk for criminalisation than at less sensitive infrastructures. In London, runways have been blockaded several times;[25] in Sweden, activists blocked the fuel train to disrupt the delivery of kerosene to the airport;[26] and the group Extinction Rebellion had plans to close an airport by driving drones close by[27] and targeted London City Airport, blocking the entrance with their bodies. In addition, one person climbed onto a plane. Another person refused to sit down inside a plane whilst giving a lecture on the climate crisis, delaying takeoff for two hours. In the Global South, street blockades and strikes have taken place. In India in August 2019, small-scale farmers staged a sit-in for over a month in front of the district's planning administration, continuing their year-long protest to counter the expansion of Karad airport in Maharashtra State.

FURTHER READING

News on airport struggles can be found on the website of Stay Grounded and of the Global Anti Aerotropolis Movement, as well as their facebook accounts:
https://stay-grounded.org
https://www.facebook.com/StayGroundedNetwork
https://antiaero.org
https://www.facebook.com/GAAMovement

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Noise Data from citizens & App to measure aircraft noise:
https://reports.explane.org

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6. FOSTERING ALTERNATIVES

How do we shift from flying to other modes of transport? Much can be done to make train travel, in particular, more attractive, especially through better coordination of international train schedules and booking systems. At the same time, we cannot avoid the question of how to travel less (i.e. less often, shorter distances) in general. The modern hypermobile lifestyle we have developed over the last few decades must come to an end.

Plane tickets are not only cheap, but the lack of good and affordable alternatives also pushes people to fly. What alternatives are already in place, and what is needed to improve them? More generally, we must question the hypermobile lifestyle many of us have developed over the last few decades. Perhaps a form of decelerated societies can be part of the solution, as the *Slow Food* and the emerging *Slow Travel* movements are proposing.

There are many ways of envisioning a world where people still travel, but travel in different ways, i.e. slower, less often, shorter distances, staying longer once they travel, and choosing sustainable means of mobility (see **Info Box 4**). This chapter will first explore alternatives to travelling by plane (trains, buses, ships and online conferences). The reader will note that many of these alternatives have their disadvantages: Their energy use is not zero, and some alternatives are still way too marginal. Also, not everything can be shifted from the plane to other modes. Therefore, it is necessary to generally reduce the need for transport and to degrow tourism and the trade of goods. Changing our lifestyles and the desire for far distance mobility may be hard to achieve,[1] but is necessary. As a study[2] from the UK shows, the average time spent travelling hasn't changed over the past 50 years: what has changed is the distance travelled—and this is what needs to change again.

SHIFTING FROM PLANES TO (NIGHT) TRAINS AND BUSES

Currently, the existence of trains, night trains, long distance and overnight buses differs widely between countries and continents. In many countries where a railway does not exist, good bus systems provide for longer distance travel (like many Latin American countries). Night trains have long been commonplace across Europe, but most were discontinued in recent years, nearly to the point of extinction.[3] They lost large portions of their market share to low-cost airlines and to subsidised high-speed trains, and are disfavoured by unfair policies and by a lack of cooperation between train operators and national authorities.[4] Still, there are some positive developments: The Austrian railways have been buying up night-trains from other countries which have shut them down, and have expanded their night train service. The Swedish government announced in 2019 that it will fund the creation of overnight train services from Sweden to the European mainland.

Today, a common opinion among European professionals is that a rail journey time of four hours is a reasonable alternative to flying. A study by FoE Germany (BUND) found that 200,000 flights from German airports—about two thirds of all domestic flights—could be replaced by

trips of less than four hours on existing ICE-trains.[5] A recent study for the German Environmental Agency[6] confirmed this order of magnitude. Avoiding such short-haul flights is not enough, but even this shift hasn't happened. Proactive rail companies, intensive public debates and bans of short-haul flights are needed to make this modal shift appealing—especially if we want to replace more than just extremely short flights.

Buses and trains are not only more environmentally friendly than planes, they are also easier to access than airports. Since train or bus stations are well connected to local public transport systems, they don't imply check-in and security checks (with the exception of the Eurostar train), provide for greater flexibility (booking a ticket on the day of travel), and passengers can work while in transit thanks to common Wi-Fi. Additionally, if the journey is overnight, the cost of accommodation is avoided. Measures that can help shift travellers from planes to trains and buses include improved international booking, affordable tickets and improved transfers between trains (e.g. night trains and day train connections). Railway connections to large airport hubs are also imperative in order to avoid short-haul flights.

Currently, there are only a handful of websites for those who might want to travel by alternative means and book trips at affordable prices. These include *The Man in Seat 61*[7] and *Back on Track*,[8] a European network to foster European cross-border passenger train traffic and in particular the night trains.

HIGH-SPEED TRAINS: AN ALTERNATIVE THAT CREATES NEW PROBLEMS

Some argue that high-speed trains are the only feasible alternative to flights. However, high-speed trains are not without their own problems: First of all, energy use rises exponentially with speed, so high-speed trains are extremely energy intensive. They also involve high CO_2 emissions from producing the cement and steel used in the large-scale constructions needed for these trains (e. g. long tunnels and bridges). Second, trains still do not run with 100% renewable energy. Third, constructing new train lines for high-speed trains can be very complicated: since sharp curves are problematic, they cut straight through the landscape. This can lead to resistance because of loss of livelihoods and biodiversity (an example is the *No TAV* movement in Italy). High-speed trains involve large land destructions: A 100 km high-speed train line require the same land destruction as a new airport (5000 ha for 400 km track). They are also very expensive (10M€ for 250km), and high speeds (>300km/h) cause rails to quickly deteriorate.

It might be worth discussing whether there is a socially and ecologically acceptable limit for speed. Furthermore, convenient travelling does not mean setting new records of maximum speed but having a reliable network of lines with a high total average speed available. Having connecting trains available within 5 or 10 minutes (instead of 40 or 55 minutes) saves more time than increasing the maximum speed from 200 to 300 km/h. Even on German fast trains, average speed is far below 200 km/h.

SHIPS WITH RENEWABLE PROPULSION

Overseas travel was more common by ship than by plane until the 1970s. For such trips, ships could still be an alternative to flying. The problem is that currently, there are almost no existing passenger ships left. In addition, the shipping sector's environmental impact is also considerable. Cargo or cruise ships usually use heavy oil as fuel, which is why shipping is a growing source of greenhouse gas emissions and is also a major source of other kinds of air pollution, causing health problems, acid rain and eutrophication. Much like aviation, the sector's international emissions have never been included in international climate agreements and related reporting, including the recent Paris Agreement (see also **chapter 8**). Apart from the need to reduce international trade in goods and to strengthen regional economies, technological improvements need to be developed and implemented quickly, in order to replace heavy oil with a mix of renewable alternatives like wind, solar, battery-electric, hydrogen or ammonia. Such technologies for shipping can be implemented much easier than for aircraft. Alternative propulsion (not using fossil fuels) for small ferries on short routes is already operational, and extension to larger vessels of longer range is promising.

There currently exist some examples of alternative passenger and cargo transport by ship:

- *Fairtransport*,[9] based in the Netherlands, is the first modern 'emission free' shipping company. They use only the wind as a means of propulsion. Their ships sail between Europe, the Islands in the Atlantic, the Caribbean and America with a focus on transporting special products which are organic, or crafted traditionally – such as olive oil, wine and rum. The ships also carry passengers, offering the opportunity to travel across the Atlantic without emissions. *Fairtransport* is a member of the Sail Cargo alliance, an alliance of sailing cargo vessels which also carry paying passengers.

- *e-Ferry*[10] is a zero emission commercial ferry powered by rechargeable batteries connecting the Danish part of the Baltic Sea and the island of Ærø to the mainland.

- The project *Race for water*[11] campaigns against plastics in the sea, and uses a ship powered by solar, wind and hydrogen.

- *Sail to the COP*[12] is a project where a ship and a crew of activists sailed from Europe to the Americas. It raised awareness of aviation before the climate summit which was meant to be held in Chile in December 2019.

On these kinds of trips, the journey is part of the adventure. It might be possible to gain sailing experience which can enable sailing with other vessels in other parts of the world. A longer ship journey offers the opportunity to take time off, relax, escape the ever-increasing pace of life and use the time for oneself.

But of course, this kind of ship travel is no alternative to current forms of plane travel. Trips by ship are very marginal and something for adventurers or people with enough money. Furthermore, to be able to use traditional sailing ships, only specific routes can be taken, and only at certain times of the year when the winds are reliable.

TELEPHONE OR VIDEO CONFERENCES

Telephone and online conferences can drastically reduce work travel. Online methods can be used for interviews, conferences, workshops (webinars), or hybrid learning (to communicate with one or more remote students or faculty in a classroom environment synchronously with video and content). While Skype used to be the most common platform, many more providers have established well-functioning systems in the last years. Some of them are for free, some require a charge, some are less secure, while others are encrypted. There are real-life examples for how conferences can be organised with online attendees and presenters in ways that are inclusive and function well.

- The network *ecolize* is developing an inclusive concept for online participation at conferences, which includes the remote participants into the social aspects of a conference like meals, coffee breaks etc.[13]

- Virtual reality (VR) is growing and improving by the minute. There are companies already offering VR platforms for meetings. Examples are *meetinvr.net* and *portalspaces.com*.

This alternative can save both emissions and money, reduce paper and plastic waste, save time, and increase flexibility. Establishing online conference systems is also cheaper than paying for flights.

Online conferencing is considerably more climate friendly than flying, but online communication or virtual reality is not emission free. In fact, studies say the internet in total produces about 2% of the world's CO_2 emissions. [14] Further, special electronic equipment is needed for large-scale video conferencing, and electronics are increasingly associated with a range of environmental and social problems, such as mining pollution, local resistance or problematic working conditions. Other problems that result from treating information online include security breaches and privacy issues. Also, it will always be necessary for certain personal relationships to interact face-to-face: feelings, friendships and emotions are hard to deal with when talking to a computer. But in many cases, work meetings and conferences can still be an alternative to flying.

REDUCING LONG-DISTANCE TRADE - AN ECONOMY OF SHORT DISTANCES

Freight transport accounts for a significant share of carbon emissions. Instead of aiming to triple the volume of transport by 2050,[15] we need to reduce the demand for goods from far away and develop localised economies. Food in particular could be grown as locally as possible. This measure would at the same time serve the goal of increased food sovereignty.[16] The aim must however be climate protection, not nationalist-style protectionism. This can and needs to happen alongside maintaining multi-cultural and open-minded societies.

It becomes clear that it is hard to tackle the issue of aviation in an isolated way. Aviation is embedded in a broader picture of a fossil capitalist economy that will be hard to overcome without radically changing policies—not only for transport, but also for other sectors such as trade, agriculture, energy or the financial system.

Practical measures are numerous and cannot be discussed in this report. They could include resistance to free trade agreements, higher tariffs on products brought by plane or fossil-fuelled ships, subsidies for local production of food and goods, and much more. Because they are systemic in character, such proposals will face significant resistance. Joining forces with other social struggles (on food sovereignty, trade justice, etc.) will therefore be important.

DEGROWING AND RESHAPING TOURISM

The increase in aviation, and especially in cheap flights, has been a key driver for the parallel increase in mass tourism and its negative effects both on the environment and the local society (see **Info Box 3**). There has recently been a surge in local protests around airport expansions, real estate speculation and urban planning policies. If aviation and its impacts are to be reduced, this necessarily involves changing the tourism industry and travelling in different ways. Tourism must change both quantitatively and qualitatively:

1. Reshaping tourism in order to reduce its negative impacts, making tourism more sustainable and in line with the visions of long-distance travel in the future.

2. A degrowth of tourism induced by a reduction of tourists, especially at hotspots, through the establishment of negative incentives or straight forward caps and limits.

Qualitative change: Reshaping tourism

If we wish to transform tourism in an equitable way for citizens of 'tourism-struck' areas and the environment, it is crucial to empower citizens to express how tourism affects their daily lives. Urban planning plays an important role in order to grant the opportunity to democratically decide what each space is dedicated to. To design cities with the resident and not only the visitor in mind, must necessarily imply limitations to large transport infrastructures such as airports and ports. In Barcelona, a suggestion for democratising the planning related to tourism has been to move from tourism management based on public-private undertakings (such as *Turismo de Barcelona*) to public-community management, where citizens can effectively participate through legal entitlement.

Unfortunately, one must also be realistic and consider some of the key obstacles for the implementation of participatory and citizen-led local decision-making concerning tourism: The first regards the large influence of very powerful lobbyists representing the supply side of the tourism sector. The second is society's general positive image of tourism. Social media and its individualist/identity-shaping premise begs us to share content online. And this is exactly what fuels the tourist sector's belief in and realisation of profits. Furthermore, as in the case of Barcelona, many tourist-occupied infrastructures are owned by the state and therefore decisions are not made at the local level where the impacts of tourism are felt the most. Concrete ways to reduce negative effects of tourism also include fostering environmentally friendly transport (see above); rent-freezes and public housing in touristic areas, so that residents are not driven away; the generation of alternative jobs that could replace both fossil and mass-tourism oriented ones (e.g. in a localized production of goods); and facilitating public space, local shops and trading which is oriented towards the residents.

Apart from the measures above, the perception of tourism and travel would need to qualitatively change. We could call this travelling, in order to make the difference to tourism clear. Travelling includes an openness towards cultures and new experiences, demands only modest infrastructure and facilities, and usually takes more time, maybe even several weeks or months.[17] However, the scale problem, with respect to the amount of tourists, will remain even if we travel differently. In some places this problem is so big that reshaping tourism alone will not help.

Quantitative change: Degrowing tourism

If a rising amount of people start travelling to unconventional tourist destinations in order to experience 'authentic' cultures, there may no longer be any unspoilt environments to speak of. For example, Instagram has recently driven thousands of people to take photos in national reserves and places where tourists usually would not travel to—or are prohibited to visit for good reasons.[18] So while it might be clear that tourism needs to change qualitatively, we also need to think about reducing tourism overall.

Most of the measures to reduce aviation discussed in this report would likely lead to a reduction of a certain type of problematic tourism. But there are also concrete measures to degrow tourism that can be implemented, especially by affected communities. One possibility is to increase the tourist charges for the public sector services that tourists make use of, such as public transport, maintenance, cleaning and security of public space. For example, in September 2019, Venice started to collect a $3-$10 fee from visitors.[19] Tourists can purchase their tickets online before coming to Venice and, depending on the exact package, these tickets grant them admission to tourist attractions and cultural events, as well as access to public transportation.[20]

Local taxes or bans could be linked to the travel mode or other tourism facilities, such as accommodation. Finally, reducing the 'supply' side of the tourism sector, might be the most effective. Reducing the number of visitors and overnight guests can be achieved in many ways: limiting the number of cruise ships/flights per day, placing a moratoria on the expansion of local airports and/or on the construction of new touristic accommodation, or imposing a reduction of tourist accommodations by banning the use of Airbnb or reregulating parts of the city.

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INFO BOX 4: A VISION FOR LONG-DISTANCE TRAVEL BEYOND AVIATION

While many understand the critique of aviation and support some of the policies proposed to curb aviation growth, it is difficult to imagine the long-term degrowth of aviation. What would long-distance travel look like? How would people work and travel on holidays? Visioning exercises are useful when trying to imagine a different future. So, let's travel to the future and imagine a new reality! We can imagine that we are in the year 2035 and that things have fundamentally changed. What would the world be like if the aviation industry has radically shrunk?

Policies and institutions have limited aviation to a minimum: people only fly during exceptional circumstances, and long distance travel by other means is available to everyone, not just the privileged few. Long distance trips are reserved for once every few years. Then people really take some time for travelling. Decelerated lifestyles and work time arrangements enable slow travelling. We now have longer holidays, the possibility for switching working spaces, as well as sabbaticals. There has been a process of just transition for those working in aviation and aviation-dependent sectors, such as mass tourism sites or airports. Social justice legislation enables long-distance travel for people with families in distance places, acknowledging the differences in how difficult it is for certain groups not to fly.

Other means of transportation enable long-distance and climate friendly travel: night trains, coaches, sailing and solar ships with renewable gears as well as air ships are used. They are somewhat slower, but quite comfortable. People still travel, visit and explore. Cross-border trains can be easily booked, have good connections and are affordable. They include separate carriages for families, sleeping, chatting and eating. Everyone loves train stations—they are a space where people from all over meet in the clean, comfortable and convenient waiting rooms, while childcare is offered at the playing sites. Train rides and bicycles are often combined, and there is enough space for taking bicycles on the trains.

There are still a few planes that are used for special circumstances, such as when people with migration background need to join his or her family for an emergency situation, or catastrophes are to be averted. International cooperation and exchange has deepened.

While people travel less distance in total, they experience deeper connections to places and people with slower modes of travelling. The journey itself is just as valuable as the destination. We travel less and slower, and have longer stays. We have accepted that 'fast and long distance' travel is not possible anymore (the same way that it is not possible to go to the moon for a visit). This means re-localised networks, where world diversity is recreated in each locality, and good coordination and cooperation within this diversity. While visiting Algerian bars and Algerian friends it seems not so necessary to travel to Algeria. We experience more storytelling by travellers who tell about other parts of the world. There are no more tourists of the old kind, but rather visitors that we welcome in our homes—reconnecting with this part of humanity that used to welcome each other. It also means more solidarity at the local level, including reduced consumption of products from far away. Instead, such products have become very special, and not for everyday consumption. Some formerly imported products are now produced locally instead. We give more value, in each locality, to local archaeology and nature, instead of focusing on touristic mythic monuments. This way, we have reconnected with the diversity around us. Airports are recuperated for other purposes like adventure parks and museums of the old fossil history, and secondary houses have been recuperated for local inhabitants. There are quiet skies and healthy environments for everyone.

Societies have always and will continue to transform, and there are many futures possible. It seems easier to imagine climate breakdown than a world after capitalism — let's try to create more vivid imaginations of the future we want!

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[18] Coffey (2018)
[19] Fox (2019)
[20] Venezia Unica (2014)

Conference Degrowth of Aviation, July 2019 in Barcelona.
Photo credits: Christine Tyler / Stay Grounded

7. INSTITUTIONAL CHANGE OF TRAVEL POLICIES

Travel policies of organisations mostly follow this pattern: the cheapest and fastest way to travel will be refunded. This often supports the current norm of flying for convenience, and forces people to take the plane even if they don't want to. However, individuals and organisations are now increasingly challenging this way of doing things, and many bottom-up initiatives within organisations are currently developing more sustainable travel policies.

As the detrimental climate effects of flying become more evident, many organisations and businesses are starting to consider what role they can play through fostering sustainable travel practices. These vary from voluntary measures (e.g. you can take the train if you want) to strict rules (e.g. ban on short-haul flights). Such travel policies can complement top-down approaches like taxes, restrictions or bans, by raising awareness about the negative impact of flying and by initiating changes in norms and behaviour within organisations. They can also be seen as a bottom-up political action to create conditions for institutional change (e.g. regulations and norms) more generally.

The development of progressive, broad and strict travel policies has begun to occur in many places. However, it seems that academic and research institutions are particularly ahead on these development, and even more so, departments working on climate change and sustainability. However, we also find examples of progressive travel policies in a wider range of sectors, including municipalities (e.g. Malmö), cultural centres (e.g. Helsingborg concert hall), the media (e.g. Politiken, one of the largest Danish daily newspapers), public organisations (e.g. BBC Worldwide) or private firms (e.g. Lush, Novo Nordisk).

The types of travel policies, however, vary considerably. Many organisations have some kind of general environmental certification, such as EMAS or ISO 4001. The problem with many of these certifications is that they do not specifically address flying or transport, nor strategies to cut emissions. Other organisations focus on economic incentives, like internal offsetting or subsidies (e.g. UCLA). Offsetting emissions from flights is one of the preferred measures. It imposes higher costs, but means no real change in behaviours and policies. According to several studies it is basically useless in terms of emissions reductions (see **Info Box 5**).

A progressive travel policy is a policy that aims to reduce emissions. Within organisations which have an active policy with respect to travelling, there are typically 3 types of policies (according to degrees of enforcement):

- *allowing* employees to take the time needed to travel by train (and pay any extra costs),
- *actively encouraging* environmentally friendly travel or less travel, or
- *imposing* more sustainable travel arrangements – that is, enforced internal rules.

In the following, a focus will be put on the latter kind of policies.

Ghent University is an example of an organisation which has adopted an organisation-wide travel policy with some absolute and enforced internal rules that imposes certain limits on staff's travel. For example, it has banned reimbursements for plane travel to any location that is accessible by a six-hour train ride. Similarly, BBC Worldwide's travel policy stated in 2009 that staff are only permitted to fly if train travel adds more than three hours to the journey.[1] Another example is the German initiative *Einfach Jetzt Machen*[2] featuring companies that promise to avoid domestic flights and flying for distances shorter than 1000 km. A best practice example of an organisation that has developed an elaborate, strict and awareness-raising travel policy, comes from LUCSUS (Lund University Centre for Sustainability).[3] A two year process led to the adaptation of a travel policy in December 2018. The adopted travel policy aims to reduce emissions while also creating awareness and ownership to one's own process of reducing flying, and involves, amongst other things, a structured decision tree to help employees in this process. Other organisations focus on aspects such as including visiting guests in addition to staff and management in their travel policies. Some also focus on work-life balance, i.e. they encourage and reward avoided personal flying by giving extra days off for travelling slow during holidays (e.g. Weiber Wirtschaft or 1010uk.org).

ADVANTAGES AND DISADVANTAGES OF PROMOTING CHANGE IN TRAVEL POLICIES

For many organisations, travelling is by far the largest contributor to their carbon footprint, and implementing progressive travel policies could make a substantive contribution to reducing them. Hence, the motivational aspect is clearly present, and in practical terms, it is also a feasible measure. Instead of waiting for collective top-down measures (arguing that general regulation is more effective) or that others should go first, developing an organisational travel policy is available to everyone.

In practice, progressive travel policies are often initiated by the staff themselves in what can be termed an internal bottom-up process. This can have the advantage, compared to more managerially imposed internal policies, of creating more ownership of the organisation's travel policy. Existing examples show that only a few employees can achieve much within their organisations. However, for this to happen, it is necessary to overcome the belief that individual/small scale solutions do not matter.

Additionally, the managerial level of organisations have discovered that developing progressive travel policies is an opportunity for them to be 'climate leaders'. Organisations can inspire and influence others simply by being examples and role models in their respective sectors and showing what is possible. Ideally, they also engage more actively, in ways such as making the issue of travel policy more visible and creating pressure in their sector for other organisations to follow suit. Interesting examples include initiatives like *Einfach Jetzt Machen*,[4] individuals pledging not to fly for work,[5] or, in the academic sector, *#flyingless*[6] and *No Fly Climate Sci*.[7] Another example of bringing visibility to the way we travel is the idea of the European Society for Conservation Biology, which gives an award to the person(s) who have travelled in the most environmentally friendly way to their biannual conference.

Organisations can become ambassadors for broader policy changes that are necessary to reduce flying on a societal level. Changing internal practices helps raise awareness. Staff who are forced to change their travel practices at work might transfer their new experiences and awareness to their private lives. Organisations can also push for regulations that makes progressive travel policies mandatory for everyone. They can work politically to address obstacles that become obvious as they try to change travel habits at the organisational level. Such obstacles include public travel refund laws, travel policies of funding institutions, and the general shortcomings of alternative modes of transport (see **chapter 6**).

For example, public sector bodies and other organisations receiving public funding in Germany (e.g. universities, NGOs) cannot freely choose their own travel policies, as they must follow the centrally decided travel policy (the Bundesreisekostengesetz[8]). Centrally changing public sector travel regulations would have a huge impact on overall emissions since these policies often inspire other organisations' travel policies.

Finally, developing and promoting progressive travel policies need to happen within a broader discourse, which also questions the necessity of business trips. In person work meetings could be converted to online conferences (see **chapter 6**). This also means that competences and infrastructures must be formed within organisations (skill and knowledge sharing) that enable employees to participate in meetings virtually. It also means a change of norms regarding how to conduct business meetings. For the organisation travelling less it can save costs, and for employees, it would afford more time at home and less stress. There is also a gender dimension to this: as men generally fly more, reducing flying can also make care work conditions more even.

Fostering train travel can result in a direct advantage for staff: the time on a train can be used for work or exchange with colleagues (working conditions there are generally better than on planes), trips are only taken as necessary (the overall amount of travelling is reduced, therefore there is an improvement of the work-life-balance), and with trains you usually arrive directly into city centres causing less stress with security checks. Regarding train travel, the development of awareness and competences amongst employees has to be supported (e.g. regarding how to get from A to B, how to find the cheapest option, how to plan meetings in a way that everyone can attend by taking the train, how to work on trains, etc.).

The main disadvantage with respect to achieving wide implementation of sustainable travel policies is that they are (so far) voluntary measures. Implementation depends on the goodwill of organisations, meaning it can end up being the progressive and ecological ones who lead the way, while big business continue with their emissions intensive and high-speed practices. There is also a potential for sustainable travel policies being misused for greenwashing and PR.

STRATEGIES FOR FOSTERING PROGRESSIVE TRAVEL POLICIES

Promoting the implementation of sustainable or fly-less travel policies can be a way to engage actors who want to make a contribution to reducing their carbon footprint without having to wait for policy changes from above. Putting in place or changing organisational travel policies is a bottom-up measure which can be combined with other public policy initiatives, thus supplementing the top-down measures discussed in previous chapters.

Strategies for fostering progressive travel policies should focus on two main issues:

1. supporting the introduction of progressive travel policies within organisations, that is, travel policies which enforce flying less policies;

2. supporting organisations who aim to spread good practices, inspire peers, and who push for stronger regulation to address aviation growth and, more generally, the climate crisis.

Campaigns might focus on how companies and other organisations can reduce their environmental footprint through progressive travel policies. Although the most progressive travel policies seem to have been developed through internal bottom-up processes by a few engaged people, we could also envision a larger role for local trade unions as an alternative way of pushing for more progressive travel policies from within organisations.

Shaming campaigns, like the Swedish *#flygskam*, can have large impacts on behaviours and impact the public discourse. Still, there might be as much to gain from highlighting and promoting best practices, and facilitating learning between organisations and initiatives. By exposing best practices, organisations can inspire and learn from each other. A range of examples exist from which to draw inspiration and build upon. Campaigns could also appeal to organisations who want to be in the forefront in terms of addressing climate change, and help distinguish those who make genuine contributions from those who might use the travel policy as a greenwashing strategy. In this case, commitment at the management level is imperative. The *Let's Stay Grounded!* campaign aims to collect pledges from organisations to change their travel policies by reaching out to NGOs, universities, cities, ministries, trade unions and companies and proposing concrete measures to reduce flights in their institutions. Best practice examples will be shown on the campaign platform.[9]

In particular, campaigns could identify and support those organisations who work beyond their own organisation by sharing examples and pushing for change at the policy level. A concrete case to draw inspiration from, in this regard, is the former smoking policy in Denmark: workplaces of a certain size were obliged to formulate a smoking policy (the public did not interfere with the content of this internal policy, it just demanded that a policy was formulated). We could explore whether something similar might be a first step on the way to more top-down restrictions on organisations' travel habits.

Campaign efforts should also address large corporations and national public sector bodies, who would have significant aggregate effects on emissions if they changed their travel policies.

An important part of a 'changing travel policy' campaign is to link to wider questions of systemic change. This would entail not only promoting restrictions on short-haul flights, but to raise awareness about travelling more generally. To what extent is business travel necessary?

There is a range of actors to involve in the promotion of more progressive travel policies. One group to reach out to is journalists—to encourage critical journalism that can write about the whole range of issues related to the topic. Another actor is trade unions. In particular the issues of health and stress related to travel, should be a topic of common interest, but also trade unions should be involved in contributing to establish more progressive travel policies.

Travel agencies are notoriously bad at providing good information on non-flying travel alternatives. It is a skill to learn to travel differently and take the train again, a practice which was normal for business trips until the 1970s. In this regard, sustainable travel agencies have an important role to play.

There is also a need for more research. For example: does sustainable travel necessarily mean higher travel costs and more time spent on travelling in total? This seems to be the general perception, but there is also evidence pointing against it. Maybe it is as simple as this: slower travel = less travelling = lower costs?

Another area in need of further development, is emission calculators related to travelling. Both better data and improved methods are necessary to ensure that calculating the climate impact from aviation take into account non-CO_2 related impacts. The issue links to another accounting and reporting issue, namely, what kind of emissions do companies and organisations account for in their environmental reports: only direct emission, or also indirect

emissions? In France, for example, companies with more than 500 employees are required to report their carbon emissions, but only the direct ones. A campaign for progressive travel policies, should challenge this rule and general practice.

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2 Einfach jetzt machen (n.d.)
3 LUCSUS (2018)
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7 No Fly Climate Sci (n.d.)
8 Bundesministerium der Justiz und für Verbraucherschutz (2005)
9 Stay Grounded (2019c)

INFO BOX 5: EMISSIONS OFFSETTING— A MODERN SALE OF INDULGENCES

Offsetting emissions from flights is a popular measure amongst organisations trying to implement more sustainable travel policies. However, offsets generally means no real change in behaviours and policies, and is virtually useless in terms of emissions reductions.[1]

Offsetting projects can involve generating energy from methane (which is produced in large quantities in industrial livestock farming) or building hydropower plants that claim to prevent production of energy from fossil fuels. Forest conservation projects and operators of tree plantations can also sell such offset credits representing supposedly achieved emission savings for the aviation industry.

Studies show that a majority of projects miscalculate their savings. Öko-Institut investigated the effectiveness of existing offsetting projects for the European Commission and concluded that only 2% of the offset projects have a high probability of resulting in additional emissions reduction.[2] If for example a hydropower plant is being built anyway, such a project should not be eligible for selling carbon credits, which in turn allow others to pollute more.

Additionally, offsetting projects are largely located in the Global South and often lead to local conflicts or land grabbing. This is especially the case with land or forest-based projects like REDD+ (Reducing Emissions from Deforestation and forest Degradation).[3] Often, small-holders and indigenous people are restricted to use the forest in their ancestral way in order to store the predicted amounts of carbon in the trees. Ultimately, offsetting is unjust and a form of carbon colonialism.

To enable a small share of the world population to fly indefinitely with a clear environmental conscience, others bear the costs: people whose emissions are often already very low, whose historical contribution to climate change is negligible, and who are already experiencing the impacts of the climate crisis. Some have argued that if we make offsetting possible only as a 'last resort,' and try to offset emissions locally (for example in the local town or even inside the organisation), we do not contribute to further injustice. However, the fact remains that offsetting then becomes a license to pollute and help preserve the status quo. In this way, offsetting *prevents* the necessary fundamental changes of our mobility system.

[1] Stay Grounded (2017)
[2] See e.g. Cames et al. (2016)
[3] WRM (2014)

8. OTHER MEANS FOR REDUCING AVIATION

In addition to the measures outlined in the previous chapters that were discussed in working groups at the conference Degrowth of Aviation in July 2019, there are numerous other measures that could be explored further. Several of them are listed briefly here. They are not extensively researched but can serve as a starting point for future discussions, campaigns and policy changes. If you know of additional approaches to stop aviation's growth, please get in touch.

IMPROVE THE ACCOUNTING OF AVIATION'S CLIMATE IMPACT

Currently, different numbers ontheclimate impact of aviation are misleading both public and policy discussions. Industry, governments and media often only include national flights intheir numbers (since this is what is reported to the UNFCCC), and almost never mention the overall climate impact of aviation—beyond CO_2. Important measures are therefore to seek the following improvements by those entities:

- Include non-CO_2 effects in GHG emissions accounting and online calculators. This should be done using a widely agreed-upon multiplication factor. Some countries already use such a factor: 1.9[1] in the UK, 2 in France[2] and Germany,[3] 2.7[4] in Austria. A wider review is underway, towards an agreed number. What is important to note is that the non-CO_2 impact is not a uniform factor, but that it differs according to aircraft type, route, altitude, season and day vs. night time. For example, a flight across the North-Atlantic from Europe to North America can have a non-CO_2 impact of 4.5 times the CO_2 impact.

- Make it mandatory for countries to include emissions from international aviation (and international shipping) in their reporting to the UNFCCC. Until this requirement is in place, international aviation (and shipping) should be included in each country's accounts for greenhouse gas (GHG) emissions. This also means including international aviation and shipping when trying to achieve own carbon neutrality objectives (as e.g. the UK[5] and France[6] are considering to do).

- Calculate and make available the indirect emissions of aviation, i.e. CO_2 emissions related to the production and distribution of jet fuel (regardless of fuel type, i.e. also including biofuels and synthetic fuels), the trips of the passengers and goods to and from the airports, the manufacture of aircraft, and airport activity.

- Require airlines to state an accurate estimate of the carbon emissions and non-CO_2 effects of each flight on the tickets.

- Require companies and organisations to include business trips in their carbon accounting and environmental reporting.

- The climate impact of aviation should be included in airports' GHG accounting/reporting and budgeting.

- Theclimate impacts from surrounding airports should also be included into cities' emissions accounting.

LIMIT AIR TRAVEL ADVERTISING

Air travel, although the most carbon intensive form of transport, remains highly advertised. The Stay Grounded position paper, outlining 13 steps to reduce aviation, demands in step number 10 that: "Systemic incentives for air travel should end. These include flight-related ads or other marketing by the travel, airline and aircraft manufacturing industries. [...] These strong actions have precedent. Some nations banned cigarette ads decades ago, despite the ubiquity of smoking (and the ads) and the perceived rights of smokers".[7]

One strategy is to demand a ban or limit on advertising for flying, due to its harmful effects on the climate. Another strategy is to require that statements about climate impacts, and aviation's contribution to them, be included on reservation websites, on tickets, at check-in stands and (unless they are banned) in advertisements. There are already several initiatives working towards changes in this direction: The Swedish campaign *20% Klimatvarning* demands that EU-wide, 20% of the advertising space for air travel and fossil-fuelled cars should include information about climate change effects.[8] The German group *Am Boden Bleiben* calls for a stop to aviation advertising. The goal is to emulate the anti-tobacco campaigns that achieved governmental bans on print and broadcast advertising of tobacco products, as well as health impact labels on cigarette packages.

A by-invitation report to the UK's Committee on Climate Change discusses air travel marketing and makes this recommendation: "Encourage more responsible flying by mandating that all marketing of flights show emissions information expressed in terms that are meaningful to consumers (e.g., as proportion of an average household's annual emissions now and under Net Zero)".[9]

BAN FREQUENT FLYER PROGRAMMES

The primary function of frequent flyer programs (FFPs) is inducing a norm of excessive—and often unnecessary—travel,[10] to help boost the growth of the air travel industry. They cannot be justified in an era of dire climate crisis and should therefore be banned. Major airlines commonly make around half of their profits from their FFPs,[11] resulting from high mark-ups on frequent flyer plan 'miles' sold to credit card companies, car rental companies, hotels, etc., as well as merchant charges on airline-branded rewards credit cards.[12] In many cases, American Airlines' flight operations have run at a loss, with its sole source of profit being its FFP.[13]

Such bans have already been tested: Denmark[14] had bans for domestic frequent flyer programs in the past, to equalise competition among airlines. A report from 2019 by the UK government's Committee on Climate Change[15] includes recommendations for a ban on air miles and on frequent flyer programs, and proposes emissions labelling in air travel marketing.

BAN STATE FUNDING FOR AVIATION

Another approach is to campaign for a general ban on state funding for aviation. State support for aviation is widespread. It ranges from indirect subsidies to exemption of VAT (as outlined in **chapter 2**). Other examples include support to Airbus (which caused trade penalties issued by the US), free infrastructure that is brought in place to enable people to get to and from airports, extremely low lease costs of grounds for airports to state-funded research for aviation, artificially low landing fees, costs of police and security, and investments in (partly) state owned airliners. Additionally, the cost of air traffic control is borne by taxpayers. Topped by free CO_2 emissions under emission trading schemes and CORSIA. These exemptions and subsidies cost taxpayers tens of billions of euro and dollars. Each time a traveller buys a ticket, taxpayers pay at least the same as the ticket price for these hidden costs. This also increases the gap between rich and poor: the poor pay for the travelling habits of the privileged few.

REGULATE INTERNATIONAL AVIATION'S (SUPPOSED) REGULATOR - ICAO

The UN Framework Convention on Climate Change (UNFCCC) has delegated the task of regulating non-technical aspects of aviation's climate impacts to the UN International Civil Aviation Organisation (ICAO). However, the UNFCCC must reclaim this authority for several reasons. ICAO is deeply conflicted on climate matters because one of its main goals is the growth of aviation. In addition, ICAO's process is secretive, and organisations that lobby on behalf of the aviation sector have strong insider positions. If the UNFCCC does not take that step, it should prohibit ICAO from continuing to use and adopt regulations that rely on offsetting (see **Info Box 5**), and require that ICAO operates with utmost transparency on climate matters, including allowing unfettered observation of its meetings by the public, and free public access to all climate- and environment-relevant documents.

BAN AVIATION INDUSTRY'S LOBBYING

One large campaign, which started at the end of 2019, demands that the EU cuts fossil fuels out of its politics, and pushes for change at the national and UN level.[16] The goal is to hinder the industries from profiting from the climate crisis and from influencing policies aimed at addressing it. There is a precedent: the World Health Organisation introduced a firewall to protect public health officials from tobacco lobbyists. The campaign on fossil fuels could also have an impact on aviation, since kerosene is mostly made up of fossil oil, but biofuels which can sometimes be even more harmful are excluded from this approach. Another possibility is to demand a firewall for the aviation industry, biofuels and related sectors.

RESTRICT AVIATION'S FUEL SUPPLY

A declining cap on aviation fuel production and importation, regionally as well as (eventually) globally, would directly reduce climate-harming emissions and provide a clear signal to not expand airports.[17] The feasibility of this measure has not yet been studied.

USE EXISTING PERMITTING PROCESSES

Some local and regional campaigns could strategically make use of existing permitting processes to oppose new jet fuel supply pipelines and fuel farms. This could be an indirect way to oppose a specific airport project, through attacking the supply chain. Although similar to the aforementioned strategy of restricting the fuel supply of the entire regional or global aviation industry, the strategy here is specific to a local airport project and its overall impacts, as well as those caused by a long-distance fuel pipeline and the local storage facility.[18]

COUNTER LOW-COST AIRLINES AND SUPPORT A JUST TRANSITION

The relatively new existence of low-cost carriers is a major reason for the new 'normality' of flying. While deregulation and absence of taxes account for cheaper prices, low-cost carriers also skimp on workforce costs. In the USA, for instance, the wages of airport staff fell by 19% between 1991 and 2001. Qualified staff are increasingly being replaced by inexperienced, cheaper part-time labourers. While quality and safety decline, stress and burnout are on the rise.[19] There have been many strikes recently, demanding collective labour agreements, higher payments and better working conditions.

Supporting the demands for good working conditions in the aviation industry may at first seem counter-productive for achieving emission reductions, but it may actually be an important step: if low-cost carriers cease to be low-cost due to improved working conditions, this could decrease the demand for flights. If combined with both a reduction of employees' working hours and the creation of good 'climate jobs' (railway/renewable energy sector), the result could be a reduction of aviation. Supporting a just transition in alliance with trade unions is a necessary step for eliminating the supposed 'jobs versus climate'-dilemma, and can bring new allies to the climate justice movement.

DIVESTMENT FROM AVIATION INDUSTRY STOCKS AND BONDS

There are existing campaigns pressuring investors (especially large ones like pension funds, investment firms, insurance companies and universities) to shift the fossil fuel stocks and bonds (or mutual funds that include them) in their portfolios to other kinds of assets. These campaigns have succeeded in diverting several trillion dollars of investments. A similar strategy could focus on investments in airlines, aircraft manufacturers, airport corporations, and airport construction companies.

The aforementioned aviation corporations will likely be affected to some degree by any impacts caused by the more general fossil fuel divestment campaigns, but a specific campaign could intensify the results. An aviation divestment campaign could be run under the aegis of the existing fossil fuel ones, or independently.

It is relevant to investigate how effective divestment campaigns actually are (apart from raising public awareness of fossil fuels' climate impacts). These campaigns only have a direct effect on an industry if a smaller market for the stocks and bonds reduces the value of new offerings of those financing instruments. Any devaluation of existing stocks and bonds as a result of the campaigns only reduces their value in trades between investors, and is inconsequential to the industry itself, but in practice there is little devaluation. As a result, substantial benefit, if any, of divestment campaigns for the climate is delayed and dependent on when corporations issue new securities.[20] Another matter is that while fossil fuels are widely viewed as problematic for the climate, an aviation divestment campaign has the added burden of changing public mindsets regarding air travel in order to get significant traction. But divestment campaigns can raise public awareness, helping to build a movement. Also, it is usually easier to call for divestment from dirty industries than proposing new investment in 'green' assets (which can, in any case, be problematic and drive land grabbing).

UNINSURE AIRLINES AND AIRCRAFT MANUFACTURERS

Large corporations depend on insurance to guard themselves against legal liabilities. This year, insurance companies have refused to renew or initiate insurance policies for several coal companies due to liabilities for climate change. Several cities have sued major oil companies over fraud and harms regarding their role in climate change. These companies may eventually also find insurance difficult, very expensive, or impossible to obtain. Campaigns to highlight the risk-exposure of airlines, aircraft manufacturers and airports to legal liabilities—or to sue them—may hinder these companies' ability to obtain insurance, operate profitably or to attract investors. Campaigns that have helped make coal operations uninsurable may serve as a model for how to proceed concerning aviation. The most successful model to date is *Unfriend Coal*.[21] Their 2018 scorecard doesn't shy away from their achievements.[22] For now, forcing de-insurance of aviation companies faces a higher hurdle than for coal, because aviation still has a positive public image. But that image is beginning to change. For inspiration, in 2015 the world's largest in-

surance company (Allianz) divested from coal,[23] and last December, 73 environmental organisations urged re/insurers to pull out support for Australian coal mine.[24]

CHALLENGE MILITARY AVIATION

Climate harming emissions by military aviation of some nations are enormous, particularly in the USA, UK, several European nations, Russia and China. It is a matter not only of the conduct of war, but of ongoing logistics of moving personnel and material by air, and of maintaining readiness in a tense world. These emissions have so far been intractable, with no NGOs finding a way to effectively confront the problem. Nonetheless, it deserves attention and should be part of a wider strategy that challenges both the climate impact of the military and its other inhumane consequences.[25]

BEHAVIOUR CHANGE CAMPAIGNS

In Europe in recent years, several campaigns started raising awareness about the negative impacts of flying and encouraged people to pledge to fly less or not fly the next year/summer. Their goal is to start a snowball effect of individuals changing their travel behaviour. A prominent example is the 'flygskam' or 'flying shame' concept that went viral in social and conventional media, with people confessing to feeling ashamed when flying. In Sweden, it seems to have caused a slight reduction in flights and notably higher demand for trains in 2019.[26]

Conversely, there are also critical voices concerning the effectiveness of behaviour change campaigns—the praxis theory points out several of them.[27] They foment the idea that individuals can only create change by consuming differently—while there are also many other ways for political engagement. They also 'desocialise' people and do not take into account the factors that drive people to fly, for example the social and cultural background, the economic situation, or the existing infrastructures. If flights remain 'normal'—with advertisements placed at every corner, tickets continuing to be extremely cheap and few night trains available—there will be few people receptive to pledge campaigns, while millions of new people around the world discover the coolness of flying.

Still, especially in environmentally attuned sectors of society, the normality of flying can be challenged by role models like Greta Thunberg or people in one's circle of friends, who show that living or travelling without flying is possible, exciting and 'the new cool'. Being able to spark a movement of grounded or 'terran' people can, as has been the case with veganism, have an effect, especially if this leads to increased political pressure for policy changes.

For these reasons Stay Grounded is organising the European campaign *Let's stay grounded!*,[28] incentivising people not only to pledge to fly less, but also to engage in activism combating aviation through a variety of means.

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[23] m350.org (2015)
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Activists draw a red line to demand a stop of the expansion of Barcelona airport. The action took place during the "Degrowth of Aviation" Conference in July 2019. Photo credits: Christine Tyler / Stay Grounded


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BRINGING IT ALL TOGETHER. A SUMMARY

A multitude of measures have been discussed in this report. How do they fit together? What is necessary to bring them forward? Which actors are key in promoting them? Choosing a combination of measures must take into account cross-cutting concerns like social justice. The systemic change needed in order to avoid climate crisis is complicated but achievable step by step, when building a strong movement.

To reduce the negative impacts of aviation, we need to reduce aviation, that is, the amount of flights and planes. There is no alternative. As this report discusses, we have a wide range of measures to choose from for constructing the most effective strategy. They vary from fiscal measures, such as taxes and subsidies, to regulatory law, like absolute caps and bans. They can be either top-down or bottom-up strategies, but a combination would probably be most effective. Measures can include incentives that are negative (e.g. taxes on flying) or positive (e.g. inspiring more meaningful tourism and travelling). Fundamental to applying any of the measures is the importance of widespread communication about the need to reduce aviation.

Each measure has advantages and disadvantages in how easily it can be implemented, and to what extent it might help address wider systemic issues such as climate justice and transitioning to an ecologically sound mobility system. Some measures might work within the current system, while others might challenge it. If measures are only bottom-up and small-scale, without tackling the power and privileges of the aviation industry, they will not result in slowing down our current climate crisis. In formulating a strategy for degrowing aviation, one needs to think about how these measures can best be combined, how they can be brought forward, and by whom.

THE ROLE OF FISCAL MEASURES

While flying is virtually tax free, other forms of transportation are subject to excise duty, value added tax, and other levies. Hence, a main argument for introducing fiscal measures is to counter the ongoing, massive indirect subsidising of the aviation sector. Conventional economic theory holds that taxation will decrease demand for a service. However, a much discussed question concerns how high aviation tax rates have to be to cause a significant decrease in flying. For example, levying a standard VAT (Value Added Tax) on kerosene could lead to an 18% reduction in CO_2 emissions in Europe. A smaller tax would merely cancel out some of the (indirect) subsidies that the aviation industry receives, without having much impact on emissions reduction.

Market and price instruments have been the most favoured environmental instruments during the era of neoliberalism that started in the 1980s. From a social perspective, taxes on goods and services are often disfavoured because they apply equally to everyone—rich or poor. The wealthy can continue to consume, while the poor cannot. The frequent flyer levy (FFL) or the air miles levy (AML) attempt to address this social injustice, by making frequent or far flying progressively more expensive. Because lower income groups fly much less often, the FFL would mainly affect wealthier persons or companies that pay for work travel. This would be especially effective if the FFL or AML levy would increase for business or first class. For campaigning, it would be a key advantage. This suggests that the FFL or AML might be

among the introductory measures of policies for shrinking the aviation sector, being much more socially acceptable than other policy proposals. Since the focus of the FFL is on the number of flights, rather than distance travelled, it favours people with a migration background who have families living far away and those wealthy enough, despite the levy, to continue taking many long-distance flights per year. Reducing the *number* of flights is also the key demand of communities impacted by noise around airports. The AML escalates with air miles travelled rather than simply the number of flights taken. It more effectively discourages long-haul flights, shifting travel to surface transport—or to shorter distance flights. It is more closely linked to emissions and falls more heavily on those polluting more. An additional idea related to taxation is that the revenues generated could be earmarked and redirected towards developing more sustainable modes of transportation. The revenues collected in countries of the Global North should also be used to support climate friendly alternatives in the Global South (see **Info Box 2** on Climate Justice). Earmarking of taxes, however, is not common practice. Therefore, this part of a tax or levy policy might be more difficult, and in conflict with the legal system in some countries. Additionally, the aviation industry seeks to 'ring-fence' the revenues for its exclusive use, when tax or levy proposals are under consideration.

VAT, kerosene or ticket taxes, as well as a carbon tax, fit with current economic policy and the use of economic instruments, and could easily be implemented technically. Such taxes already exists in many countries. An advantage of ticket taxes is that they can be introduced at the national level without significant legal hurdles, and can be designed freely regarding rate, distance bands, and other features. A carbon tax would in theory apply to all fossil fuel use, while the other taxes would be specifically targeted towards aviation.

More generally, one disadvantage of a tax-based approach fundamentally ties in with the limits of market-based approaches and, as a result, fall short of offering a profound critique of systemic problems. Given the modest goal of any tax, it is not of utmost importance what kind of tax is introduced. The vital aim is that aviation is not given an unfair advantage over other transport modes. It should be feasible to receive support for levelling this competition. The FFL or AML would indeed tackle flying habits more than usual VAT, ticket or kerosene taxes, and should be applied in addition. Increasing the price for flying can by itself give a boost to alternative modes of transport, making them relatively cheaper. On the other hand, fiscal measures will not go far enough in terms of the needed emission reduction. Hence, to really have such an effect, it is necessary to also foster sustainable alternatives, and to implement regulatory measures like limits to the numbers of flight, moratoria on airport projects, shutting down certain airports, limiting air travel advertisements or other measures discussed in this report.

THE ROLE OF ABSOLUTE LIMITS

Setting absolute limits on aviation is, in principle, the easiest and most secure way to guarantee that the aviation industry does its fair share for climate mitigation. Arguably, setting limits is also preferable from a fairness perspective as hard caps and bans affect all concerned parties equally, rich and poor alike. The main challenge is that implementing absolute environmental limits does not seem to be politically feasible currently, as straightforward regulation or limiting people's freedom are generally opposed. However, impacts of climate change are now worsening at an increasing rate, meaning a social tipping point might be in the near future. Moves in recent years to attempt soft caps through taxation, offsetting or emissions trading (cap-and-trade schemes) are examples of reluctance to set absolute limits. They allow the possibility (for those wealthy enough) to buy themselves out of the commitment. Still, the idea of banning especially easy-to-substitute short-haul flights has gained support in recent years and should be pursued.

Limits are necessary for more than just the number of flights or their specific distances. Chapter 8 proposed banning frequent flyer programmes, low cost airlines, state funding for aviation and industry lobby in certain democratic institutions. Other regulatory measures might include limiting the amount or presentation of air travel advertising, or restricting the amount of available aviation fuel. In addition, we have to start limiting tourism, especially in areas heavily affected by it. Such limitations could be formed through regulating the construction of new hotels or through a tourist tax. Also, divestment campaigns demanding limits to fossil or aviation investment, or campaigning for uninsuring harmful industries are possible strategies.

A **red line** also needs to be put on airport expansions. Currently, 550 new airports or runways are planned or are being built around the world, plus runway expansions and new terminals etc.—all in all, more than 1200 infrastructure projects. Constructing new airports is the aviation industry's surest way to secure its future growth. Effective resistance against airport projects can prevent 'stranded investments' in a hopefully soon outdated infrastructure. In some of these sites, local resistance is already large and organised. Making alliances with stakeholders like trade unions might be a challenging but necessary strategy here. An advantage of a moratoria on airport expansion is that it is a direct hard stop on the local problem and does not necessarily involve extensive national or international legislative processes in order to be established. Calling for regulations on flying can also support the struggle against an airport project, as well as demanding alternatives to aviation.

DEVELOPING SUSTAINABLE ALTERNATIVES TO AVIATION

Boosting the use of alternatives to flying requires investing in expanding the network of long-distance inter-city train and bus routes, including larger numbers of and more comfortable night trains and buses. This does not necessarily mean building high-speed train lines, which should be avoided due to climate and environmental damage during construction, along with high operational energy use. Ferries should become an alternative to flying; however, they need to be modernised with vessels having renewable propulsion (wind, solar, batteries, etc.) and reopening closed routes should be considered.

The degrowth of the aviation industry will therefore combine with a certain growth in other climate-friendly sectors. Jobs will not be lost, but be directly transferred in a 'Just Transition'. This requires negotiations and collaborative planning, and includes improvements in the quality of work, including a reduction of work hours. Privatisations should in most cases be replaced with climate-friendly local initiatives, public ownership and democratic accountability.

A maximal shift in patronage from flying to long-distance surface (and sea) transportation requires the establishment of integrated and user-friendly international booking systems and improved transfers between trains, buses and ferries. A decline in air freight is also necessary to help stabilise the climate. Successes in reducing air travel by any of the means discussed in this report will contribute to that decline by reducing the airlines' aggregate belly-freight capacity. However, aviation is not only about transporting people, but also about transporting goods. Efforts to make economies more local for providing food and goods, ongoing in some places, need to be replicated elsewhere and will undercut some of the demand for air freight (as well as problematic sea shipments). Working for the relocalisation of economies is one way to challenge the massive international transportation of goods. Giv-en the close links between the current fast mobility system and our current economic system based on constant growth, international free trade and globalised structures, such a measure will necessarily be viewed as problematic by those in favour of upholding the economic system in its current form. Military aviation is yet another aspect of aviation that must be addressed both due to its environmental impact and its humanitarian side.

THE ROLE OF BEHAVIOURAL CHANGE

All the above mentioned strategies need to be combined with raising public awareness of the fact that aviation is the fastest way to fry the planet. Communicating the total impact of aviation, and including the climate effects additional to CO_2 in different accounting is core for this (see **chapter 8**). For campaigning, language that uses metaphors, creates concrete pictures of problems or alternatives, and the ability to formulate new narratives and visions (see **Info Box 4**) are important tools for both seeking support for policy changes as well as incentivising individual behaviour change.

Seeking lifestyle changes by individuals that include less flying or even reducing one's overall amount of travel is a campaign strategy already practiced by flight shame and flight free organisations. These campaigns challenge the aviation industry's dominance by creating different narratives about travel and tourism. The aforementioned improvements to long-distance surface transportation, in addition to measures limiting aviation, are enablers of this shift in norms and practices.

Among the progressive narratives are, when possible, do not travel far if at all (e.g. stay local, use video conferencing); make fewer trips but with longer stays; enjoy the benefits and reduced stress of slow travel, as well as the opportunity (for a professional or student) to do productive work while *en route*. The need is to create a positive vision and desire for environmentally sound tourism and travelling.

Another campaign opportunity is behaviour change by organisations whose climate and environmental footprints include a large component from travel. The objective is getting them to adopt a progressive travel policy that leads substantially to travelling less and using the least impact mode of travel for each trip (even if the cost may be somewhat higher). Examples of such travel policies are already operative, and expectations for the content of a satisfactory plan should increase over time as societal travel norms shift for the better.

It is likely that for now only a few progressive organisations will adopt good travel policies. But these can be exploited as showcases, toward increasing acceptance of this new kind of thinking and practice. Collectively, voluntary behaviour changes by individuals and organisations can lead to a stampede of others making similar changes and eventually to the feasibility of achieving systemic changes that greatly diminish the aviation industry. For climate activists, campaigners and scientists, or people struggling against airport expansion, it is also necessary to stay grounded in order to be coherent and credible.

Only opting for campaigns targeting individuals or institutions to change their consumption are not enough—they need to be combined with the push for the structural changes mentioned above. The *Let's Stay Grounded Campaign!* is aiming to do just that.

INCORPORATING SOCIAL JUSTICE

The report suggested ways for taking social justice into account in campaigns for reducing aviation. It is vital that climate mitigations do not harm or burden the already

vulnerable groups in society, for example through unfair taxation or through destructive projects (e.g. biofuels plantations that put food security of poor people at risk). Some measures discussed in this report, like the FFL or AML, specifically address the topic of social justice, while other measures have a more indirect impact. Fiscal measures could create revenues to achieve more climate justice, including financial payments from countries of the Global North for liability and redress. At the same time, none of the measures discussed in this report will, alone or in combination, lead to social justice. Unequal distribution of wealth and power has to be tackled by other means, such as directly taxing the wealth.

One of the unresolved issues is how to take into account the needs of migrants. While migrants may desire to see family on other continents regularly, the relevant question in this era of climate crisis is to what extent it is reasonable to accommodate this special need. The dilemma cannot be ignored that forced migration will also most likely skyrocket with worsening climate catastrophe. Further, most refugees currently are excluded from taking flights because of exclusive visa and border regulations, and economic status. When discussing this topic, we also need to keep in mind the global injustice of the climate crisis at large. Still, the Frequent Flyer Levy is a measure that could allow regular visits to family living far away. Other strategies include contingents for every person, higher contingents for those with close family in other continents, or the possibility for applying for urgency-flights might be possibilities to explore for the future.

STRATEGY, ACTORS AND SYSTEMIC CHANGE

Aviation is closely linked with our transport system, with tourism, energy and global trade, and with our economic system based on constant growth and competition. Fast mobility is a key element of globalised capitalism, yet the faster the mode of transportation, the more climate-harmful it is. Climate justice can only be achieved by challenging this model, by reorganising mobility, regionalising the economy, and overcoming global inequity. This sometimes seems too big of a task - but step by step, with many different civil society actors, social tipping points are possible.

Until recently, flying was not viewed as a problem. However, in 2018 and 2019 a shift in the debate began in Europe and other parts of the world, due to the *Fridays for Future* movement, the *Flying Shame* debate, the *Stay Grounded* network, and rising media attention to the issue. In a *YouGov* poll, conducted in the United Kingdom in August 2019, two thirds of those interviewed said that air travel should "definitely" or "probably" be limited to handle the climate crisis. Scientists, decision-makers and public figures are starting to raise the issue—even though problematic measures like offsetting, biofuels or beliefs in technological miracles still hold and shift away attention from the needed reduction.

When reviewing the various measures outlined in this report, we see that they complement one another. Hence, working to implement a fiscal tax, while also calling for regulation of aviation activity as well as promoting alternatives makes sense. However, campaigns usually require focus and concrete demands, especially if brought forward by only a few stakeholders. Not everything can be done at the same time. It is important to choose demands and strategy carefully, while also allowing others to have *their* strategies, but also to keep the overall vision in mind when communicating about the specific case. This report, for example, recommends that we do not discuss 'green' or 'decarbonised' aviation, but a needed reduction of flights. It also makes a strong case for continually checking the proposed measure for its social justice implications.

The measures promoted in this report to reduce aviation are in line with those of the wider social movements for systemic change, including airport resistance groups, environmental NGOs, the tax justice movement, the climate/environmental justice movements, land and indigenous rights movements, and the degrowth movement. Additionally, reaching out to new alliances might be necessary: trade unions demanding a just transition; migrant organisations; human rights organisations; doctors calling for fine dust regulations, or others.

Tactics can range from raising awareness to organising affected residents of airport noise; effective media work (social media, press, adbusting, etc.) and working together with critical journalists in order to change discourses; looking for allies in policy making institutions; direct action and civil disobedience; creative, funny or artistic initiatives; lawsuits; petitions and more. When the movement becomes strong enough to challenge corporate interests, repressive tactics can be expected from the industry, as well as attempts to divide the movement. Special attention needs to be paid to not allow splits in the movement for climate justice and aviation reduction, but to respect different tactics or campaign focuses, and exchange experiences. Building solidarity through networking is key to bringing about the systemic change needed.

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Diagram 4:
Degrowth of Aviation –
Cluster of Different Measures

The aviation industry is growing without limits. In order to legitimize this in times of climate crisis, technological improvements and emissions offsetting have been promised as solutions to reach 'carbon-neutral' growth. But green flying is and will be an illusion in the decades to come.

The only way to effectively reduce aviation's climate impact is to reduce flights—to degrow aviation. Is increasing the prices for flying the only way to achieve this? Is flying a 'human right' for the wealthy? About 90% of the world's population has never set foot on an airplane. A very small number of frequent flyers have an immense impact on the climate.

What could be a combination of measures that leads to a socially just and ecologically sound transport system? This report discusses six ideas in detail and touches on many more possibilities to reduce aviation. Among them are: taxes, frequent flyer levies, bans on short-haul flights, moratoria on airports, progressive travel policies in institutions, and fostering alternatives like trains, ships and online conferences.

While it is key to look for inclusive measures when degrowing aviation, this alone will not bring about climate justice. Aviation is part of a bigger picture concerning how our economy and society currently work. Tackling aviation will involve changes in many other sectors, including trade and tourism. This report shows: it is possible to envision a world with reduced aviation, to enjoy life in an open society while respecting the possibility for others to also enjoy their lives—now and in the future.

STAY GROUNDED NETWORK

Lebegue statement to Port of Seattle 4/14/26

Greetings Chair, members, I'm Dr Breck Lebegue, Co-Chair of Climate & Health Task Force, WA Physicians for Social Responsibility. As a retired AF flight surgeon for 30 years, I love flying, have thousands of hours of flight time—and trained to recognize the harms of aviation fuel. PSR formed last century nationally to oppose nuclear weapons as a threat to life on the planet. PSR continues that work and now commits to prevent and mitigate climate change as the greatest clear and present threat to human health; especially disease caused directly by burning fossil fuel, & climate change.

The transportation sector remains the largest source of carbon emissions in Washington. If we keep doing what we've done, we get more of what we've got. Transport policy has clear consequences to human health. Air cargo & passengers contribute significant and growing climate harms. Short hops are the worst. Burning fuel releases microscopic PM 2.5 particles that go deep into the lungs, enter the bloodstream, cause heart & lung disease, even dementia, and premature deaths. A UW study found that SeaTac residents living under the flight path have a 2-5 year shorter life span. Flying hurts poor people's health. Climate science & WA law requires us all to reduce GHGs. Reducing flight numbers & no airport expansion are the best solutions to mitigate health & climate harms.

Rather than building or expanding airports & increasing fossil-fueled flights, WPSR strongly advocates a full North-South and East-West passenger rail system with fast, frequent, reliable & affordable inter-city trains that meet all other public transport nodes. We strongly support rapid completion of the long-delayed *Cascades* Long-Range Plan, & electrification ASAP. Shifting from fossil fuels to electric power for transport requires clean electricity.

So, will we keep doing what we're doing, or choose healthy transport mode? WPSR stands ready to advise you of health consequences of aviation policy and practice as you carry out your work over the next biennium. Thank you for that privilege and for speaking with you today.

icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

JUNE 2025

Air and greenhouse gas pollution from private jets, 2023

DANIEL SITOMPUL AND DAN RUTHERFORD, PH.D.

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EXECUTIVE SUMMARY

The aviation industry, including commercial, private, and military aircraft, emits about 1 billion tonnes of carbon dioxide (CO_2) annually, making it the seventh-largest source of CO_2 if considered a country. Without significant action, emissions from international aviation could double or even triple by 2050, reaching up to 1,800 million tonnes (Mt), according to the Climate Action Tracker (2024).

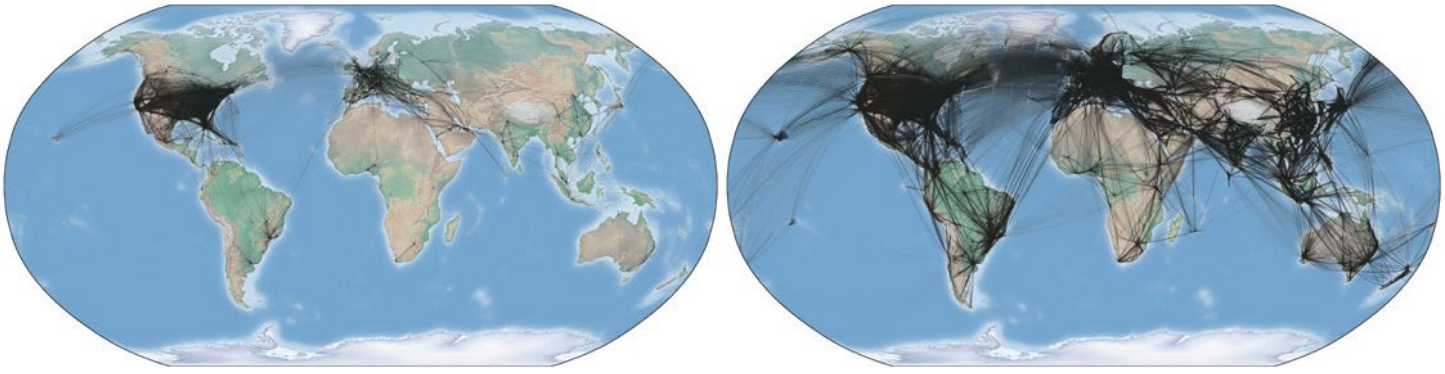
While there are several high-fidelity emission inventories for commercial aviation, data on greenhouse gas (GHG) and air pollution from general aviation—including nitrogen oxides (NO_x) and fine particulate matter ($PM_{2.5}$), which impact air quality and human health—remain limited. Private jets were responsible for about 2%–4% of total annual GHG emissions from aviation in 2013–2023. Better data on the magnitude and distribution of private jet pollution could help inform efforts to reduce these emissions through targeted policy measures.

This report quantifies and maps the air and GHG pollution emitted globally by private jets in 2023. We developed both a top-down and a bottom-up emissions inventory for private jet flights using a variety of data sources, such as global flight trajectories, airport coordinates, and engine emission databases. These data allowed us to spatially allocate fuel use and emissions to airports and countries for about 94% of private jet activity globally.

Figure ES1 shows the global distribution of private jet flights (left panel) and commercial flights (jets and turboprops; right panel) in 2023. Private jet activity was overwhelmingly located in the United States, with almost two-thirds (64.6%) of flights departing a U.S. airport. In contrast, commercial jet flights were distributed more widely around the globe, with only about 26% of flights departing U.S. airports.

Figure ES1

Flight trajectories for private jets (left) and commercial flights (right), 2023

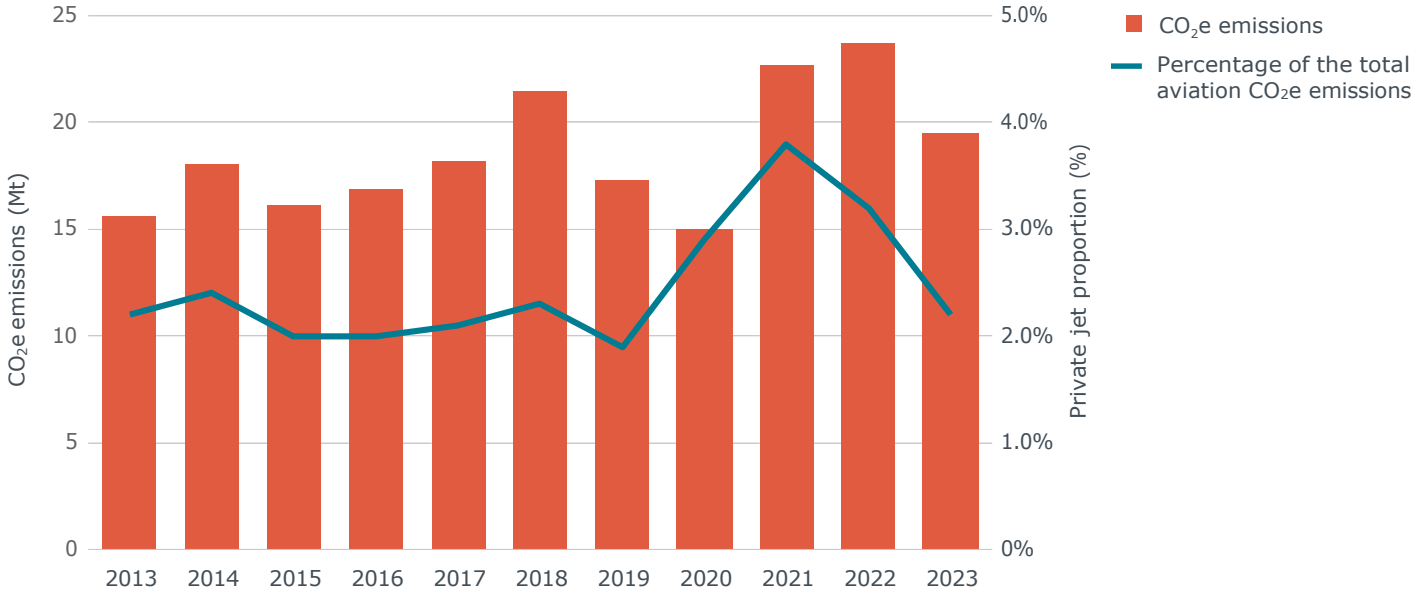


Note: This figure was derived from Spire's 2023 database.

Figure ES2 displays the estimated GHGs from private jets over time based on our top-down emissions inventory methodology. The bars show absolute emissions (in Mt) and the line shows private jets' share of civil aviation (commercial plus private jet) emissions. Greenhouse gas emissions from private jets increased 25% over the past decade, from 15.7 Mt in 2013 to 19.5 Mt in 2023, with significant year-on-year volatility.

Figure ES2

Private jet GHG emissions (bars) and percentage of total aviation GHG emissions (line), 2013 to 2023



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From these results we draw the following conclusions and policy recommendations.

Private jets are a large and growing source of air and climate pollution. A private jet emits about 810 tonnes of GHGs in a typical year, equivalent to 177 passenger cars or nine Class 8 heavy-duty trucks. At their post-COVID peak in 2022, private jets emitted an estimated 23.7 Mt of CO_2-equivalent emissions and accounted for nearly 4% of the civil aviation total. In 2023, private jets collectively emitted more GHGs than all flights departing from Heathrow Airport, the busiest airport in Europe (Heathrow Airport, 2024).

Private jet activity and emissions are overwhelmingly concentrated in the United States. In 2023, private jet flights departing from U.S. airports accounted for more than half (55%) of private jet GHG emissions globally. The states of Florida and Texas generated more private jet flights and GHG emissions than the entire European Union. We found that 18 of the 20 airports with the highest estimated private jet NO_x emissions in 2023 are in the United States.

A typical private jet flight is short-haul (less than 900 km) and lasts less than two hours. This means that the emissions of private jet flights could be reduced through the use of turboprop aircraft, which are much more fuel efficient than turbofan aircraft, and by a modal shift to high-speed rail in regions where it exists, like Europe.

Taxation of private jet flights or GHG emissions could generate substantial revenue to support aviation decarbonization. We find that introducing a global tax on fuels consumed by private flights of approximately $1.59/gallon ($0.42/L)—as proposed in legislation considered by the previous U.S. Congress—could generate up to $3 billion annually, based on a top-down analysis of total annual fuel usage estimated at 5.8 million tonnes.

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INTRODUCTION

Aviation is a cornerstone of global connectivity, economic development, and cultural exchange. In 2019 alone, the aviation industry supported 87.7 million jobs worldwide and contributed approximately $3.5 trillion to global gross domestic product (GDP), equivalent to 4.1% of the world's economic output (Air Transportation Action Group, 2020). This level of activity has a steep environmental and social impact. Commercial aviation emitted an estimated 918 million tonnes (Mt) of carbon dioxide (CO_2) in 2019 (Graver et al., 2020). The International Energy Agency estimated that global aviation emissions rebounded from the global COVID-19 pandemic to almost 950 Mt CO_2 in 2023 (Lombardo, n.d.). That would rank aviation as the seventh-largest source of CO_2 if it were treated as country (Joint Research Centre, 2023).

Within the aviation sector, private jets occupy a unique position, catering to a select group of corporate executives and other high net-worth individuals. Ownership models of private jets vary, ranging from full ownership to fractional shares and charter services. Although private jets represent a small fraction of overall aviation activity, they disproportionately contribute to emissions, releasing up to 14 times more CO_2 per passenger than commercial jets and 50 times more than trains (Murphy & Simon, 2021). As the aviation industry faces increasing scrutiny over its contribution to global carbon emissions, a more rigorous examination of private jets' environmental footprint is necessary.

This paper quantifies and maps the greenhouse gas (GHG) pollution emitted globally by private jets in 2023. We develop two emissions inventory methodologies: a top-down approach for estimating global fuel burn and GHG emissions and a bottom-up approach for modeling GHG and air pollution (NO_x and $PM_{2.5}$) at the country and airport levels. The next section reviews the literature on aviation emissions and recent policy efforts to reduce private jet emissions. We then introduce the methods we used to model the fuel burn and CO_2 and air pollution emissions of private jets. From there, we describe the results of our modeling and validate those results against available data. We close with recommendations for policymakers who aim to constrain the growth of private jet emissions. Additional methodological detail and results can be found in Appendices A through D.

RESEARCH AND POLICY CONTEXT

While there are several high-fidelity emission inventories for commercial aviation, data on GHG and air pollution from general aviation are limited. In 2009, private jets and turboprops were estimated to be responsible for about 2% of total aviation GHG emissions, or 20 Mt of CO_2 (General Aviation Manufacturers Association & International Business Aircraft Council, 2009). Gössling and Humpe (2020) applied a top-down assessment to conclude that private jets might have emitted as much as 34 Mt of CO_2 in 2016. In an updated study using high-fidelity Automatic Dependent Surveillance-Broadcast (ADS-B) flight trajectory data,[1] Gössling et al. (2024) concluded that private aviation emitted at least 15.7 Mt of CO_2 globally in 2023.

There are also several regional estimates of private aviation emissions. In the United States, where 60% of all private jets are registered (General Aviation Manufacturers Association, 2020), private jets emitted an estimated 16.3 Mt of CO_2 in 2023, representing 7% of all CO_2 emissions from U.S. aviation. Argus Analytics (2024) tracked 4.7 million business flights (private jets and turboprops) in 2023 globally; the large majority (67%) originated from U.S. airports, with 31% of flights departing from just three states: Florida, Texas, and California. The second-most private flights originated in Europe, accounting for 16.5% of global private flights. Faber and Raphaël (2023) concluded that private jet flights in the top 10 countries in Europe emitted 2 Mt of CO_2 in 2022.

A consistent theme of research on private jet emissions has been the explosive growth in private aviation over the past two decades, which has further accelerated since the COVID-19 pandemic. Murphy and Simon (2021) leveraged European Business Aviation Association data to conclude that greenhouse gas emissions from private jets increased by 31% in the European Union (EU) from 2005 to 2019. Gössling et al. (2024) and the Federal Aviation Administration (FAA; 2024) estimated that CO_2 emissions from private aviation—including private jet, piston, and turboprop flights—jumped by 46% between 2019 and 2023. Health and safety concerns led to an increase in private jet use during the pandemic (Amalfijets, 2024). Looking ahead, the FAA (2024) projects that U.S. private jets will emit 28 Mt of CO_2 in 2044, a 70% increase from 2023 levels.

Given the short duration of many private flights, researchers have also focused on the high emission intensity of private jets and the emissions reduction potential of modal shift. Murphy and Simon (2021) concluded that private jets burn, on average, 10 times more fuel per passenger than commercial aircraft, and that close to half of all intra-EU private flights cover distances less than 500 km. Gössling et al. (2024) and Faber and Raphael (2023) concluded that about half of private aviation flights are less than 500 km in length. This brevity implies that much of the greenhouse gas emissions from private jets could be avoided, either by modal shift to high-speed rail or the use of alternative fuels. U.S. private jet fuel burn and operating hours have remained closely coupled, suggesting only modest (0.4%) annual improvements in fuel efficiency since 2010 (FAA, 2024).

In addition to GHGs, private jets emit air pollutants that impact human health, including nitrogen oxides (NO_X) and fine particulate matter ($PM_{2.5}$). Atmospheric ozone linked to aviation NO_X caused an estimated 53,000 premature deaths in 2015, with $PM_{2.5}$ accounting for an additional 21,000 premature deaths that year (Eastham, 2024). Due to their high-altitude operations, private jets may also contribute disproportionately to persistent condensation trails (Gryspeerdt et al., 2024).

1 ADS-B is a surveillance technology used by most aircraft to broadcast their position in real time to ground and satellite receivers.

In 2021, the International Business Aviation Council committed to achieve net-zero CO_2 emissions by 2050. However, few concrete policy measures are in place to curb private jet emissions. The International Civil Aviation Organization (ICAO) established international fuel efficiency targets for private jets in 2016, but it will not require any jets to make improvements when the targets take full effect in 2028 (Rutherford & Kharina, 2017).

Moreover, private jets are not often subject to the same level of taxation imposed on commercial aviation and other forms of transportation. In 2021, Transport and Environment found that in most European countries, private jet fuel is taxed at a lower rate relative to their GHG emissions per passenger than commercial aviation or automotive fuel, effectively creating a tax advantage for the wealthiest travelers (Murphy & Simon, 2021). Many non-commercial aircraft operators, such as private jets, also are exempt from emissions trading under the EU Emissions Trading System (ETS), as they fall below the 1,000-tonne CO_2 emissions threshold in effect through 2030 (European Commission, 2023a). As a result, these operators are not required to purchase emission allowances, meaning their flights are undertaxed relative to commercial flights. These regulatory differences not only undermine efforts to address aviation's carbon footprint but also highlight the opportunity for targeted policies to ensure private jets contribute their fair share to climate mitigation efforts.

Policymakers in Europe and the United States have taken important steps in the regulation of private aviation. Beginning in 2025, the UK and French governments will tax private jet passengers between £84–£673 (Sentinel Aviation, n.d.) and €420–€2,100 (GlobeAir, n.d.), respectively, depending on flight distance. Meanwhile, various proposals to tax private aviation have failed to advance in the United States, where most private jet activity is concentrated. In 2023, companion bills were introduced in the U.S. House and Senate that would have increased the fuel tax for private jet travel to $1.589/gallon ($ 0.42/L) and devoted the revenue to public transport and climate spending (Fueling Alternative Transportation with a Carbon Aviation Tax Act, 2023).[2] A separate measure would have established tax surcharges on private jets to reduce GHG emissions (Whitehouse, 2023). During the Biden administration, the Internal Revenue Service announced that it would audit private jet tax exemptions claimed by executives (The Associated Press, 2024), but the status of that initiative is uncertain.

Civil society groups, notably the Global Solidarity Levies Task Force, have proposed a luxury aviation tax as a way to raise funds to compensate the Global South for historical damages from climate change (Global Solidarity Levies Task Force, 2024).

2 In January 2025, U.S. Senator Edward Markey of Massachusetts reintroduced the Senate measure for consideration in the 119th Congress; the new bill would increase the federal jet fuel tax to $1.641 per gallon. As this analysis was conducted prior to the reintroduction of the bill, the section on taxing private jets considers the original ($1.589) proposed increase.

METHODOLOGY

We used two methods to estimate global fuel burn and GHGs from private jets: a simplified top-down approach using data on yearly private jet operations and total registered private jets, and a spatially allocated bottom-up calculation using aircraft trajectory data matched to fleet inventories and engine emissions data. The top-down approach was used to estimate global fuel burn and GHG emissions, while the bottom-up approach allowed for estimation of GHG and air pollution (NO_x and $PM_{2.5}$) at the country and airport level.

TOP-DOWN APPROACH

Our top-down approach used FAA general aviation and JETNET data to calculate total fuels consumed and GHGs emitted by private jets globally. The FAA (2023) general aviation data provide insights into U.S. and global private jet fuel consumption and carbon dioxide emissions. Key data points include the estimated average fuel consumed per hour of flight and the average hours flown annually per registered aircraft. JETNET (2023) data provide insights into globally registered private jets. We used the number of registered private jets on an annual basis from 2013 to 2023 to estimate the global fuel consumption and GHG emissions assuming the same average hours flown, as suggested in the FAA dataset.

Top-down fuel consumption and GHG emissions

We first determined the number of private jets in the United States and globally using data from the FAA and JETNET. Using total annual private jet flight hours estimates from the FAA, we calculated the total fuel consumption, factoring in the average fuel burned per hour. As the FAA general aviation data contain no private jet-specific data on flight distance or fuel usage, we used the "all turbojet aircraft" category as a proxy for private jets. We assumed that global private jets had the same average fuel consumption per flight hour and annual flight hours per aircraft as reported in the FAA data. The global top-down fuel burn was calculated using the following equation:

$$TFB = RPJ \times AFC \times AHF$$

Where:

TFB is global fuel burn by private jets;

RPJ is global registered private jets;

AFC is average fuel consumed by U.S. private jets per hour; and

AHF is average hours flown per U.S.-registered private jet.

The average fuel consumed per hour, annual hours operated, and GHGs per U.S. private jet from 2013 to 2023 is shown in Table 1.

Table 1

U.S. private jet activity statistics, 2013 to 2023

Year	Average fuel consumed (kg/h)	Average hours flown per year (h)	Average GHG emissions per U.S. private jet (tonnes CO_2 equivalent)
2013	822.9	299.8	780.6
2014	886.9	313.9	880.8
2015	840.5	285.5	759.2
2016	881.4	279.7	780.0
2017	897.8	285.9	812.1
2018	960.5	314.6	956.1
2019	903.8	263.7	754.1
2020	941.4	217.8	648.8
2021	969.6	318.8	978.0
2022	974.2	324.8	1001.1
2023	930.8	279.9	824.3

Note: Table 1 assumes an energy density of 0.8 kg per L of fuel. Adapted from Federal Aviation Administration, 2023.

We then used a tank-to-wheel (TTW) CO_2-equivalent (CO_2e) emission factor to derive CO_2e emissions from the fuel burn estimates. In our top-down calculation, we used a TTW value of 3.164 kg CO_2e per kilogram fuel burn. The equation used to calculate total TTW emissions is as follows:

$$TCO_2e = TFB \times TTW$$

Where:

- TCO_2e is total carbon dioxide equivalent;
- TFB is total fuel burn by private jets; and
- TTW is tank-to-wake carbon dioxide equivalent per kilogram of fuel.

BOTTOM-UP APPROACH

Our bottom-up approach uses data from Spire, OurAirports, IBA Insight, ICAO, the Engine Emissions Databank (EEDB), and the World Bank to calculate emissions at the airport, country, and regional levels, providing insights into the distribution of private jet flights.

Dataset

Aircraft position data

Spire's ADS-B database was our primary data source for identifying private jet flights by airport and calculating flight distances for our bottom-up analysis. The dataset includes 1-minute interval trajectory data for global flights from January to December 2023 (Spire Aviation, 2023). The data include details on flight departure and arrival time, departure and arrival airports, aircraft type, plane registration, and flight role (commercial, private, etc.).

For this study, we filtered Spire's data for private jets to estimate air pollution based on flight distance, analyzing impacts at the airport and country levels. Aircraft were identified based on the 24-bit ICAO address of the ADS-B transponder, a unique identifier assigned to each aircraft. This information is available for all flights in the

Spire dataset, though the information is inconsistent over time for some aircraft. To harmonize aircraft characteristics, we selected the most common value of each attribute for the same aircraft based on the number of flights. Table 2 shows the shares of valid, invalid, and missing values in the raw data, as well as the share of values we arrived at by using the statistical mode (i.e., the value that appears most frequently in a dataset) per aircraft.

We singled out private jets based on two aircraft attributes. First, we identified specific aircraft types that are designated as private jets in Spire's dataset. Examples include the Embraer EMB 505 Phenom 300 and the Cessna 680A Citation Latitude, which are commonly operated for private or business travel rather than commercial airline services. Aircraft model information was available for 96% of flights in the Spire dataset; a full list of aircraft models we classified as private jets is presented in Appendix D. Second, we identified all aircraft whose role was listed by Spire as "VIP," which denotes private jets as well as commercial aircraft configured for private use (such as Boeing Business Jet and Airbus Corporate Jet aircraft, which are often designated with BBJ or ACJ in their type name). [3] Aircraft role information was available for 56.6% of flights in the Spire dataset.

Table 2

Share of all flights and private jet flights with valid, invalid, or missing values per attribute in the raw 2023 Spire data

Attribute	All flights				Private jet flights			
	Valid	Invalid	Missing	Mode	Valid	Invalid	Missing	Mode
Aircraft type	92.2%	0.1%	7.7%	96.1%	100.0%	0.0%	0.0%	100%
Aircraft role	56.4%	0.0%	43.6%	56.6%	3.4%	0.0%	96.6%	4.3%
Tail number	95.9%	0.6%	3.5%	95.9%	99.3%	0.6%	0.0%	99.3%
Departure airport	91.9%	0.1%	8.1%	—	92.7%	0.2%	7.1%	—
Arrival airport	90.2%	0.1%	9.6%	—	93.5%	0.4%	6.1%	—
Takeoff time	86.7%	0.0%	13.3%	—	90.5%	0.0%	9.5%	—
Landing time	89.1%	0.0%	10.9%	—	95.9%	0.0%	4.1%	—

Note: The Mode column shows the percentage of flights that use the most common value for that attribute for each aircraft (tail number). This reflects how consistently a given value (e.g., aircraft type or role) appears across all flights for the same aircraft.

In total, we identified approximately 3.57 million private jet flights conducted globally in 2023. Of these, 3.49 million (97.8%) were identified based on the aircraft type, roughly 100,000 based on a combination of aircraft type and role, and about 50,000 based on aircraft role.

In the Spire database, approximately 11.7% of private jet flights had incomplete departure or arrival information (Table 3). For these flights, we used the average distance of all flights with complete departure and arrival airport data (1,164 km) to ensure that every flight in the database was taken into account. As we used the departure airport as the reference point for our flight distance calculation, flights with a known departure airport but without a known arrival airport were included in our country- and airport-level analysis using this average flight distance. Flights without departure airport data were excluded from the country- and airport-level analysis but included in the global results.

3 Because the "VIP" value was available only for flights beginning in September 2023, we reclassified all aircraft that were labelled "VIP" after that time as private jets throughout the entire year based on aircraft tail number.

Table 3
Spire data quality and coverage

Status	Median ground time (h)	Flight share
Continuous flight with complete arrival and departure	10.1	79.6%
Incomplete arrival/departure airport	20.9	11.7%
Incomplete routes	22.2	8.7%

We also identified flights with non-continuous routes, using aircraft tail numbers to determine whether a given aircraft departed from the same airport it flew into on the preceding flight. Approximately 8.7% of flights did not depart from the preceding arrival airport. These non-continuous flights had a median ground time twice as long as that of continuous flights. Similarly, flights with incomplete departure or arrival information exhibited double the median ground time. These findings suggest that up to 8.7% of private jet flights may be entirely or partially missing from the ADS-B data and underscore the need for both a top-down and bottom-up approach to account for data gaps and better understand yearly trends.

We used Spire data to calculate the flight time between two airports. Understanding private jet flight time is crucial for evaluating the efficiency that most users gain by flying private compared with taking other modes of transportation. We used the trajectory observation time to account for idling (i.e., taxi) time. The flight time of each flight is calculated as below:

$$T_i = TOE_i - TOS_i$$

Where:

T_i is total flight time for flight i;

TOE_i is flight trajectory observation end in Spire database for flight i; and

TOS_i is flight trajectory observation start in Spire database for flight i.

Airport location data

To calculate actual distances between airports, we used arrival and departure airport coordinates from the OurAirports (2024) database. We merged these data with the departure and arrival airport ICAO codes provided for each flight in the Spire data. The flight distance was then calculated using the Great Circle Distance (GCD) formula (Roy, 2022), which determines the shortest path between two points on a spherical surface, effectively representing the ideal flight distance between airports. We also applied a correction factor based on actual flight trajectories from the Spire dataset to ensure the distances reflected realistic flight paths (see "Bottom-Up Fuel Consumption and GHG Emissions" below).

Aircraft registration data

Aircraft tail numbers from the Spire dataset were cross-referenced with an aircraft fleet database from IBA Insight (2024) to identify corresponding engine configurations. For aircraft lacking direct matches in the IBA database, we assigned representative engines based on the most frequently occurring engine type within the same aircraft model category.

Engine Emission Databank

We used the engine configuration data to estimate emissions using the European Union Aviation Safety Agency's EEDB, which provides emissions information on

different engines based on the aircraft type. The EEDB served as our primary source for engine-specific emissions data, including for nitrogen oxides (NO_x) and non-volatile Particulate Matter (nvPM; ICAO, 2024). For consistency, we used the most recent test results available for each engine model in our calculations. In cases where nvPM data were unavailable, we employed smoke numbers (SNs) for estimation, applying ICAO-recommended Smoke Factor (SF) values to predict missing data points following the methodology outlined in the *Airport Air Quality Manual* (ICAO, 2020), as shown in Table 4.

Table 4

SF values used to predict missing SNs in the ICAO EEDB

Engine category	Take-off	Climb-out	Approach	Idle
Most non-DAC engines	1.0	0.9	0.3	0.3
GE CF34 engines	1.0	0.4	0.3	0.3
CFM DAC engines	0.3	0.3	0.3	1.0

Note. Values are derived from the International Civil Aviation Organization, 2020. After populating the missing SN values, we calculated the emission index value using the SCOPE11 method (Ahrens et al., 2023). More detail on the SCOPE11 method is provided in Appendix B. We then used the emission index and emission value to calculate the Landing and Take-Off (LTO) cycle emissions of each flight (see "Bottom-Up Air Pollution Estimation").

World population data

To calculate private jet flights in each country on a per capita basis, we used World Bank population estimates (World Bank Group, 2024) together with Spire data on the number of private jet flights departing each country. We calculated per capita flights as follows:

$$FPC_j = \frac{\sum PJF_j}{P_j}$$

Where:

FPC_j is flights per capita in country j;

PJF_j is the number of private jet flights departing from airports in country j in 2023; and

P_j is the population of country j in 2023.

In addition to analyzing per capita private jet flights, we identified the top countries of origin for private jets traveling to destinations with the highest per capita flight activity.

Small Emitters Tool

Flight fuel consumption and associated CO_2 emissions were calculated using Eurocontrol's Small Emitters Tool, which determines full flight fuel burn based on flight distance and aircraft type. For precise aircraft-specific modeling, specific ICAO aircraft type designators were applied to each flight. The European Commission uses the Small Emitters Tool for EU ETS annual compliance reporting, specifically for aircraft operators emitting less than 25,000 tonnes of CO_2 per year (European Commission, 2023a). While the standard methodology includes a 95-km adjustment, we developed a custom distance correction factor, detailed in the next section, to more accurately represent the unique flight patterns of private jets.

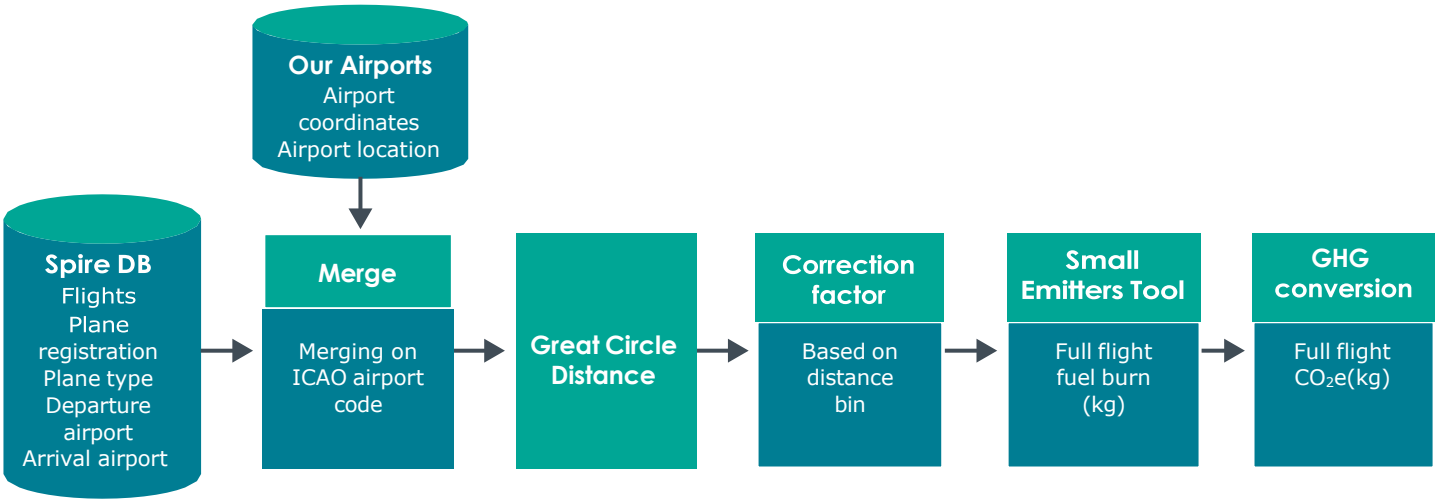
Bottom-up fuel consumption and GHG emissions

With our bottom-up analysis, we calculated fuel consumption and CO_2 emissions based on the aircraft type and distance flown. Figure 1 illustrates the methodology

of this approach. The distance flown was derived using departure and arrival airport information from Spire. This distance, along with the aircraft type information, was input into the Small Emitters Tool to estimate the full flight fuel burn. We then used the TTW conversion factor to calculate the full flight CO_2e. For the country- and airport-level analysis, we used Spire data on departure and arrival airport locations to identify the route of each flight.

Figure 1

Bottom-up modeling of fuel burn and CO_2 emissions



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We calculated the GCD between origin and destination points using the Haversine formula, which accounts for Earth's spherical geometry (Sinnott, 1984).

$$GCD = 2 \times R \times \arcsin\left(\sqrt{\sin^2\left(\frac{lat_2 - lat_1}{2}\right) + \cos(lat_1) \times \cos(lat_2) \times \sin^2\left(\frac{lon_2 - lon_1}{2}\right)}\right)$$

Where:

GCD	is the great circle distance in kilometers;
R	is the mean radius of Earth (6371.0088 km);
lat_1 and lon_1	are the latitude and longitude of the first point (in radians); and
lat_2 and lon_2	are the latitude and longitude of the second point (in radians).

To reflect more realistic flight paths, we used the trajectory data available from Spire and the GCD to derive correction factors. After missing trajectory sections were linearly interpolated and resampled to 1-min intervals, the real-world ground distance flown was calculated as the sum of distances between each waypoint for each flight. This approach establishes a standardized method to handle incomplete trajectory data and ensures consistency in calculating distances across all flights. While direct distance calculations from ADS-B data could be more precise, they are often subject to data gaps, noise, and irregular update intervals, which can introduce inconsistencies. By aggregating correction factors into distance bins, we mitigated these issues and provided an adjustment for emissions modeling. Correction factors were aggregated to distance bins as follows:

$$corr_i = \frac{\sum_i TD}{\sum_i GCD}$$

Where:

$corr_i$ is the distance correction factor in distance bins i;

TD is the trajectory ground distance of all flights in distance bins i; and

GCD is the GCD of all flights in distance bins i.

To enable a comprehensive analysis, we established five distance-based flight categories. Regional flights encompass distances below 500 km, while short-haul flights range from 500 to 1,499 km. Medium-haul flights cover distances between 1,500 and 4,000 km, and long-haul flights are from 4,001 to 10,000 km. Finally, ultra-long-haul flights are classified as those exceeding 10,000 km. The correction factor varied by distance bin, as shown in Table 5. For ultra-long-haul flights, a correction factor of 1 was applied because, at such distances, the deviation caused by the Earth's oblate shape becomes negligible, and GCD calculations are highly accurate.

Table 5

Distance correction factor by distance bin

Distance bin	Stage length	Correction factor
Regional	< 500 km	1.219
Short-haul	500–1,499 km	1.076
Medium-haul	1500–4,000 km	1.044
Long-haul	4,001–10,000 km	1.043
Ultra-long-haul	> 10,000 km	1

The GCD was thus adjusted by multiplying it with the correction factor to yield the corrected GCD. To correct abnormalities in flight distance—specifically, several flights by small private jets with fewer than 19 passengers—we identified flights exceeding 12,000 km as outliers and applied the average flight distance in these cases.

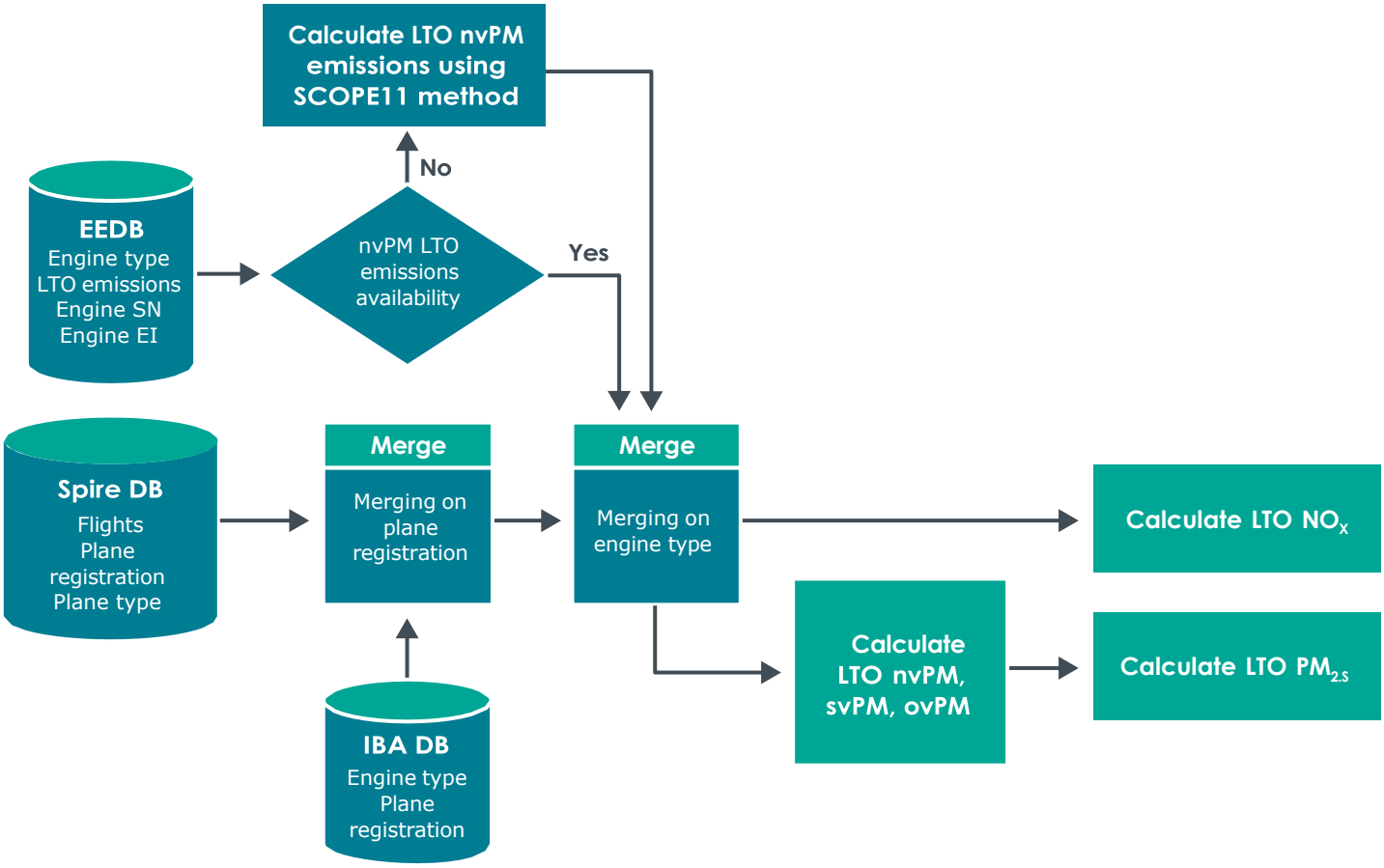
To validate our bottom-up methodology for fuel consumption and emissions calculations, we compared our results for all commercial flights with FAA-reported figures and found a 5% underestimate, demonstrating that the Small Emitters Tool provides a sufficiently accurate basis for our calculations. The CO_2 consumption calculation using the Small Emitters Tool was also compared with the Conklin and de Decker CO_2 calculator, as shown in Appendix A. We compared the values using the average private jet flight distance and found an average difference of 8%, with the highest deviation at 18% and the lowest at -3% among the top 10 most-used aircraft in 2023.

Bottom-up air pollution estimation

In our NO_x and $PM_{2.5}$ calculations, we focused exclusively on LTO emissions as estimated via engine certification standards established by ICAO. The LTO cycle comprises four modes of operation: takeoff, climb, approach, and idle/taxi. Emission quantities are based on test points in each operating mode that approximate thrust conditions. To simplify our modeling, we assigned all emissions from a single operation to the departing airport, assuming that approach and taxi-in emissions at the arrival airport are mirrored on the return flight.

Figure 2 illustrates the methodology we used to model NO_x and $PM_{2.5}$ LTO emissions. The primary data sources were Spire, IBA, and EEDB. There is a slight difference in the methods used to calculate NO_x and $PM_{2.5}$ due to limited $PM_{2.5}$ data for engines in the EEDB database. To address this limitation, we applied the SCOPE11 method to approximate the emission index for $PM_{2.5}$ based on SN values from the NO_x data (Appendix C).

Figure 2
Modeling NO_x and $PM_{2.5}$ LTO emissions



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Estimating NO_x LTO emissions

Private jet engines emit NO_x during high-temperature combustion, in which temperatures often exceed 1600 °C (2912 °F; Prashanth et al., 2021). At these temperatures, nitrogen in the air reacts with oxygen to form nitric oxide (NO) and nitrogen dioxide (NO_2), collectively known as thermal NO_x. The quantity of emissions is influenced by engine design and operational conditions, with high-thrust operations producing considerable output (Stettler et al., 2011). In the atmosphere, NO_x reacts with volatile organic compounds (VOCs) to create ground-level ozone (a smog component linked to respiratory issues) and contributes to fine $PM_{2.5}$, posing significant health risks near airports (Lee et al., 2010). At higher altitudes, NO_x affects global warming by influencing atmospheric chemistry, specifically its role in the short-term production of ozone (O_3) and the destruction of methane (CH_4; Fuglestvedt, 1999).

We used the EEDB to calculate LTO cycle NO_x emissions per engine, which we multiplied by the number of engines on each aircraft. Emissions were then aggregated to the airport level.

Estimating LTO $PM_{2.5}$ emissions

$PM_{2.5}$ emissions are a significant environmental and health concern associated with private jet operations. These fine particles, smaller than 2.5 micrometers in aerodynamic diameter, are primarily emitted during the LTO cycle, particularly at lower altitudes where incomplete combustion occurs (Stettler et al., 2011). $PM_{2.5}$ comprises non-volatile particulate matter (nvPM) formed from soot and trace metal impurities

in jet fuel, along with secondary particles produced through atmospheric reactions involving sulfur oxides (SO_x) and NO_x (ICAO, 2019). Near airports, $PM_{2.5}$ exposure has been linked to severe respiratory and cardiovascular health issues (World Health Organization, 2021). Moreover, $PM_{2.5}$ has broader environmental implications, as fine particles can alter cloud microphysics, influencing regional precipitation patterns and contributing to radiation forcing (Righi et al., 2013).

We quantified $PM_{2.5}$ emissions using the EEDB, which provides engine-specific data based on aircraft type and operational profiles (International Civil Aviation Organization, 2024). To calculate final $PM_{2.5}$ values, we added the total nvPM to two kinds of volatile PM—the first derived from fuel sulfur (svPM) and the second from unburned hydrocarbons (ovPM)—per the ICAO (2020) *Air Quality Manual*. For engines listed in the nvPM emission database, the emission calculation follows the same equation as for NO_x (see "Estimating NO_x LTO emissions").

As noted above, for engines without nvPM data in the EEDB, we estimated the emissions index using the SCOPE11 method (Agarwal et al., 2019), where fuel used in each mode is the product of the time in that mode and the fuel flow (kg/s) in that mode. The time in mode (TIM) assumptions for each of the four components of the LTO cycle can be found in the Environmental Protection Agency's (1992) *Procedures for Emission Inventory Preparation:*

$$\textit{fuel in mode}\ [kg] = \textit{fuel flow}\ [kg/s] \times \textit{TIM}[min] \times 60\ [\text{s/min}]$$

Table 6 shows the TIM assumptions used in this analysis.

Table 6

Time in mode assumed for air pollution modeling

Mode	TIM (min)
Take-off	0.4
Climb	0.5
Approach	1.6
Idle/taxi	13

Note. Values are derived from Environmental Protection Agency, 1992.

Aircraft engines produce svPM emissions when fuel containing sulfur is combusted. The level of emissions is directly proportional to the sulfur content of jet fuel. ICAO's *Airport Air Quality Manual* (2020, §3.8) suggests a conversion efficiency of 0.024 (m/m) of sulfur to vPM and sulfur content of 680 parts per million (ppm); 0.068%. Accordingly:

$$\textit{LTO svPM}\ [mg] = 0.024 \times 0.068\% \times \textit{LTO fuel}\ [kg] \times 1{,}000{,}000\ [\text{mg/kg}] \times \text{NE}$$

Where:

LTO svPM is total svPM emissions during the LTO cycle;
LTO fuel is total fuel during the LTO cycle; and
NE is the number of engines on the aircraft.

Engines produce ovPM emissions when unburnt hydrocarbons from the fuel adsorb onto a fine particle, adding to its mass. These emissions are largely untested across EEDB engines, so we followed ICAO's method to calculate them by using the CFM56-

2-C1 turbofan aircraft engine as a reference (see ICAO, 2020, §3). The ovPM emissions were assumed to be directly proportional to LTO fuel for all engines in the EEDB:

$$LTO\ ovPM\ [mg] = (4.6 \times TO\ fuel\ [kg] + 3.8 \times CO\ fuel\ [kg] + 4.5 \times App\ fuel\ [kg] + 11.3 \times Idle\ fuel\ [kg] \times NE$$

Where:

LTO ovPM is total ovPM emissions during the LTO cycle;

TO fuel is fuel burn during takeoff, in kilograms;

CO fuel is fuel burn during climb out, in kilograms;

App fuel is fuel burn during approach, in kilograms;

Idle fuel is fuel burn during idle/taxi, in kilograms; and

NE is number of engines on the aircraft.

The equation to calculate the final $PM_{2.5}$ value is as follow:

$$PM_{2.5}\ [g] = nvPM\ [g] + svPM\ [g] + ovPM\ [g]$$

Where:

nvPM is non-volatile particulate matter;

svPM is sulfate particulate matter; and

ovPM is organic particulate matter.

RESULTS

PRIVATE JET FLIGHTS

Based on 2023 Spire data, our bottom-up analysis identified 22,749 private jets by unique tail number that operated over 3.57 million flights. In terms of global flights in 2023, Table 7 shows the top 10 private jet models seating 19 or fewer passengers (left) and the top 10 models with more than 19 seats converted from commercial types (right).

Table 7

Top 10 aircraft models based on number of seats and number of flights in 2023

19 or fewer seats			More than 19 seats		
Rank	Aircraft model	Number of flights	Rank	Aircraft model	Number of flights
1	Embraer EMB 505 Phenom 300	238,141	1	Boeing 737-700 (BBJ)	11,757
2	Cessna 680A Citation Latitude	167,513	2	Airbus ACJ319-100	9,579
3	Bombardier BD-100-1A10 Challenger 350	145,221	3	Boeing 757-200 (BBJ)	5,743
4	Cessna 560XL Citation XLS	99,139	4	Embraer Lineage 1000	4,708
5	Bombardier BD-100-1A10 Challenger 300	89,030	5	Airbus ACJ320-200	4,294
6	Cessna 525B CitationJet CJ3	76,307	6	Airbus A320-200	2,592
7	Cessna 560XL Citation XLS+	74,962	7	Airbus A321-200NX(LR)	2,309
8	Bombardier Learjet 45	73,202	8	Boeing 737-800(BBJ)	2,228
9	Cessna 560XL Citation Excel	69,703	9	Airbus ACJ318-100	2,164
10	Cessna 680 Citation Sovereign	67,574	10	Airbus A319-100	1,822

Table 7 highlights the dominance of private jets with 19 or fewer seats compared with those with more than 19 seats. In total, private jet models seating 19 or fewer passengers accounted for 97% of all flights. Among these smaller jets, the Embraer EMB 505 Phenom 300 topped the list with 238,141 flights, followed by the Cessna 680A Citation Latitude and Bombardier BD-100-1A10 Challenger 350. Meanwhile, among private jets with more than 19 seats, the Boeing 737-700 Business Jet led with 11,757 flights, along with models from Airbus and Embraer. These larger jets may be favored in some instances for their extended range and larger seating capacity.

The bottom-up analysis data revealed a significant geographical concentration in the United States. Figure 3 shows the top 10 countries in terms of total private jet flights in 2023. An estimated 2.3 million flights departed U.S. airports in 2023, representing almost two-thirds (64.6%) of all global private jet flights. France and the United Kingdom, the second and third most active countries, recorded 80,169 and 73,626 flights, respectively. These figures represented just 2.3% and 2.1% of the global total, highlighting the disparity in private jet activity between the United States and other countries. Canada logged 73,536 flights (2.1% of global activity), while Germany, Italy, Brazil, Mexico, Spain, and Switzerland each contributed less than 2% of global flights.

Figure 3

Share of private jet flights globally for the top 10 countries and regions

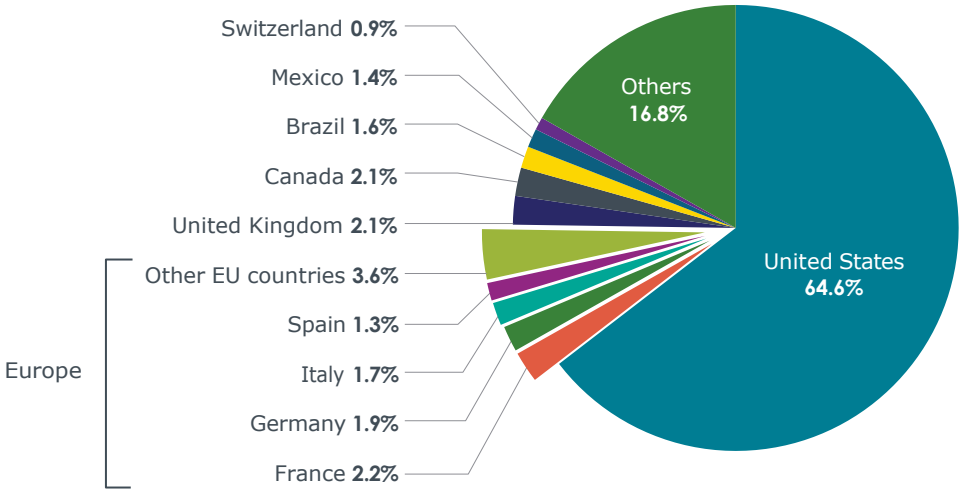

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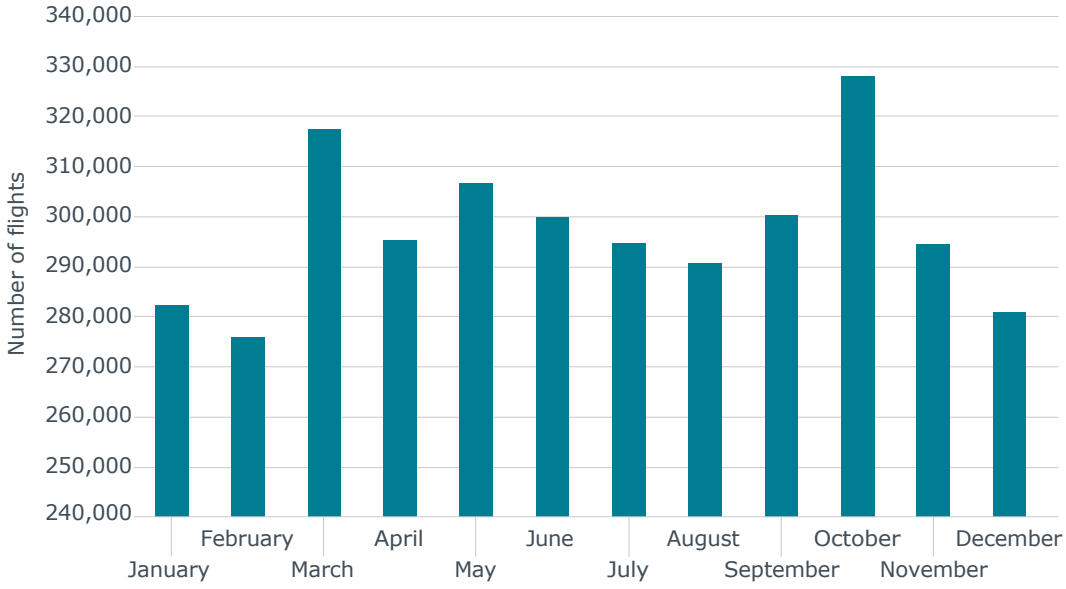
Figure 4 shows global private jet flights in 2023 by month. Activity was relatively stable, averaging 297,150 flights per month. Flights peaked in October (327,955) and March (317,403); the United States played a major role in both surges, accounting for month-over-month increases of 14.2% (25,983 additional flights) in October and 15.6% (29,153 additional flights) in March. The lowest activity levels were observed in February (275,792 flights) and December (280,826 flights). This variation suggests potential seasonal factors influencing private jet operations, such as holidays, fiscal year-end activities, or global events that affect aviation demand.

Figure 4

Global private jet flights by month, 2023



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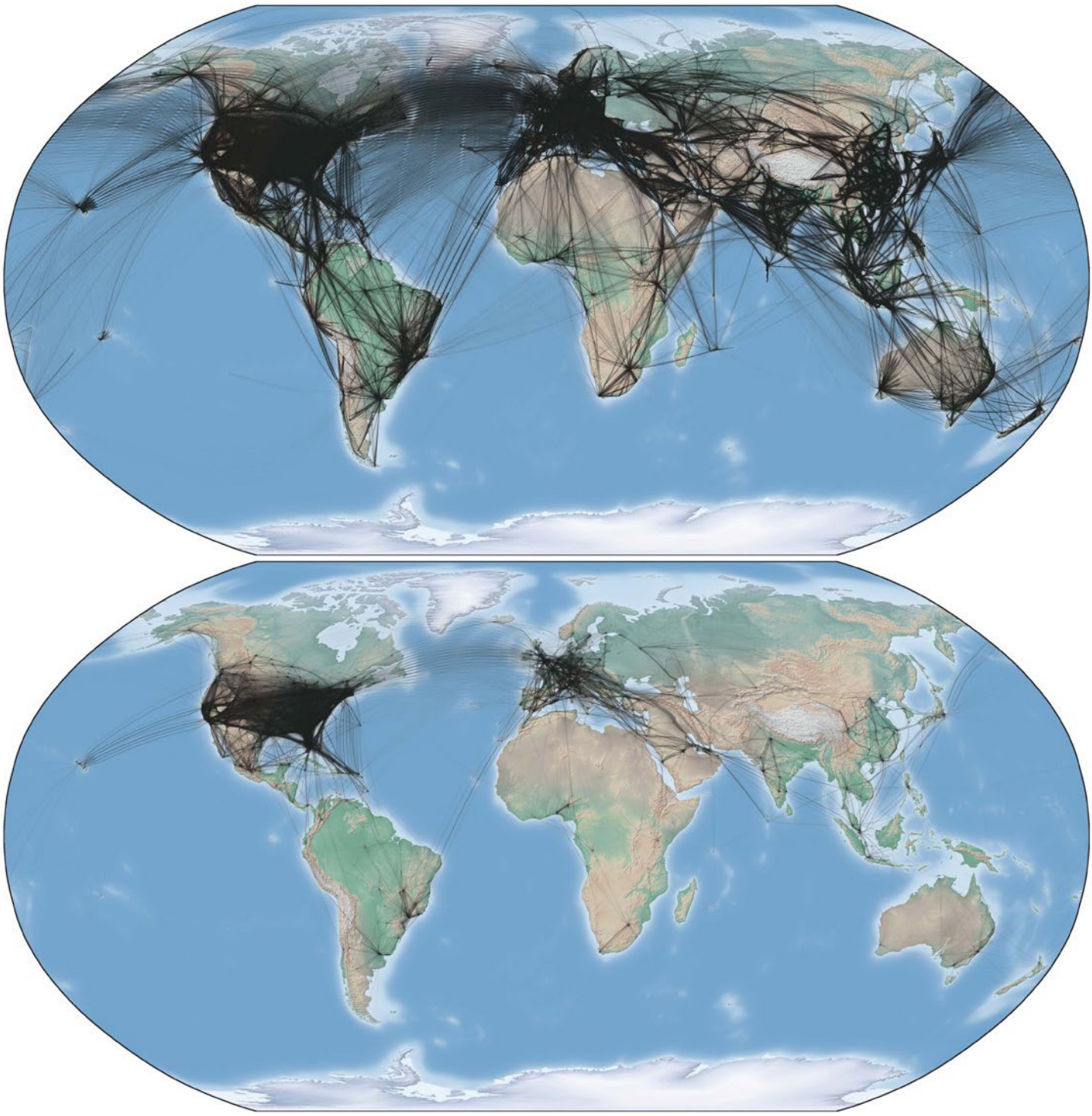
As shown in Figure 5, most private jet flights were concentrated in North America and Europe, while commercial flights were more evenly distributed across continents. This distinction highlights the differing roles of these aviation sectors, with private jets primarily serving niche markets, and underscores the distinct environmental impacts and policy considerations required for each sector.

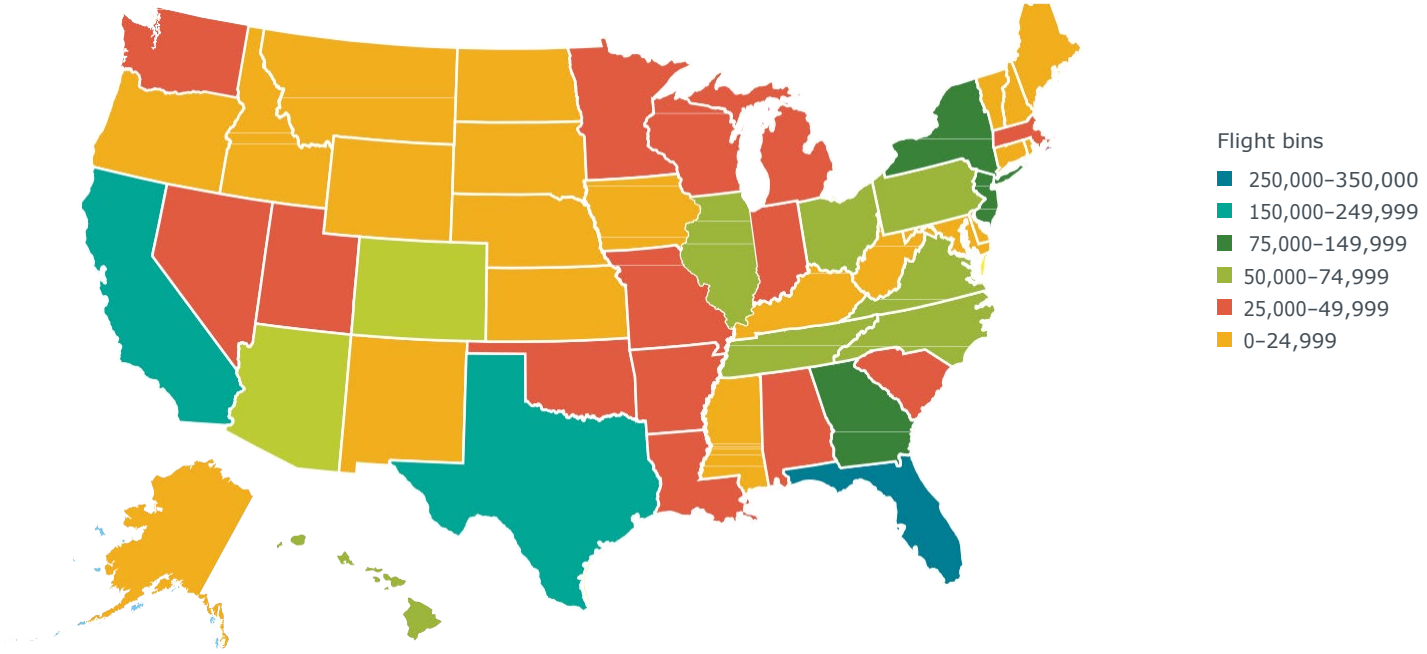
Figure 5
Trajectories of global commercial flights (top) and private jet flights (bottom), 2023



United States

Within the United States, private jet activity is concentrated in highly populated states (Figure 6). Florida leads among the states for private jet departures with 313,672 flights, accounting for 13.7% of the U.S. total. Texas and California follow, with 10.0% and 9.55% of U.S. flights, respectively. These three states also rank first (California), second (Florida; tied with New York), and fourth (Texas) in the number of residents on the Forbes 400, an annual list of the wealthiest people in the United States (Hunter-Hart, 2024). Other notable contributors include New Jersey (4.29%) and Georgia (3.66%).

Figure 6
U.S. private jets flights by state, 2023



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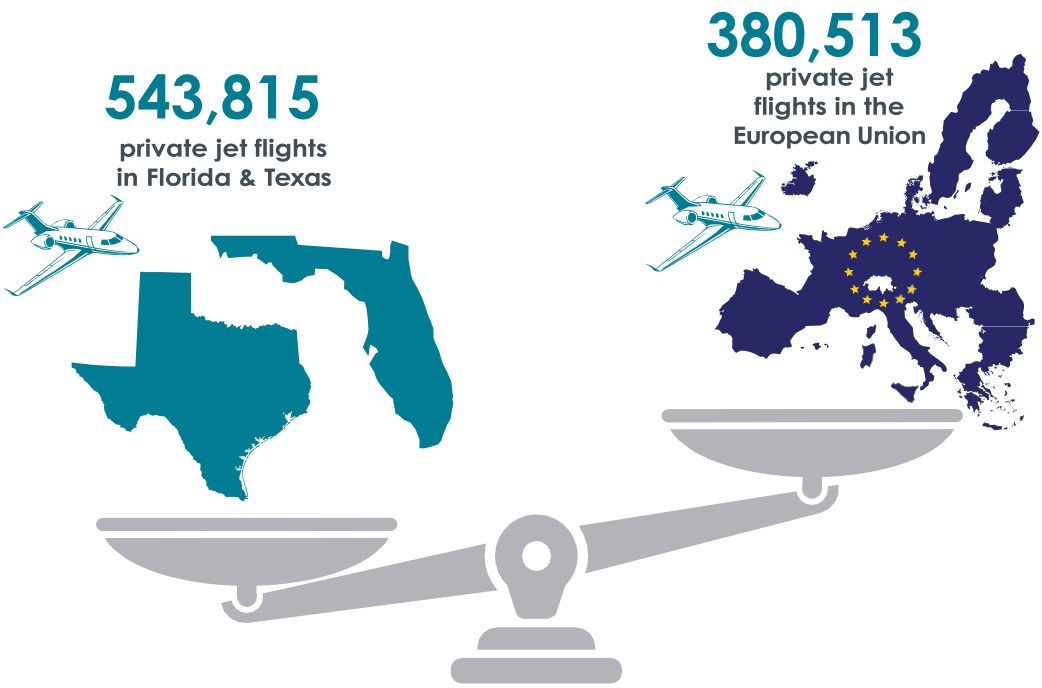
European Union

The European Union recorded 380,513 private jet flights in 2023, of which 71.1% were domestic or intra-EU flights. This number of flights was lower than the combined total for just the U.S. states of Florida and Texas (Figure 7). Most international private jet flights departing from EU countries were destined for the United Kingdom (35,889 flights), Switzerland (22,437 flights), and the United States (8,052 flights).

Figure 7
Private jet flights in the European Union compared with Florida and Texas



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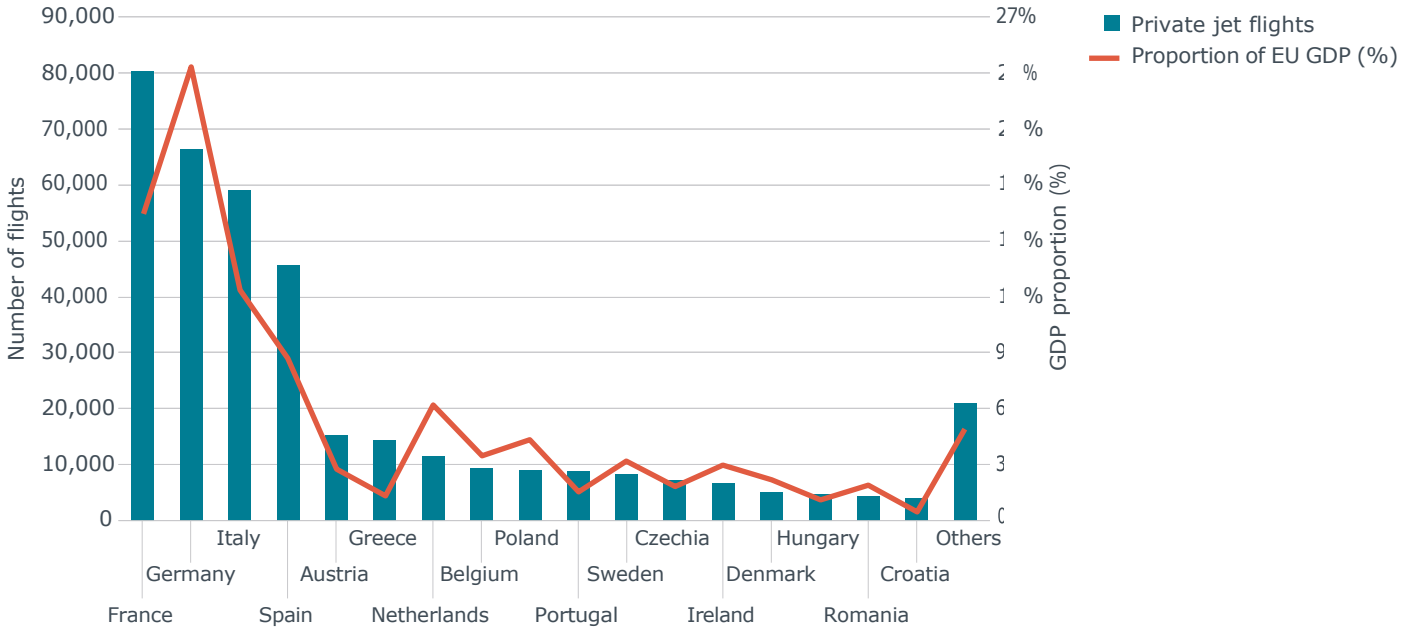
As shown in Figure 8, France led the European Union in private jet activity in 2023 with 80,169 flights, representing 21.1% of the EU total. Germany and Italy followed with 66,337 flights (17.4%) and 58,933 flights (15.5%), respectively, reflecting their roles as key business and travel hubs. Spain accounted for 45,595 flights (12.0%), driven by both business and tourism demand, while Austria, a tourism hotspot, ranked fifth with 15,185 flights (4.0%). Smaller EU countries like Greece (14,332 flights, 3.8%), the Netherlands (11,373 flights, 3.0%), and Belgium (9,416 flights, 2.5%) showed lower activity levels, primarily driven by regional travel.

Figure 8

Private jets flights by EU country, 2023



Comparing GDP in 2023 to private jet activity shows a correlation between economic size and flight volume. This suggests that private travel patterns generally align closely with economic performance. However, there are notable exceptions to this trend. For example, France, which accounted for 16.4% of the European Union's GDP, had more private jet flights than Germany, which accounted for 24.3%. This difference is likely attributable to international tourism rather than corporate travel trends: France ranked first globally in international tourist arrivals in 2023 (United Nations Tourism, 2024). A similar trend is observed between Austria and Greece, which rank fifth and sixth in private jet activity, despite being 10th and 16th in GDP, respectively.

Flights per capita

The 10 countries with the most outgoing private jet flights per capita in 2023 were predominantly located in the Caribbean and Atlantic Islands, as shown in Table 8. Gibraltar was the exception. By comparison, the three countries with the most private jet flights in 2023 had 687 (the United States), 107 (France), and 117 (the United Kingdom) flights per 10,000 people.

Table 8

Top 10 countries with the most private jet flights per capita

Rank	Country Name	Flights per 10,000 population	Most common origin country
1	Turks and Caicos Islands	9,361	United States
2	Sint Maarten	7,642	
3	The Bahamas	4,626	
4	Cayman Islands	3,979	
5	Bermuda	3,247	
6	British Virgin Islands	2,260	
7	Virgin Islands	1,290	
8	Gibraltar	1,245	Spain
9	Antigua and Barbuda	1,214	United States
10	St. Kitts and Nevis	902	

The top 10 countries in terms of private jet flights per capita were characterized by small populations and strong appeal as tourist destinations for luxury travelers from the United States and, in the case of Gibraltar, from Spain. These islands appeal to affluent travelers drawn to exclusive resorts, private villas, and natural beauty and who prefer private aviation for its flexibility and convenience, particularly in the wake of the COVID-19 pandemic (Gollan, 2021). Moreover, some travel agents market private jet services for island-hopping in the Caribbean (Haute Jets, 2024).

Private jet distance and flight times

Our bottom-up analysis indicated that most private jet operations consisted of regional and short-haul flights. Figure 9 illustrates the number of flights categorized into 250-km distance bins (bar chart) and the cumulative percentage of flights for each distance bin (line chart). Out of all global private jet flights in 2023, 50% were shorter than 900 km, and 75% were shorter than 1,500 km. The most frequent flight distance range was between 250 and 500 km, accounting for about 600,000 flights, followed by the 500–750-km range, with about 500,000 flights. As flight distances increased, the frequency declined sharply; for example, flights over 3,000 km accounted for only 5% of the total.

Figure 9

Number and cumulative proportion of private jet flights by distance bins

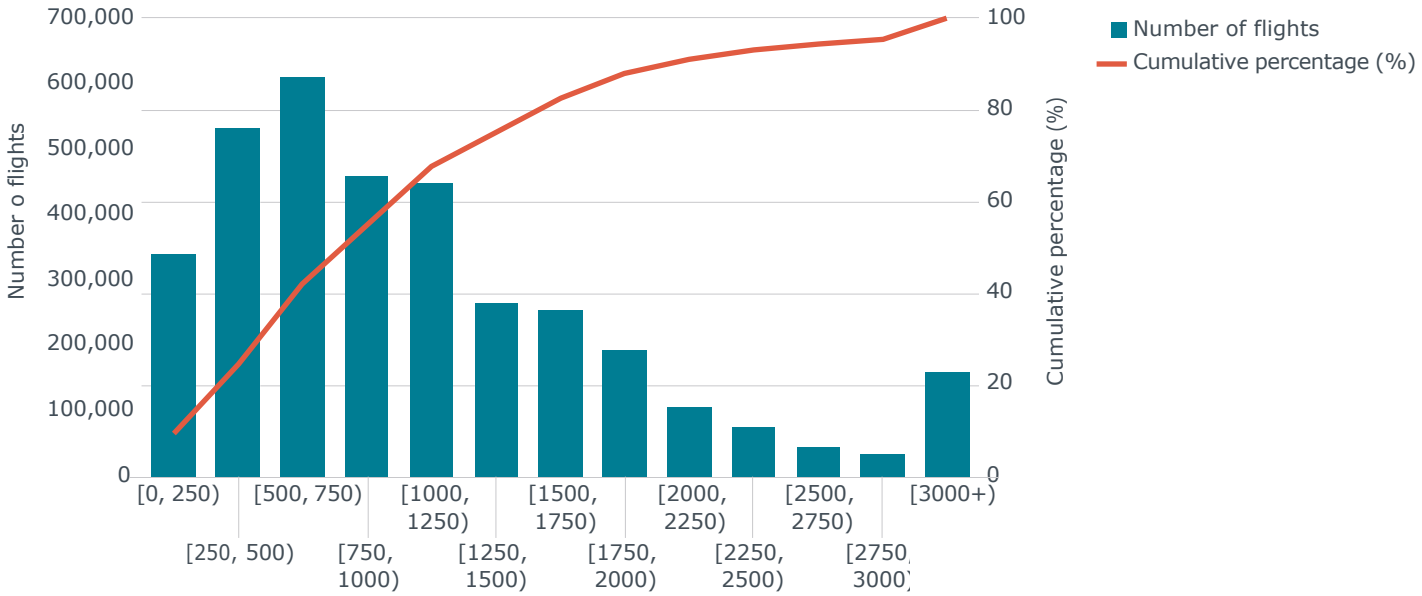


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Table 9 shows the average duration of private jet flights by distance bin. In 2023, flights under 500 km, categorized as regional flights, averaged around 48 min, while short-haul flights (between 500 and 1,499 km) lasted an average of 93 min. Long-haul (4,001–10,000 km) and ultra-long-haul (over 10,000 km) flights had average durations of 417 and 724 min, respectively. The average private jet flight duration was approximately 109 min, indicating a typical short- to-medium-haul operational range. The median duration of private jet flights was 85 min, reflecting the fact that more than half of private jet flights were regional and short haul.

Table 9

Average flight time per distance category

Distance Category	Distance bin	Average flight distance (km)	Average flight time (min)
Regional haul	< 500 km	283	48
Short haul	500–1,499 km	923	93
Medium haul	1,500–4,000 km	2,119	178
Long haul	4,001–10,000 km	5,709	417
Ultra-long haul	> 10,000 km	10,525	724
Average		**1,164**	**109**

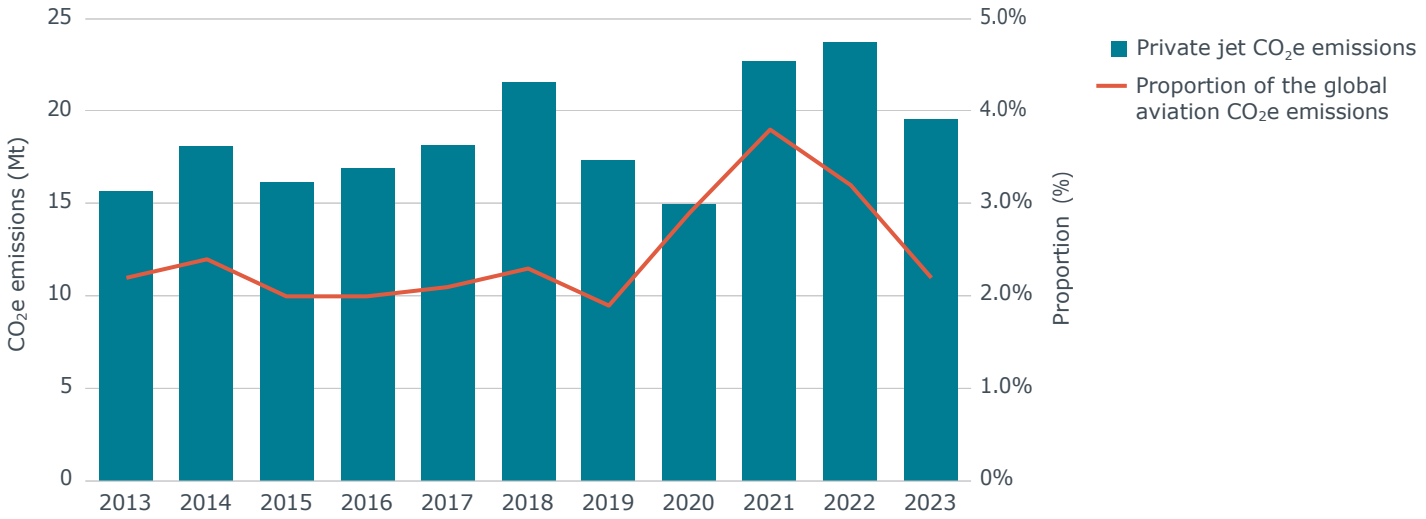
The relatively short average flight time aligns with the earlier finding that most private jet operations focus on short-haul and regional travel, underscoring that the primary benefit of private jet travel is convenience and flexibility, not speed or range. The predominance of short-haul, short-duration private jet flights provides a compelling case for exploring alternatives to private aviation, including modal shift to high-speed rail where available (Li et al., 2024) or the use of more fuel-efficient turboprop aircraft (Kilic, 2023).

GREENHOUSE GAS EMISSIONS

Top-down approach

Our results indicated an overall increasing trend in GHG emissions from private jets globally between 2013 and 2023. Figure 10 presents estimated private jet CO_2 emissions (bars) and their corresponding share of civil aviation (commercial plus private jet) emissions (line).[4] Absolute GHG emissions from private jets increased 25% over the period, from 15.65 Mt in 2013 to 19.55 Mt in 2023, with significant year-on-year volatility. At their post-COVID peak in 2022, private jets emitted an estimated 23.74 Mt CO_2e and accounted for nearly 4% of the civil aviation total.

Figure 10
Global private jet GHG emissions, 2013–2023



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Peaks in activity occurred in 2014, 2018, and 2022, with a significant decline in 2020 due to the COVID-19 pandemic. Private jets' share of civil aviation CO_2 emissions ranged between 2% and 2.5% most years but increased to nearly 4% in 2021 as private travel surged while commercial aviation remained depressed, reflecting an increased reliance on private aviation amid restrictions and health concerns related to COVID-19. Private jets' share of civil aviation emission subsequently declined to pre-pandemic levels by 2023, when travel patterns shifted amid a normalization of commercial travel for business purposes (Soderlund, 2023). This shift is reflected in the decline of private jet GHG emissions as a proportion of global aviation emissions. These trends coincided with a 8.6% drop in private jet activity (Federal Aviation Administration, 2023) compared to 2022 (Kerry Lynch, 2024).

Bottom-up analysis

Based on the bottom-up analysis, private jets emitted an estimated 18.4 Mt of CO_2e in 2023, totaling more GHGs than all flights departing from Heathrow Airport, the busiest airport in Europe (Heathrow Airport, 2024). This level of emissions translates to an average of 5.15 tonnes of CO_2e per private jet flight globally.

4 This calculation excludes emissions from military aviation, which were estimated to account for approximately 10%–15% of total aviation emissions in 2002 based on Aero2k modeling. Additionally, emissions from turboprop and piston-driven aircraft could not be calculated due to a lack of engine emissions data for these aircraft types.

The bottom-up estimate of 2023 GHG emissions is just 5.9% lower than our top-down estimate of 19.55 Mt. A potential source of error in our bottom-up analysis arises from the 7.1% of flights without a recorded departure airport, for which we applied an average flight distance of 1,164 km, accounting for 1.56 million tonnes of CO_2e. These missing data, along with additional flights not captured in the dataset, could have contributed to the gaps between our top-down and bottom-up results. For example, when applying our top-down analysis, the United States accounts for 13.6 million tonnes of CO_2e, whereas applying our bottom-up analysis results in 10.2 million tonnes.

Table 10 shows the dominance of the United States and European countries in global private jet fuel consumption based on our bottom-up analysis. According to this approach, the United States accounted for 55% of total private jet CO_2e emissions in 2023.

Table 10

Top 20 countries by private jet fuel burn and estimated GHG emissions, 2023

Rank	Country	Fuel burn (thousand tonnes)	GHGs (thousand tonnes CO_2e)	Share of total
1	United States	3,220.66	10,190.17	55.1%
2	United Kingdom	165.95	525.07	2.84%
3	France	146.83	464.58	2.51%
4	Canada	114.22	361.39	1.96%
5	Italy	94.97	300.50	1.63%
6	United Arab Emirates	87.37	276.43	1.50%
7	Spain	80.55	254.86	1.38%
8	Germany	79.96	253.00	1.37%
9	Mexico	68.67	217.28	1.18%
10	Brazil	68.49	216.70	1.17%
11	China	60.26	190.66	1.03%
12	Saudi Arabia	59.31	187.67	1.02%
13	Switzerland	54.44	172.25	0.93%
14	India	50.80	160.73	0.87%
15	Türkiye	43.54	137.76	0.75%
16	Japan	36.40	115.18	0.62%
17	Russian Federation	32.17	101.80	0.55%
18	Australia	31.97	101.15	0.55%
19	Bahamas	26.33	83.32	0.45%
20	Ireland	24.39	77.18	0.42%
	Others	1,293.76	4,011.68	22.15%
Global total		**5,841.04**	**18,399.28**	**100%**

Other top contributors of CO_2e from private jets included the United Kingdom (525.1 thousand tonnes), France (464.6 thousand tonnes), and Canada (361.4 thousand tonnes), each accounting for about 2% of the global private jet total. Private jets departing from the remaining countries in the top 10, including Italy, the United Arab Emirates, Spain, Germany, Mexico, and Brazil, collectively contributed approximately

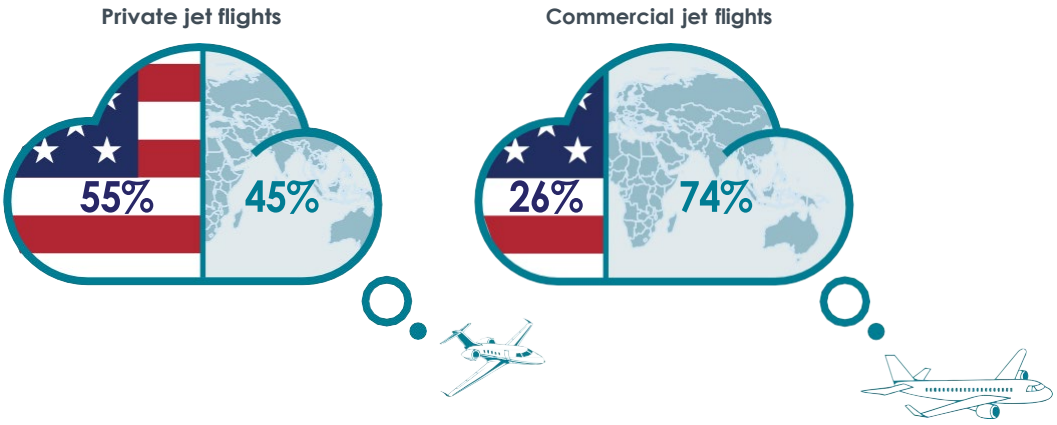
1.52 million tonnes of CO_2e. In total, the top 10 countries represented 70.7% of global private jet CO_2e emissions, and the top 20 countries represented approximately 77.8%.

United States

Figure 11 illustrates the United States' share of private jet (left) and commercial jet (right) GHG emissions in 2023. While the United States accounted for 55% of estimated private jet emissions, its share of total commercial jet emissions was lower, at 26%.[5] Private jets departing U.S. airports emitted 19 times more GHGs than the second highest emitter, the United Kingdom. These results underscore the opportunity for effective carbon mitigation by targeting high-emission countries and regions, particularly the United States.

Figure 11

GHG emissions from U.S. private and commercial jet flights versus rest of world



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Consistent with the results of the top-down methodology, Florida, California, and Texas were the top three states in terms of GHG emissions (Table 11). Flights departing from Florida (responsible for 1.42 Mt of GHGs) and California (1.24 Mt) collectively accounted for over 25% of U.S. private jet emissions. Texas (938.3 thousand tonnes, 9.1% of the total), New Jersey (686.1 thousand tonnes; 6.7%), and New York (434.5 thousand tonnes; 4.2%) rounded out the top five, collectively accounting for more than 45% of U.S. private jet emissions and 26% of global private jet greenhouse gas emissions.

5 This figure is based on Spire's 2023 database of departing airports, modeled using the Small Emitters Tool.

Table 11

Top 20 U.S. states by private jet fuel burn and GHGs, 2023

Rank	State	Fuel burn (thousand tonnes)	GHGs (thousand tonnes CO_2e)	Share of total
1	Florida	449.5	1,422.1	13.8%
2	California	392.4	1,241.5	12.1%
3	Texas	296.5	938.3	9.1%
4	New Jersey	216.8	686.1	6.7%
5	New York	137.3	434.5	4.2%
6	Colorado	112.2	355.0	3.5%
7	Georgia	97.3	307.8	3.0%
8	Illinois	94.3	298.3	2.9%
9	Arizona	83.3	263.6	2.6%
10	Virginia	82.5	261.1	2.5%
11	Nevada	79.7	252.2	2.5%
12	Massachusetts	74.8	236.6	2.3%
13	North Carolina	70.5	223.0	2.2%
14	Tennessee	69.8	220.8	2.1%
15	Ohio	68.3	216.1	2.1%
16	Pennsylvania	61.3	194.1	1.9%
17	Michigan	58.8	185.9	1.8%
18	Missouri	51.4	162.7	1.6%
19	Washington	47.2	149.2	1.5%
20	Indiana	43.3	137.0	1.3%
	Others	633.46	2,004.27	20.4%
U.S. total		**3,220.66**	**10,190.17**	**100%**

European Union

The EU-27 countries collectively accounted for 1.95 Mt (11.8%) of estimated global GHG emissions from private jets (Table 12). Consistent with the top-down results, France was the largest emitter, accounting for 23.8% of the European Union's total private jet CO_2e emissions. Italy (15.4%), Spain (13.1%), and Germany (13.0%) were other top emitters. Collectively, these four countries constituted close to two-thirds of the GHG emissions of EU-27 countries.

Table 12

Top 20 EU countries by private jet fuel burn and GHGs, 2023

Rank	Country	Fuel burn (thousand tonnes)	GHGs (thousand tonnes CO_2e)	% of total
1	France	146.83	464.57	23.8%
2	Italy	94.97	300.49	15.4%
3	Spain	80.55	254.86	13.1%
4	Germany	79.96	252.99	13.0%
5	Ireland	24.39	77.17	4.0%
6	Portugal	21.83	69.07	3.5%
7	Greece	21.53	68.12	3.5%
8	Austria	17.50	55.37	2.8%
9	Netherlands	15.65	49.52	2.5%
10	Poland	13.82	43.73	2.2%
11	Sweden	13.30	42.08	2.2%
12	Belgium	13.15	41.61	2.1%
13	Czechia	10.51	33.25	1.7%
14	Cyprus	8.89	28.13	1.4%
15	Hungary	7.97	25.22	1.3%
16	Denmark	7.53	23.82	1.2%
17	Romania	5.92	18.73	1.0%
18	Malta	5.54	17.53	0.9%
19	Croatia	4.90	15.50	0.8%
20	Slovak Republic	4.30	13.61	0.7%
	Others	16.99	53.74	2.9%
EU-27 total		**616.03**	**1,949.11**	**100%**

Other countries in the top 10, including Ireland, Portugal, and Greece, each contributed less than 5% of total emissions. Meanwhile, the seven EU countries outside of the top 20 in terms of private jet emissions—comprising smaller countries like Luxembourg, Lithuania, Latvia, Estonia, and Slovenia—collectively accounted for less than 3% of the regional total. These findings highlight the concentration of emissions in a few key countries, suggesting that targeted policies could yield large reductions in GHG emissions within the EU-27.

Emissions per aircraft

Our analysis of emissions per flight found that, within the global fleet of 22,749 registered private jets, each jet emitted an estimated 812.4 tonnes of CO_2e annually on average. This figure is equivalent to the annual GHG emissions of 177 typical passenger vehicles (U.S. Environmental Protection Agency, 2024), or nine trucks of the heaviest vehicle category, Class 8 (U.S. Department of Energy, 2021).

AIRPORT FLIGHT INTENSITY AND POLLUTION

The United States has a commanding share of the top airports in terms of private jet flights, with 18 of the top 20. As shown in Table 13, Teterboro Airport in the U.S. state of New Jersey led with 69,932 flights, followed by Florida's Palm Beach International Airport (39,927) and Texas' Dallas Love Field (34,438). These three airports accounted for 4.0% of all global private jet flights.

Table 13

Top 20 airports by private jet flights and estimated LTO NO_x and $PM_{2.5}$ emissions, 2023

Rank	Airport Name	Country	Flights	NO_x (tonnes)	$PM_{2.5}$ (tonnes)
1	Teterboro Airport	United States	69,932	478.73	4.88
2	Palm Beach International Airport		39,927	250.74	2.38
3	Dallas Love Field Airport		34,438	198.21	2.05
4	Van Nuys Airport		30,778	210.32	2.28
5	Harry Reid International Airport		30,338	202.80	1.93
6	Westchester County Airport		29,298	198.92	2.06
7	Washington Dulles International Airport		27,419	177.39	1.74
8	Miami-Opa Locka Executive Airport		26,636	183.11	1.72
9	Scottsdale Airport		25,335	142.70	1.46
10	William P Hobby Airport		24,447	148.47	1.31
11	Paris-Le Bourget Airport	France	22,837	128.99	1.46
12	Naples Municipal Airport	United States	22,049	131.71	1.15
13	DeKalb Peachtree Airport		21,215	126.42	1.08
14	Chicago Midway International Airport		20,575	124.38	1.12
15	Centennial Airport		20,474	123.77	1.12
16	John Wayne Orange County International Airport		20,172	128.61	1.20
17	Austin Bergstrom International Airport		18,858	113.44	1.04
18	Nashville International Airport		18,660	125.34	0.97
19	Laurence G Hanscom Field Airport		18,204	115.97	1.12
20	Nice-Côte d'Azur Airport	France	16,768	100.25	1.16

Van Nuys Airport, which ranked fourth in terms of private jet flights, has become a "super-hub" post-pandemic for private jet travelers from Hollywood (Stern, 2023). Private jet activity has also increased at other airports. Westchester County Airport, for example, has become a preferred hub for hedge fund managers (Zucker, 2020), reflecting the close relationship between the finance industry and private jet usage and emissions.

The only two non-U.S. airports in the top 20 are both in France: Paris-Le Bourget Airport (ranked 11th, with 22,837 flights) and Nice-Côte d'Azur Airport (ranked 20th, with 16,768 flights). Paris-Le Bourget Airport is recognized as Europe's leading business aviation hub, commonly used for corporate travel and luxury tourism (Groupe ADP, n.d.). Nice-Côte d'Azur functions as the main entry point to the French Riviera, a renowned destination for luxury tourism and affluent travelers (Smith, n.d.).

Nearby communities have complained about noise and air pollution from several of these airports. For instance, residents living near Teterboro Airport have filed complaints with the FAA and the Port Authority, citing noise and pollution caused by aircraft operations (DiTommaso, 2024). Similarly, concerns about heightened noise pollution and air quality Van Nuys have increased due to private jet traffic (Eng, 2023). Residents frequently report disturbances from low-flying jets and health symptoms linked to elevated emissions. These challenges underscore opportunities for stricter regulation of private jet operations and policy measures, such as emissions or fuel taxes to address the impact of these jets.

NO_x and $PM_{2.5}$ emissions

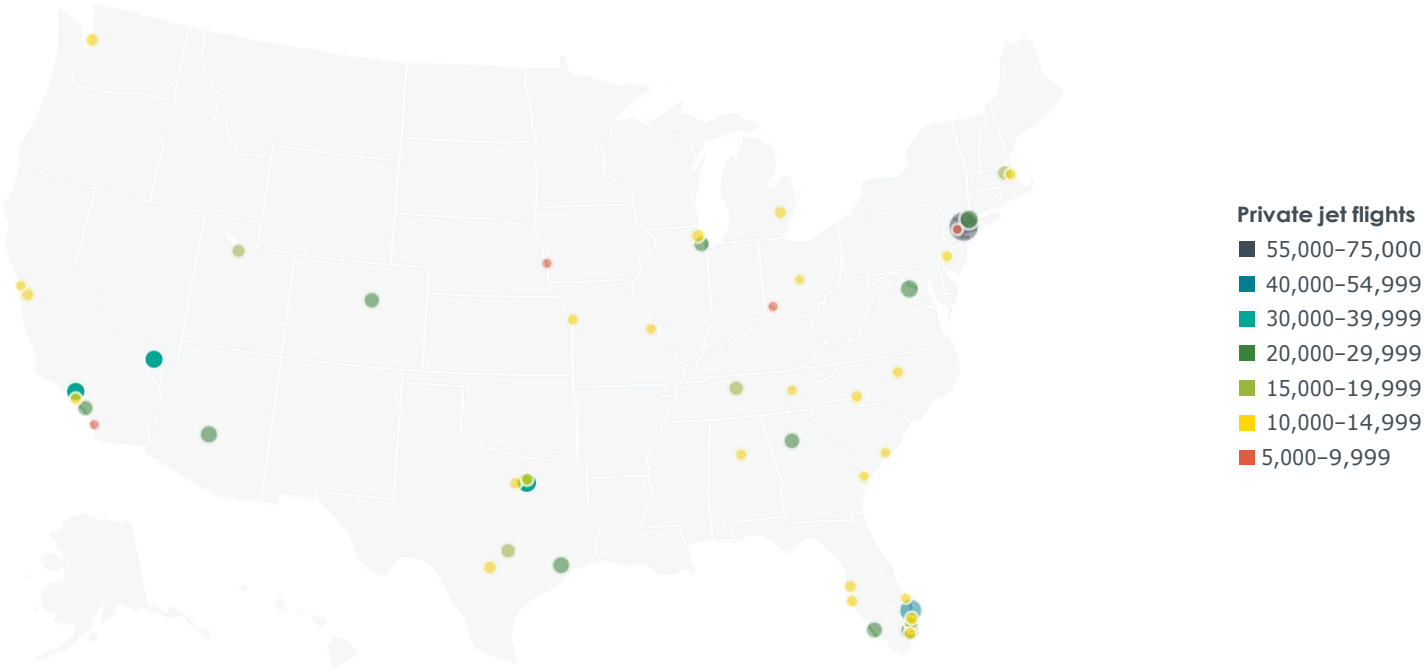
Estimates of LTO NO_x and $PM_{2.5}$ emissions reflect the number of flights from a given airport. Globally, private jets emitted an estimated 21.3 thousand tonnes of LTO NO_x emissions and 203 tonnes of LTO $PM_{2.5}$ emissions across 7,082 airports. Of the 20 airports with the highest estimated LTO NO_x emissions in 2023, 18 are in the United States (Appendix D, Table B4). Teterboro Airport ranked highest, with 478.7 tonnes of NO_x emissions and 4.88 tonnes of $PM_{2.5}$ emissions, followed by Palm Beach International Airport, with 250.7 tonnes of NO_x and 2.38 tonnes of $PM_{2.5}$. Notably, NO_x emissions from private jets at Teterboro Airport alone exceeded the total emissions from all private jets in Canada, which amounted to 450 tonnes. Similarly, estimated $PM_{2.5}$ emissions from private jets at Teterboro Airport (4.88 tonnes) nearly equaled the total $PM_{2.5}$ emissions from private jets across the United Kingdom (4.87 tonnes).

Among the 20 airports with the highest estimated LTO NO_x emissions, only two are outside the United States: Paris-Le Bourget Airport and Nice-Côte d'Azur Airport in France, which emitted 129.0 tonnes and 100.3 tonnes, respectively. The ranking differs slightly for LTO $PM_{2.5}$ emissions, where Canada's Toronto Pearson International Airport joins the list, contributing 1.06 tonnes of $PM_{2.5}$ emissions (Appendix D, Table B5). These findings further highlight the concentration of private jet emissions in the United States and the potential for geographically targeted mitigation strategies to yield large reductions in overall NO_x and $PM_{2.5}$ emissions from private jets.

U.S. airports

The top 50 U.S. airports with the largest number of private jet flights in 2023 were distributed across 23 states, as shown in Figure 12. Florida led with 10 airports, followed by California and Texas, with six each. These three states alone account for 44% of the top 50 airports. Florida has four airports with the most private jet charters: Fort Lauderdale-Hollywood International Airport, Miami Executive Airport, Miami-Opa Locka Executive Airport, and Miami International Airport (Zaher, 2019). These airports serve as hubs for luxury travel, such as cruises to the Caribbean and island-hopping in the Caribbean.

Figure 12
Top 50 U.S. airports by private jet flights, 2023



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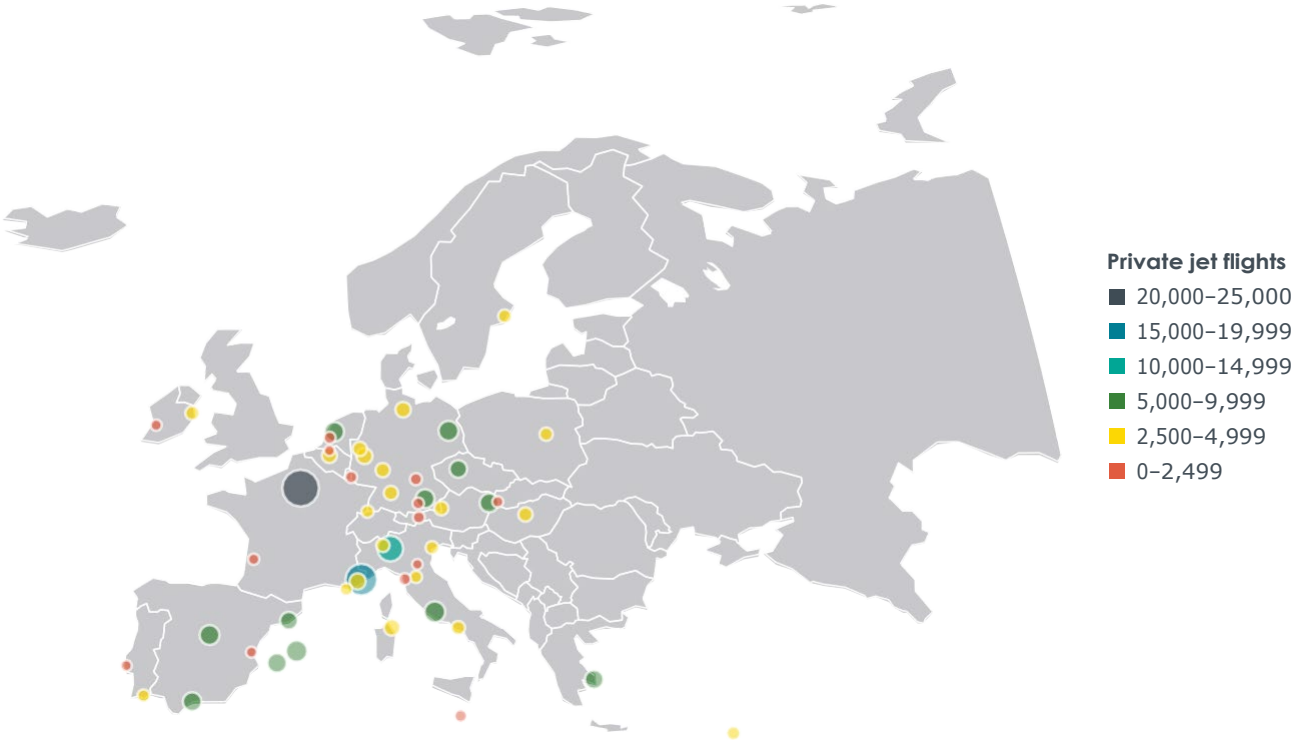
Georgia, Illinois, Massachusetts, Missouri, North Carolina, New Jersey, Tennessee, and Ohio each had two airports in the top 50, while 13 other states, each had one airport in the top 50.

EU airports

In the European Union, the top 50 airports by number of private jet flights were spread across 18 countries (Figure 13), but activity was concentrated in only a few countries. Italy and Germany led with nine airports each, followed by France and Spain, with six each. These four countries collectively accounted for 60% of the top 50 airports.

Figure 13
Top 50 EU airports by rivate jet flights, 2023



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The remaining 14 countries, including Austria (three airports), Ireland, Belgium, Netherlands, and Portugal (two airports each), and smaller contributors such as Czechia, Greece, Hungary, and others (one airport each), hosted the rest of the top 50 airports.

Top domestic route pair

The most common domestic routes for private jets were concentrated in the United States. In 2023, 2,116,512 U.S. flights were domestic, accounting for 91.9% of U.S. private jet flights. Table 14 highlights the top five domestic airport pairs globally. The Harry Reid International Airport–Van Nuys Airport route (connecting Las Vegas, Nevada, and Los Angeles, California) ranked highest with 5,549 flights, contributing an estimated 17.49 thousand tonnes of GHG emissions. All other flights in the top five traveled to and from Teterboro Airport in Teterboro, New Jersey, connecting with airports in Florida, Virginia, and Massachusetts. Collectively, these flights accounted for an estimated 93.1 thousand tonnes of GHG emissions. Although it did not rank among the top five most flown routes, the Teterboro Airport–Van Nuys Airport route generated the highest domestic flight GHG emissions, accounting for an estimated 50.47 thousand tonnes.

Table 14

Top five global domestic route pairs, 2023

Rank	Route	City Pair	Number of flights	Total GHGs (thousand tonnes CO_2e)
1	Harry Reid International Airport–Van Nuys Airport	Las Vegas, Nevada–Los Angeles, California	5,549	17.49
2	Teterboro Airport–Palm Beach International Airport	Teterboro, New Jersey–West Palm Beach, Florida	4,702	36.92
3	Teterboro Airport–Washington Dulles International Airport	Teterboro, New Jersey–Dulles, Virginia	4,461	13.50
4	Teterboro Airport–Miami-Opa Locka Executive Airport	Teterboro, New Jersey–Opa-locka, Florida	3,984	34.17
5	Teterboro Airport–Laurence G Hanscom Field	Teterboro, New Jersey–Bedford, Massachusetts	3,468	8.55

Table 15 shows the top five domestic routes outside of the United States. The top route was in Nigeria, connecting Murtala Muhammed International Airport and Nnamdi Azikiwe International Airport, with 3,115 flights, accounting for an estimated 10.63 thousand tonnes of GHG emissions. The King Khaled International Airport–King Abdulaziz International Airport route in Saudi Arabia ranked second with 2,883 flights, and was the leading non-U.S. domestic flight route in terms of GHG emissions, contributing 29.57 thousand tonnes. The other top domestic private jet routes involved airport pairs in France, Canada, and Brazil.

Table 15

Top five non-U.S. global domestic route pairs, 2023

Rank	Route	City Pair	Number of flights	Total GHGs (thousand tonnes CO_2e)
1	Murtala Muhammed International Airport–Nnamdi Azikiwe International Airport	Lagos, Nigeria–Abuja, Nigeria	3,115	10.63
2	King Khaled International Airport–King Abdulaziz International Airport	Riyadh, Saudi Arabia–Jeddah, Saudi Arabia	2,883	29.57
3	Paris-Le Bourget Airport–Nice-Côte d'Azur Airport	Paris, France–Nice, France	2,326	9.02
4	Montreal / Pierre Elliott Trudeau International Airport–Toronto Lester B. Pearson International Airport	Montreal, Canada–Toronto, Canada	1,763	5.46
5	Congonhas Airport–Santos Dumont Airport	São Paulo, Brazil–Rio de Janeiro, Brazil	1,748	3.74

Top international route pair

Among the top international route pairs (Table 16), the most common was Toronto Pearson International Airport–Teterboro Airport, connecting Toronto, Canada, and Teterboro, the United States, with 2,866 flights. This route pair accounted for an estimated 9.27 thousand tonnes of GHG emissions. The next top route pairs were Paris, France–Geneva, Switzerland (2,655 flights) and Punta del Este, Uruguay–San Fernando, Argentina (1,995 flights). Although it did not rank among the top five international routes in terms of number of flights, the Newark Liberty International Airport–Paris-Orly Airport, connecting the United States and France, generated the highest estimated international flight GHG emissions, of 44.79 thousand tonnes.

Table 16

Top five global international route pairs, 2023

Rank	Route	City Pair	Number of flights	Total GHGs (thousand tonnes CO_2e)
1	Toronto Lester B. Pearson International Airport– Teterboro Airport	Toronto, Canada–Teterboro, New Jersey, U.S.	2,866	9.27
2	Paris-Le Bourget Airport–Geneva Cointrin International Airport	Paris, France–Geneva, Switzerland	2,655	7.19
3	Capitan Corbeta CA Curbelo International Airport–San Fernando Airport	Punta del Este, Uruguay–San Fernando, Argentina	1,995	3.61
4	Lynden Pindling International Airport–Palm Beach International Airport	Nassau, Bahamas–West Palm Beach, Florida, U.S.	1,672	4.12
5	Farnborough Airport–Nice-Côte d'Azur Airport	Farnborough, United Kingdom–Nice, France	1,550	8.71

CONCLUSIONS

We assessed trends in global private jet activity and emissions, using both top-down and bottom-up approaches. Several conclusions can be drawn from our results.

Private jets are a large and growing source of air and climate pollution. We identified a total of 3.57 million private jet flights in 2023, with a typical private jet emitting approximately 810 tonnes of GHGs annually, equivalent to the emissions of 177 passenger cars or 9 Class 8 heavy-duty trucks. At their post-COVID peak in 2022, private jets collectively emitted an estimated 23.74 million tonnes of CO_2e, accounting for nearly 4% of total civil aviation emissions. Our top-down analysis revealed that global private jet operations in 2023 consumed 6.2 million tonnes of fuel, resulting in an estimated 19.5 million tonnes of CO_2e emissions. We estimated that these flights produced 21.3 thousand tonnes of NO_x and 203 tonnes of $PM_{2.5}$ at airports.

Private jet activity and emissions were overwhelmingly concentrated in the United States. In 2023, two-thirds of global private jet flights departed from US airports, accounting for more than half (55%) of estimated private jet GHG emissions. The second and third largest contributors, France and the United Kingdom, trailed with 2.2% and 2.1% of flights, respectively. The U.S. states of Florida and Texas alone generated more private jet flights and GHG emissions than the entire EU-27. Moreover, 18 of the top 20 airports globally by private jet NO_x emissions were in the United States. This concentration of private jet activity implies that U.S. national or state-level policies to reduce private jet emissions could have a substantial impact.

A typical private jet flight is short-haul and lasts less than two hours. Our bottom-up analysis showed that private jet operations were predominantly short-haul. Half of all flights covered distances under 895 km, while 75% were under 1,500 km. Flights over 3,000 km make up only 5% of the total. The median private jet flight in 2023 lasted 85 min, indicating a regional to short-haul operational range. These findings suggest that private jets prioritize convenience and flexibility over speed or range. Private jet flights may therefore be mitigatable by modal shift to high-speed rail in regions like Asia and Europe and by an increased use of turboprop aircraft, which are more fuel efficient than turbofan aircraft. Short-haul flight bans have already been introduced in France, where high-speed rail can compete with air travel in terms of total travel time for short distances. Meanwhile, taxation policies with differentiated rates for turbofan versus turboprop aircraft could incentivize a shift to the latter.

Policy recommendations

Policymakers could consider various measures to reduce the growing emissions of private aviation. Potential policies include tightening fuel efficiency (CO_2) requirements for new private jets (Rutherford & Kharina, 2017); requiring the use of sustainable aviation fuels (SAF), for example under an aviation-wide mandate like ReFuelEU (European Union Aviation Safety Agency, n.d.); and implementing measures to limit the formation of persistent condensation trails (contrails). This last approach may be especially effective because contrails have a large but short-lived climate impact and because private jet flights may be especially likely to form persistent contrails (Gryspeerdt et al., 2024).

In addition, the taxation of private jet flights or GHG emissions could generate substantial revenue to support aviation decarbonization or other priorities. Taxing private jets could simultaneously reduce emissions and generate climate finance revenue by targeting passengers who are ultra-wealthy and less price-sensitive (Collins et al., 2024), allowing tax rates to bridge the 2-5 times cost gap between conventional jet fuel and SAF without heavily impacting commercial aviation. If implemented in 2023, a private jet fuel tax of $1.589/gallon ($0.42/L), as proposed in House and

Senate measures introduced in the last Congress (Fueling Alternative Transportation with a Carbon Aviation Tax Act, 2023), could have generated up to $3 billion globally, based on an estimated 5.8 million tonnes of annual fuel consumption. Additional tax options include distance-based levies, emission-based taxes tied to fuel consumption or pollutant output, and luxury taxes on non-essential flights. These revenues could be directed toward zero-emission aviation technology development, public transportation infrastructure, or loss and damage mitigation in the Global South, promoting a just transition to net-zero aviation.

Future work

This paper presented a medium-fidelity emissions inventory for global private jets in 2023, covering full-flight CO_2 emissions and LTO NO_x and $PM_{2.5}$. Future research could refine and expand this analysis by including full-flight NO_x and $PM_{2.5}$ emissions to create a more comprehensive inventory. Additionally, modeling the contrail impacts of private jets would provide a deeper understanding of their climate effects. Expanding the scope to include all general aviation, such as turboprops and piston engine aircraft, would capture more of the general aviation emission. Updating the inventory with future-year data would allow for the creation of a bottom-up time-series analyses, enabling the identification and tracking of emissions trends over time.

Another avenue for future research is to explore the drivers behind the growing number of private jet flights. This knowledge would support data-driven recommendations for policies such as taxation or regulation of private jet operations to mitigate their environmental impact.

Additional research could inform policies to curb fuel use and emissions from private jets. Given the short average stage length (with 50% of flights traveling less than 900 km), public policies promoting the shift of fossil-fuel private jets to alternatives could be explored, including the shift to high-speed rail where available, the use of turboprops with much better fuel efficiency, and the development of zero-emission planes, notably hydrogen aircraft. Performance standards to boost the fuel efficiency of private jets could also be investigated.

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APPENDIX A. COMPARISON OF FUEL BURN MODELS

Using the Conklin and de Decker CO_2 calculator, we performed comparative analyses of fuel burn across the top 10 aircraft number of flights globally. We applied the same average private jet flight distance of 1,164 km and calculated the difference of the CO_2 modeling result. From Table A1, we see an 8% difference on average, ranging from the highest at 18% and lowest at -4%.

Table A1

Comparison of Conklin and de Decker (C&D) and Small Emitters Tool (SET) modeling results

Aircraft	C&D CO_2 (kg)	SET CO_2 (kg)	Difference (%)
Embraer EMB 505 Phenom 300	2,760	3,115	13%
Cessna 680A Citation Latitude	4,700	4,738	1%
Bombardier BD-100-1A10 Challenger 350	4,280	4,823	13%
Cessna 560XL Citation XLS	3,570	3,673	3%
Bombardier BD-100-1A10 Challenger 300	4,250	5,005	18%
Cessna 525B CitationJet CJ3	2,450	2,655	8%
Cessna 560XL Citation XLS+	3,570	3,673	3%
Learjet 45	2,950	3,468	18%
Cessna 560XL Citation Excel	3,810	3,673	-4%
Cessna 680 Citation Sovereign	4,330	4,580	6%

APPENDIX B. DETAILED STATISTICS

The top 20 countries with the greatest number of private jet flight departures in 2023 are shown in Table B1.

Table B1

Top 20 countries by private jet flights, 2023

Rank	Country	Flights	Rank	Country	Flights
1	United States	2,302,236	11	China	24,400
2	France	80,169	12	India	22,530
3	United Kingdom	73,626	13	Australia	22,401
4	Canada	73,536	14	Turkey	19,398
5	Germany	66,346	15	Bahamas	19,088
6	Italy	58,933	16	United Arab Emirates	16,540
7	Brazil	55,889	17	Austria	15,185
8	Mexico	48,521	18	Greece	14,332
9	Spain	45,638	19	Saudi Arabia	13,841
10	Switzerland	32,923	20	Argentina	11,915

The number of flights in the 10 U.S. states with the most private jet flight departures in 2023 are shown in Table B2.

Table B2

Top U.S. 10 states by private jet flights, 2023

Rank	State	Flights
1	Florida	313,672
2	Texas	230,143
3	California	218,989
4	New Jersey	98,339
5	Georgia	84,052
6	New York	80,378
7	Colorado	74,214
8	North Carolina	67,566
9	Illinois	67,493
10	Tennessee	65,433

The number of private jet flight departures in the EU-27 in 2023 are shown in Table B3.

Table B3

EU-27 countries by private jet flights, 2023

Rank	Country	Flights	Rank	Country	Flights
1	France	80,169	15	Hungary	4,669
2	Germany	66,346	16	Romania	4,164
3	Italy	58,933	17	Croatia	4,144
4	Spain	45,638	18	Cyprus	3,869
5	Austria	15,185	19	Finland	3,226
6	Greece	14,332	20	Slovak Republic	2,852
7	Netherland	11,373	21	Luxembourg	2,458
8	Belgium	9,416	22	Malta	2,335
9	Poland	9,175	23	Bulgaria	2,196
10	Portugal	8,883	24	Slovenia	1,164
11	Sweden	8,251	25	Lithuania	1,161
12	Czechia	7,186	26	Estonia	927
13	Ireland	6,662	27	Latvia	849
14	Denmark	4,950			

The top 20 airports by private jet estimated LTO NO_x emissions in 2023 are shown in Table B4.

Table B4

Top 20 airports by private jet estimated LTO NO_x emissions, 2023

Rank	Airport Name	Country	NO_x (tonnes)
1	Teterboro Airport	United States	478.73
2	Palm Beach International Airport		250.74
3	Van Nuys Airport		210.32
4	Harry Reid International Airport		202.80
5	Westchester County Airport		198.92
6	Dallas Love Field Airport		198.21
7	Miami-Opa Locka Executive Airport		183.11
8	Washington Dulles International Airport		177.39
9	William P. Hobby Airport		148.47
10	Scottsdale Airport		142.70
11	Naples Municipal Airport		131.71
12	Paris-Le Bourget Airport	France	128.99
13	John Wayne Orange County International Airport	United States	128.61
14	DeKalb Peachtree Airport		126.42
15	Nashville International Airport		125.34
16	Chicago Midway International Airport		125.34
17	Centennial Airport		125.34
18	Laurence G Hanscom Field Airport		115.97
19	Austin Bergstrom International Airport		113.44
20	Nice-Côte d'Azur Airport	France	100.25

The top 20 airports by private jet estimated LTO $PM_{2.5}$ emissions in 2023 are shown in Table B5.

Table B5

Top 20 airports by private jet estimated LTO $PM_{2.5}$ emissions, 2023

Rank	Airport Name	Country	$PM_{2.5}$ (tonnes)
1	Teterboro Airport	United States	4.88
2	Palm Beach International Airport		2.38
3	Van Nuys Airport		2.28
4	Westchester County Airport		2.06
5	Dallas Love Field Airport		2.05
6	Harry Reid International Airport		1.93
7	Washington Dulles International Airport		1.74
8	Miami-Opa Locka Executive Airport		1.72
9	Paris-Le Bourget Airport	France	1.46
10	Scottsdale Airport	United States	1.34
11	William P Hobby Airport		1.31
12	John Wayne Orange County International Airport		1.20
13	Nice-Côte d'Azur Airport	France	1.16
14	Naples Municipal Airport	United States	1.15
15	Centennial Airport		1.12
16	Laurence G Hanscom Field Airport		1.12
17	Chicago Midway International Airport		1.12
18	DeKalb Peachtree Airport		1.08
19	Toronto Lester B. Pearson International Airport	Canada	1.06
20	Norman Y. Mineta San Jose International Airport	United States	1.05

APPENDIX C. SCOPE11 METHOD

The SCOPE11 method uses nvPM emission data as the input. Before the tenth meeting of the Committee on Aviation Environmental Protection (CAEP10), only the particulate-related standard of SCOPE11 was based on the SN. For some engines, nvPM emission data are not available in the EEDB, so only SN measurements can be used to estimate nvPM emissions. In Step 0, calculations are performed sequentially, using the SN to derive nvPM concentration (CI_{mass}), which is then used to compute the nvPM emission index in terms of mass (EI_{mass}).

To derive the nvPM concentration (CI_{mass}), the following equation is used:

$$CI_{mass}\left[\frac{\mu g}{m^3}\right] = \frac{648.4 \times e(0.0766 \times SN)}{1 + e^{(1.099 \times (SN - 3.064))}}$$

The emission index (EI) is calculated by multiplying the concentration (CI_{mass}) by the volumetric flow rate Q_{mode} (measured in m^3/kg). The flow rate Q_{mode} depends on the Air-to-Fuel Ratio (AFR) and the reference by-pass ratio β, given by:

$$Q_{mode}\left(\frac{mg^3}{k}\right) = 0.776 \times (AFR) \times (1 + \beta) + 0.767$$

The AFR at each of the four LTO points have been estimated by Wayson et al. as 106 at idle, 83 at approach, 51 at climb-out, and 45 at take-off.

A correction factor k_{slm} is used to adjust for measurement system losses. It depends on the reference by-pass ratio β and nvPM concentration (CI_{mass}), calculated as:

$$k_{slm} = ln\left(\frac{3.219 \times CI_{mass} \times (1 + \beta) + 312.5}{CI_{mass} \times (1 + \beta) + 42.6}\right)$$

The nvPM emission index by mass (EI_{mass}) is derived for each of the four LTO modes as:

$$EI_{mass}\left[\frac{mg}{k}\right] = CI_{mass} \times Q_{mode} \times k_{slm}$$

For the nvPM emission index by number (EI_{num}), the mean particle size across all modes is used, with the number density calculated by:

$$EI_{num}\left[\frac{particles}{kg}\right] = \frac{EI_{mass}}{\left(\frac{\pi}{6} \times 10^9 \times \frac{GMD}{10^9}\right)^{(4.5 \times (\ln(1.8))^2)}}$$

This method allows for a step-by-step derivation of EI_{mass} and EI_{num} from the SN, enabling estimation of nvPM emissions for engines lacking direct nvPM emission data in the EEDB.

APPENDIX D. LIST OF PRIVATE JET AIRCRAFT TYPES

Aircraft type names categorized as private jets for this study are shown in Table D1.

Table D1

Aircraft names categorized as private jets, 2023

Embraer EMB 505 Phenom 300	Embraer Lineage 1000
Cessna 680A Citation Latitude	Airbus A340-300
Bombardier BD-100-1A10 Challenger 350	Dassault Falcon 20D
Cessna 560XL Citation XLS	Raytheon Hawker 800SP
Bombardier BD-100-1A10 Challenger 300	Airbus ACJ320-200N
Cessna 525B CitationJet CJ3	Boeing 757-200(VC-32A)
Cessna 560XL Citation XLS+	Shukoi SSJ 100/95B
Bombardier Learjet 45	Boeing 747-8(BBJ)
Cessna 560XL Citation Excel	Boeing 737-400
Cessna 680 Citation Sovereign	Airbus A340-200
Gulfstream Aerospace GV-SP (G550)	Dassault Falcon 6X
Raytheon Hawker 800XP	Grumman G-1159B Gulfstream II-B
Cessna 750 Citation X	Dassault Falcon 50SurMar
Cessna 510 Citation Mustang	Mitsubishi MU-300 Diamond IA
Cessna 525C CitationJet CJ4	Fokker F70
Bombardier Learjet 60	Sukhoi SSJ 100/95SBJ
Cirrus Vision SF50	Gulfstream Aerospace GV-SP (G550) CAEW
Gulfstream Aerospace GIV-X (G450)	Boeing 767-300ER
Bombardier BD-700-1A10 Global 6000	Raytheon Hawker 1000
Embraer EMB 500 Phenom 100	Boeing 767-200ER
Cessna 525B CitationJet CJ3+	Boeing 777-300(ER)
Cessna 525A CitationJet CJ2	Bombardier BD-100-1A10 Challenger 350
Gulfstream Aerospace G280	Airbus A340-500
Cessna 525 Citation M2	Tu-204-300
Canadair CL-600-2B16 Challenger 604	Cirrus Vision SF50 G2
Beechjet 400A	Dassault Falcon 2000DX
Hawker 400XP	Tu-214PU
Cessna 525 CitationJet	Boeing 737-300
Canadair CL-600-2B16 Challenger 605	Gulfstream Aerospace TP 102D (G550)
Gulfstream Aerospace GVI (G650)	Gulfstream Aerospace C-20G
Dassault Falcon 2000LX	Boeing 737-700
Gulfstream Aerospace G-IV-SP	Airbus A350-900
Bombardier Learjet 35A	ARJ100
Dassault Falcon 7X	Tu-214
Cessna 550 Citation Bravo	Bombardier Learjet 55B
Canadair CL-600-2B16 Challenger 650	Airbus ACJ330-200
Cessna 560 Citation Ultra	Boeing 777-200LR

Bombardier Learjet 75	Bombardier Learjet 25B
Cessna 550 Citation II	ERJ 170-200STD
Cessna 560 Citation V	Dassault Falcon 50-4
Cessna 525A CitationJet CJ2+	Dassault Falcon 20CF
Dassault Falcon 2000	Boeing 737-8(BBJ)
Honda HA-420 HondaJet	Boeing 777-300ER(BBJ)
Embraer Legacy 600	Fokker F100
Bombardier BD-700-1A11 Global 5000	Bombardier Learjet 24D
Raytheon Hawker 900XP	CRJ700 Srs 702
Cessna 525 CitationJet CJ1	Cirrus Vision SF50
Embraer EMB 545 Legacy 450	Boeing 767-300(ER)
Gulfstream Aerospace GVI (G650ER)	Boeing 787-9(BBJ)
Cessna 560 Citation Encore	Embraer ERJ 135BJ Legacy 650
Gulfstream Aerospace G200	Israel C-38A Astra SPX
Raytheon 390 Premier 1	Airbus A310-300
Embraer Legacy 650	Gulfstream Aerospace C-20H
Bombardier BD-700-2A12 Global 7500	Antonov An-148-100
Eclipse Aerospace EA500	Airbus A319-133CJ
Embraer Praetor 600	Grumman G-1159 Gulfstream II-TT
Gulfstream Aerospace G-IV	Cessna 680 Citation Sovereign
Bombardier Learjet 40	Bombardier Learjet 25
Dassault Falcon 900EX	Gulfstream Aerospace TP 102C (G-IV-SP)
Gulfstream Aerospace GV	Embraer Praetor 500
Dassault Falcon 50	Boeing 757-200(C-32A)
Embraer Praetor 500	Boeing 747-200(VC-25A)
Embraer EMB 550 Legacy 500	Boeing 737-79V BBJ
Challenger 850	Boeing 767-200(ER)
Gulfstream Aerospace GVII-G600	ACJ340-500
Bombardier Learjet 31A	Dassault Falcon 20EF
Bombardier BD-700-1A10 Global Express XRS	Boeing 767-400ER
Gulfstream Aerospace GVII-G500	Airbus ACJ220-100
Gulfstream Aerospace G150	Hawker 400XPR
Dassault Falcon 2000EX EASy	Dassault Falcon 200
Bombardier BD-700-1A10 Global Express	Boeing 777-300(ER)(BBJ)
Cessna 650 Citation III	Embraer EMB 505 Phenom 300E
Cessna 525 CitationJet CJ1+	Bombardier Learjet 40
Cessna 650 Citation VII	Tu-204-100
Cessna 501 Citation I/SP	Gulfstream Aerospace C-20B Gulfstream III
Cessna 680+ Citation Sovereign	Airbus ACJ340-600
Dassault Falcon 2000EX	Dassault Falcon 900EX EASy
Raytheon Hawker 850XP	Airbus A321-200
Dassault Falcon 900EX EASy	ARJ70

Dassault Falcon 8X	Boeing C-40B
Boeing 737-700(BBJ)	A330-200(MRTT)
Cessna 560 Citation Encore+	Boeing C-40C
Honda HA-420 HondaJet Elite	Boeing 777-200ER
Dassault Falcon 900B	Airbus CC-330
Dassault Falcon 50EX	Gulfstream Aerospace GV-SP (G550) Nahshon-Eitam
Airbus ACJ319-100	Boeing 777-200(LR)
Cessna 550 Citation S/II	Sukhoi SSJ 100/95LR
Canadair CL-600-2B16 Challenger 601-3A	Gulfstream Aerospace GV-SP (G550) Nahshon-Oron
Cirrus Vision SF50 G2	Il-96-300PU
Bombardier BD-700-1A10 Global 6500	Airbus Voyager KC3
Raytheon 390 Premier 1A	Embraer ERJ 135LR
Dassault Falcon 900LX	Bombardier Learjet 45
Dassault Falcon 900	Tu-214SR
Dassault Falcon 2000S	Airbus A321-251NX
Raytheon Hawker 750	Cessna 519 Citation Mustang
Israel IAI-1125A Astra SPX	Airbus A321-200NX
Bombardier Learjet 55	Yak-42D
Canadair CL-600-2B16 Challenger 601-3R	Boeing 787-8
Hawker Beechcraft 4000	Gulfstream Aerospace C-20A Gulfstream III
Boeing 757-200	Mitsubishi MU-300 Diamond I
Lineage 1000	Various Bombardier BD-100-1A10 Challenger 350 Airframes
Israel IAI-1126 Galaxy	Bombardier Learjet 35A
Airbus ACJ320-200	Bombardier BD-1001A10 Challenger 350
Cessna 500 Citation I	Boeing 727-100
Cessna 650 Citation VI	Dassault Falcon 20E-5
Bombardier Learjet 45XR	Dassault Falcon 20DF
Bombardier BD-700-1A11 Global 5500	Boeing 747-8
Cessna UC-35A-1 Citation Ultra	Challenger 870
Bombardier Learjet C-21A	Bombardier Learjet 24F
Bombardier Learjet 36A	Gulfstream Aerospace G280
Gulfstream Aerospace G-IV (G400)	Boeing 777-200(ER)
Dassault Falcon 10	MD-87
Bombardier Learjet 31	Boeing 737-7BC BBJ
Bombardier CRJ200LR	Gulfstream Aerospace GVIII-G800
Bombardier Learjet 70	Airbus ACJ321-200
Cessna 551 Citation II/SP	Embraer ERJ 145MP
Dassault Falcon 20F	Hawker Siddeley DH-125 Series 400A
Bombardier Learjet 60XR	Tu-154M
Dassault Falcon 900DX	Embraer ERJ 135B Legacy 650
Bombardier Learjet 35	Boeing 737-7JY BBJ

Airbus A320-200	Boeing 747-8KB
Israel IAI-1124 Westwind	Bombardier ND-100-1A10 Challenger 350
Dassault Falcon 20F-5	Bombardier Learjet 24E
Hawker Siddeley HS-125 Series 700A	Various Bombardier Airframes
Eclipse Aerospace EA550	Hawker Siddeley HS-125 Series 700B
Airbus A321-200NX(LR)	Gulfstream Aerospace
Dassault Falcon 20DC	Gulfstream Aerospace G-IV-SP
Dassault Falcon 20C-5	Embraer ERJ 145LU
Cessna UC-35D Citation Encore	Boeing 737-74U BBJ
Boeing 737-800(BBJ)	Embraer EMB 505 Phenom 300
Israel IAI-1125 Astra SP	Bombardier ND-100-1A10 Challenger 300
Israel IAI-1124A Westwind 2	Embraer EMB 505 Phenom 300
Airbus ACJ318-100	Gulfstream Aerospace GVI (G650ER)
Gulfstream Aerospace G-IV (G300)	Bombardier Learjet 24B
Gulfstream Aerospace C-37A	Bombardier BD-200-1A10 Challenger 300
Dassault Falcon 900C	Gulfstream Aerospace GVII-G600
Raytheon Hawker 800	Boeing 737-7GV BBJ
Challenger 800 (CRJ100)	Various Dassault Falcon 7X Airframes
Airbus A319-100	Bombardier BD-700-1A10 Global Express (Miscode)
Gulfstream Aerospace G100	Bombardier BD-700-1A10 Challenger 350
Beechjet 400	Raytheon 390 Premier I
Gulfstream Aerospace C-37B	Various Dassault Falcon 2000 Airframes
Cessna UC-35B Citation Encore	Boeing 737-800
Israel IAI-1125 Astra	Cessna Citation M3
Boeing 737-800	Various Dassault Falcon 2000LX Airframes
Bombardier Learjet 36	Boeing 737-8 BBJ
Gulfstream Aerospace G-1159A Gulfstream III	Embraer EMB-500 Phenom 100
ARJ85	Sukhoi SuperJet 100-95B
Raytheon Hawker 800XPi	Tu-214SUS
Gulfstream Aerospace GVIII-G700	Grumman G-1159 Gulfstream II-SP
Dassault Falcon 100	Various Bombardier BD-100-1A10 Challenger 350 Airframes
Airbus A330-200	Boeing 747SP
Dassault Falcon 20C	Gulfstream Aerospace G250
Gulfstream Aerospace GIV-X (G350)	Cessna 525A CitationJet CJ2
Bombardier Learjet 40XR	Bombardier BD-700-1A10 Global 5000
Bombardier Learjet 25D	Airbus A340-313X
Dassault Falcon 20E	Embraer EMB-505 Phenom 300
Canadair CL-600-1A11 Challenger 600S	Dassault Falcon 900EX EASy
Hawker 400XT	Dassault FA8X
Gulfstream Aerospace GV-SP (G500)	Embraer EMB 5005 Phenom 100
Challenger 800 (CRJ200)	Airbus A319-153N ACJ

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@theicct.org

icct
THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

BEIJING | BERLIN | NEW DELHI | SAN FRANCISCO | SÃO PAULO | WASHINGTON DC

TO SIGN:
https://actionnetwork.org/forms/10-measures-for-red-lines-for-airports/

A RED LINE FOR AIRPORTS

Stop the destruction – Make space for a clean, fair and livable future for all

The world is on fire. We face more dramatic climate extremes as emissions from burnt fossil fuel rises. We struggle to breathe in the smoke of wildfires and suffocating heat. As the cost of living rises essential needs like housing and health are harder to achieve. The far right grows in power and spreads climate denialism.

We dream of a fair livable future for all. A future where basic needs are met, all have a home to live in, clean air and a safe climate. A future where ultra-rich individuals don't profit from our poverty and the destruction of the physical life on Earth. A future where we use the wealth of the world to provide a healthy life for all, closer to each other and to nature, free from oppression and exploitation.

Aviation is a core part of our deadly fossil-fueled system and is a direct obstacle to our dream. Millions experience its impact daily: increasing emissions, health hazards (noise and pollution), destruction of land and loss of biodiversity. Existing airports already have an intolerable impact on health and the climate. Despite this, the aviation sector plans to more than double in size in the next decades, with dozens of new airport projects and expansions[1] currently planned in Europe and the US.

How does this fit with safeguarding the climate? It doesn't. Airport authorities justify growth plans and expansion by hiding behind bogus technological fixes and misleading economic arguments. They say jet fuel substitutes will cut emissions but don't want emissions limits on airports. The only way to cut aviation emissions is to **reduce air traffic – purported technological solutions are just a smoke screen.**

Aviation is the most unequal, unhealthy and destructive mode of transport. It directly pollutes and heats the planet. It is the driving force of touristification, with dire impacts on health, housing and the lives of local people. It ravages communities, appropriates land and resources, destroys biodiversity, fuels militarization; profits from deportation flights that expel poor, racialized and marginalized people. The ultra-rich fly anywhere on private jets. The 1% are responsible for 50% of all aviation emissions.

That is why we must cut air traffic to a bare minimum. Massive rapid emissions cuts are needed to avert the worst climate disasters, starting with fewer flights. New airport projects must be stopped.

With our voices and our bodies, we draw a red line: stop all airport expansion, reduce air traffic. We individuals and organizations experience first-hand harm by the aviation sector. **We call on others to join in our efforts** to stop airport expansion, replace the most destructive 'short hop' flights with electric trains, to build a healthy livable future for all.

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[1] Airport expansion includes any steps to increase airport capacity and activities. See this example from the UK.

We need to **reduce aviation Greenhouse Gas emissions by 80% by 2030 and 86% by 2035, compared to 2025**[2]. To achieve this, we campaign for these **ten measures to keep aviation emissions to a minimum:**

Stop aviation expansion:

1. **No airport expansion:** Flights must be reduced, not increased or by building new airports
2. **No false solutions of offsets and distraction by so-called "sustainable" aviation fuels (SAF):** we oppose 'greenwash' illusions of aviation emission reduction. Real cuts in air traffic are required.
3. **Ban Frequent Flyer Programs and aviation advertising**: These practices promote more flights.

Rapidly reduce air traffic:

4. **Shift short-haul air passengers to rail or boat:** Ban short-haul flights (<500 km/300 mi) between cities with a rail/boat route <10 hours duration. Provide affordable regional & night trains there
5. **Steep cuts in long-haul flights:** Long-haul/trans-ocean freight flights must be drastically reduced by shifting cargo & goods onto an expanded, faster, nimble freight rail/cargo ship network
6. **Ban night flights at airports:** Ban noisy departures between 11 pm & 7am. Multiple studies prove that sleep deprivation causes an unacceptable health hazard for workers & students. Night flights also have a disproportionate climate impact from the warming effect of contrails.
7. **Ban and/or heavily tax private jets** that cause the highest per-passenger-mile climate harm.
8. **Close regional airports, and replace with fast, affordable, reliable public transport (rail, bus):** Small regional airports are hugely expensive, per passenger, for FAA, weather, and security.

A transformation grounded on justice, and planetary & public health:

9. **Ensure a just transition and public ownership:** Airports & airlines must partner with clean rail lines to incentivize a rapid and just transition to publicly funded Amtrak & state-owned trains.
10. **Set binding carbon limits and distribute flights fairly:** Establish a strict carbon cap on airports, fully included in national emission 'budgets' (Nationally Determined Contributions, NDC's). Each airport can be allocated a share of the overall, steadily declining, aviation emission budget. Essential flights – medevac, disaster response, etc.—may be excluded from the cap.

The red line is here. Stand with us and stay grounded.

TO SIGN:

https://actionnetwork.org/forms/10-measures-for-red-lines-for-airports/

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[2] The EU target across all sectors for 2030 is 55% reduction compared to 1990 levels, which corresponds to an aviation reduction of 80% compared to 2025 levels. Aviation emissions have more than doubled since 1990 Based on data for CO2 emission growth between 1990 & 2019, assume that 2025 is at the same level as 2019. The EU all-sector target is reduction of 66.25-72.5% for 2035 and 90% for 2040, compared to 1990 levels. That translates to aviation reduction of 86% for 2035 compared to 2025 levels.

Outlook

[EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!

From Arun Ganti <scc.resistant069@slmails.com>
Date Mon 4/13/2026 11:18 PM
To Commission-Public-Records <commission-public-records@portseattle.org>

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Arun Ganti
scc.resistant069@slmails.com

Olympia, 98507

Outlook

[EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!

From Zain Orion <noreply@adv.actionnetwork.org>
Date Mon 4/13/2026 6:18 PM
To Commission-Public-Records <commission-public-records@portseattle.org>

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Zain Orion
mountainwoman68@yahoo.com

Tacoma, Washington 98403

From: Grace Norman
To: Commission-Public-Records
Subject: [EXTERNAL] Create better cruise ship policies
Date: Friday, April 10, 2026 10:42:13 AM

Clerk of Port_Seattle,

As a city and port, we need to do better.

The cruise economy has a massive environmental toll, and the PM2.5 levels have been shown to spike cancer cases in port cities with cruise ships worldwide.

The Port talks about the economic benefit of the cruise industry, but it's massively more important to take action to mitigate the costs.

In the year 2026, in one of the most innovative cities on earth, we can design a better system. There is great value in doing so.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,
Grace Norman

Grace Norman
grace.norman@gmail.com

Seattle, Washington 98104

From: Peter Sakura
To: Commission-Public-Records
Subject: [EXTERNAL] Let"s Work Together to Reduce the Number of Cruises
Date: Friday, April 10, 2026 1:38:06 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

The science (Climate Interactive simulators EN-ROADS and C-ROADS) is telling us that global greenhouse gas emissions must go down at a rate of 8% annually to achieve a livable climate. That simply means no more over-consumption by the wealthy.

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Peter Sakura

petersakura@yahoo.com

Seattle, Washington 98115-3572

From: Rick Harlan
To: Commission-Public-Records
Subject: [EXTERNAL] NOT SUSTAINABLE: Growth of Cruise Ship travel out of Seattle
Date: Sunday, April 12, 2026 4:49:46 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm sure you're aware: "We're on a planet; that has a problem!" And locally, the annual climate pollution generated by Seattle's cruise business is now equal to about half the annual climate pollution generated by the entire city of Seattle!!!

The question is: What is the Port of Seattle, encompassing sea and air travel, going to DO about it?

How about REDUCING vs YEARLY EXPANDING cruise ships out of Seattle?

City of Seattle for a year: 5.7 million tons of greenhouse gas

Seattle's Cruise business for 6 month season: 3 million tons

Less not more sailings, as there are no concrete solutions for reducing emissions currently available.

Reduce by 2050 is too late. At the rate you and we are going, Earth will be in widespread climate catastrophe and fewer people will afford travel.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a liveable future for our children and grandchildren. And cruise ships encourage a lopsided local economy--boom then drag every year.

While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of

sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Rick Harlan
rickharlan@igc.org

Seattle, Washington 98112

From: mariiherlinger@climateactionfamilies.org
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Monday, April 13, 2026 9:59:09 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

mariiherlinger@climateactionfamilies.org

,

From: PJ Phillips
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Sunday, April 12, 2026 9:59:57 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

PJ Phillips
contagiouscourage@gmail.com

Seattle, Washington 98112

From: Miranda Marti
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Sunday, April 12, 2026 7:43:27 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Miranda Marti
tuesdaymira@gmail.com

Seattle, Washington 98117

From: Donna Snow
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Sunday, April 12, 2026 4:36:09 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Donna Snow
dsnow3@comcast.net

Olympia, Washington 98501

From: Susan Helf
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Sunday, April 12, 2026 3:09:17 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Susan Helf,
Seattle

Susan Helf
shelf30@gmail.com

Seattle, Washington 98117

From: Greg Stinson
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Sunday, April 12, 2026 12:38:07 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I was disappointed to hear Sam Cho celebrating the INCREASE in the number of cruises at a recent conference. Cruising is an environmentally ambiguous vacation choice and the City and Port should NOT be encouraging it. Seattle does not need whatever economic boost cruising gives. It makes the waterfront less appealing.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Greg Stinson
Seattle

Greg Stinson
stinsongr@gmail.com

Seattle, Washington 98118

From: Nicole Iorio
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Saturday, April 11, 2026 10:02:42 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Nicole Iorio
Iorionicole@gmail.com

Shoreline, Washington 98133

From: Florie Rothenberg
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Saturday, April 11, 2026 6:08:56 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Florie Rothenberg
frothenberg@comcast.net

Seattle, Washington 98126-2949

From: Gabby Connors
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Saturday, April 11, 2026 2:06:23 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Gabby Connors
gnconnors@gmail.com

Seattle, Washington 98103

From: Lauren Tozzi
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Saturday, April 11, 2026 11:14:24 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Lauren Tozzi
lrntozzi2@gmail.com

Seattle, Washington 98103

From: Blaine Snow
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Saturday, April 11, 2026 8:10:11 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm a lifelong resident of Puget Sound. Our precious natural heritage means everything to me.

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Blaine Snow
snowinolympia@gmail.com

Olympia, Washington 98506

From: Ann Dorsey
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 9:58:28 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Ann Dorsey
aedorsey@hotmail.com

Northridge, California 91325-3844

From: Cheryl Lawrence
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 9:34:58 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

The climate crisis will force us to change or perish sooner or later. Why wait for that to happen? We can each change our behavior to start caring for the planet now. It's not easy to do but it is a clear choice. What are you willing to take responsibility for?

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Cheryl Lawrence

cheryllawrence@mac.com

Langley, Washington 98260

From: Linda Carroll
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 9:12:35 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

As a native of Seattle and an environmentally motivated voter, I am concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Linda Carroll
lindalouise701184951@yahoo.com

Spokane, Washington 99205

From: Graham Golbuff
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 8:34:37 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Graham Golbuff
grahamgolbuff@gmail.com

Seattle, Washington 98112

From: Laura Theodorson
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 6:10:33 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Laura Theodorson
latheodorson@yahoo.com

Tacoma, Washington 98405

From: Jonathan Hartman
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 6:08:58 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Jonathan Hartman
doctorjonny1@gmail.com

Camas, Washington 98607

From: Couren Smith
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 5:26:20 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Couren Smith
courensmith@gmail.com

Seattle, Washington 98126

From: AJ cho
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 4:49:09 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

AJ cho
amenoartemis@gmail.com

San Leandro, California 94579

From: Jean Myers
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 4:34:32 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Jean Myers
jmyers1050@gmail.com

Seattle, Washington 98122

From: Tom Sheehan
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 3:53:05 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Tom Sheehan
tsheehan2016@gmail.com

Seattle , Washington 98117

From: Jen Bowen
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 3:30:33 PM

Clerk of Port_Seattle,

Seattle's 2025 cruise season generated roughly 3 million metric tons of climate pollution from ships and passenger flights. That's over half the city's entire annual emissions. I understand the Port only counts ship emissions in our airshed and excludes flights, but the full damage is real and it keeps growing with every sailing added to the schedule.

Proposed solutions like green methanol are years away from meaningful impact. Shore power helps protect near-port communities from air pollution, but it eliminates less than 1% of a voyage's total climate emissions. The Port should not be adding sailings or planning expansion before effective solutions are actually in place.

As Earth Day founder Dennis Hayes put it, he's more interested in what the Port is doing to protect the climate tomorrow than by 2050. At current warming rates, the world is expected to pass 1.5°C by 2030 with catastrophic, irreversible consequences. Three million tons of annual pollution needs to go down, not up, and that means fewer sailings.

We all deserve vacations, but not at the cost of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Jen Bowen
jenjohnstonbowen@gmail.com

Fircrest, Washington 98466-7208

From: Laura Gibbons
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 3:09:30 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

Stop with the greenwashing and start with the climate healing!

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Laura Gibbons
lgibbons51@yahoo.com

Seattle, Washington 98118-2305

From: Robin Briggs
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 2:23:15 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Robin Briggs
rbriggs1201@gmail.com

, 98112

From: Jan von Lehe
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 2:17:38 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

You have a choice: a) live up to your hype about being so green and reduce your support for the cruise industry or b) admit that the revenue from cruise ships is something that leads you to violate your stated values of being environmentally conscious.

I spent many hours attending your meetings back in 2018-2019 asking you to be more climate conscious about the incredible impact of cruising. But honestly it doesn't seem that you really care about this climate crisis or you would be making some hard choices.

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Jan von Lehe
janvonlehe@gmail.com

Seattle, Washington 98117-4652

From: Derek Gendvil
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 1:14:46 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Derek Gendvil
dgendvil@gmail.com

Las Vegas , Nevada 89117

From: 350 Tacoma
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 1:07:34 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

We're concerned about the massive climate impact of Seattle's cruise sector. What happens in Seattle does not stay in Seattle, the climate pollution harms us all. (And the water pollution does not stop at imaginary borders.) Tacoma is also impacted by the proliferation of fossil fuel storage, refining, and transport that fuels these kinds of activities. You get the tourists at your Port, while we get the toxic emissions and health impacts.

The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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We agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

350 Tacoma
350tacoma@gmail.com

Tacoma, Washington 98421

From: Wendy Ashmun
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 12:48:15 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,
Wendy Ashmun

Wendy Ashmun
wendolen@gmail.com

Seattle, Washington 98122

From: Charles Raymond
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 12:12:35 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Charles Raymond
cfr98115@gmail.com

Seattle, Washington 98115-2564

From: Jason Li
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 11:38:54 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Jason Li
jasonli468@gmail.com

Seattle, Washington 98102

From: Brie Gyncild
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 11:12:33 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Brie Gyncild
briegyncild@gmail.com

Seattle, Washington 98122

From: Sara Bliss
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 11:07:33 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Sara Bliss
sara.c.bliss@gmail.com

Seattle, Washington 98117

From: Vivien Sharples
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 10:58:55 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Vivien Sharples
vivs@igc.org

Seattle , Washington 98112

From: Alexandra Harmon
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 10:51:49 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Alexandra Harmon
hahaharmon@gmail.com

Seattle, Washington 98109

From: Andrea Chin
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 10:51:41 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Andrea Chin
anlchin@uw.edu

Redmond, Washington 98052

From: Vanessa Jamison
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 10:37:02 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Vanessa Jamison
msvanjam@outlook.com

Marysville, Washington 98270-8067

From: Sophia Keller
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 10:35:03 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

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Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Sophia Keller
keltiawind@gmail.com

Seattle, Washington 98146

From: Jared Howe
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 10:32:09 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Jared Howe
jaredchowe@gmail.com

Seattle, Washington 98108

From: Peggy Printz
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Thursday, April 9, 2026 5:36:43 PM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

Again this year I'm distressed about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

Of course the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Peggy Printz
peggyjprintz@gmail.com

Seattle, Washington 98115

From: bria hedahl
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!
Date: Monday, April 13, 2026 10:45:42 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,
It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

bria hedahl
bjhedahl@hotmail.com

Lake Forest Park, Washington 98155

From: Elaine Hickman
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle: We"re Cruising Towards Climate Collapse!
Date: Friday, April 10, 2026 10:53:07 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm very concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

I know that the Port is exploring potential solutions such as green methanol, but I believe it's a serious miscalculation to be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Elaine Hickman
elaine.hickman@gmail.com

Seattle, Washington 98133

From: Barbara Phinney
To: Commission-Public-Records
Subject: [EXTERNAL] Seattle's Cruise Ship Hosting Contributes To Climate Collapse!
Date: Friday, April 10, 2026 10:36:48 AM

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Barbara Phinney
bphinney@mac.com

Seattle, Washington 98133

From: Rusty and Candice West
To: Commission-Public-Records
Subject: [EXTERNAL] STOP our Puget Sound Cruise Lines: Save our Environment
Date: Monday, April 13, 2026 6:10:29 AM

Clerk of Port_Seattle,

Dear Port Commissioners and staff,

We're very concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule. We MUST STOP!

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

WE MUST STOP CRUISE LINES.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in WHAT YOU ARE ACTUALLY DOING to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

PLEASE ENCOURAGE ALL TO CHANGE FROM DESTRUCTIVE CRUISE LINES, TO MUCH MORE EARTH FRIENDLY WAYS TO RECREATE.

Thank you,

Rusty and Candice West

rustytwest@gmail.com

Shoreline, Washington 98155

Outlook

[EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!

From Jim Bernthal <noreply@adv.actionnetwork.org>
Date Tue 4/14/2026 9:35 AM
To Commission-Public-Records <commission-public-records@portseattle.org>

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, the damage from these voyages and flights exists, and it keeps increasing each year as more sailings are added to your schedule.

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a climate solution: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Jim Bernthal
jimbernthal@hotmail.com

Seattle, Washington 98118

Outlook

[EXTERNAL] Seattle: Stop Cruising Towards Climate/Environmental Collapse!

From Beth Glosten <noreply@adv.actionnetwork.org>
Date Tue 4/14/2026 10:55 AM
To Commission-Public-Records <commission-public-records@portseattle.org>

Clerk of Port_Seattle,

Greetings Port Commissioners and staff,

I'm concerned about the massive climate and environmental impact of Seattle's cruise ships.

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! T

The entire cruise ship industry needs to take responsibility and reduce its polluting emissions. Perhaps Seattle can take the lead and negotiate with the cruise lines - that they are allowed to stop in Seattle only if substantive measures are in place to reduce the pollution from the cruise ships: stop dumping sewage, trash, and fuel oil into the ocean; implement measures to reduce fossil fuel emissions.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Beth Glosten
bglosten@gmail.com

Seattle, Washington 98122

Outlook

[EXTERNAL] Seattle: Stop Cruising Towards Climate Collapse!

From Julia Buck <julia.buck@alumni.tufts.edu>
via email.actionnetwork.org

Date Wed 4/15/2026 4:56 PM

To Commission-Public-Records <commission-public-records@portseattle.org>

Clerk of Port_Seattle,

Dear Port Commissioners and staff,

I'm a Seattle resident concerned about the massive climate impact of Seattle's cruise sector. The cruise ships and associated flights from your 2025 cruise season caused about 3 million metric tons of climate pollution. In comparison, the entire city of Seattle emits about 5.7 million tons per year. While I understand that the Port only counts ship emissions in our airshed (instead of the whole voyage) and ignores the impact of the flights bringing most of the passengers to Seattle, that is not how the atmosphere works. The flights and sailings put the carbon into the atmosphere, and we all share the effects as it increases global temperatures and extreme weather events, and it keeps increasing each year as more sailings are added to your schedule.

I know that the Port is exploring potential solutions such as green methanol, but you should not be increasing sailings or considering expansion of cruise until you actually have effective solutions in place. Alternative fuels won't result in substantial reductions for many years, if ever. Likewise, I appreciate that shore power reduces the harmful impacts of air pollution on port workers and near-port communities, but it is not a solution to the problem that we're pouring more gasoline on a fire: it eliminates less than 1% of a cruise's climate emissions from the entire voyage.

It is unacceptable to be contributing 3 million tons of climate pollution every year - this pollution needs to be reduced, not increased! To do this, the Port needs to *reduce* the number of sailings.

I agree with Dennis Hayes, founder of Earth Day: "I'm glad the Port of Seattle has long-term net-zero carbon goals. But I'm more interested in what you're doing to protect the climate tomorrow than by 2050." At current rates of warming, the world is expected to pass 1.5 degrees of warming by 2030, resulting in catastrophic and irreversible damage, including the loss of coral reefs.

We all need vacations, but the ways we explore, relax, connect, and have fun should not destroy the chance of a livable future for our children and grandchildren.

Please include this as a written comment for the next Port of Seattle Commission Meeting.

Thank you,

Julia Buck
julia.buck@alumni.tufts.edu

Seattle, Washington 98107