



# Air Freight Operators Soar Toward Climate Change

The Shocking COVID Air Freight Surge  
That Won't Go Away

# TABLE OF CONTENTS

<b>Executive Summary</b>	1
<b>I. Introduction</b>	2
<b>II. Air Freight Cargo a Threat to Climate Progress and Public Health</b>	3
<b>III. The Companies Behind the Problem</b>	5
<b>IV. Innovating Aviation to Prevent Climate Breakdown</b>	7
<b>Endnotes</b>	9
<b>Annex</b>	10
<b>Credits</b>	12

# Executive Summary

Market distortions originating in COVID-19 pandemic travel restrictions and supply chain disruptions accelerated shipping to the air freight cargo sector. Rather than returning to pre-pandemic levels, air freight has plateaued and, in some cases, is still growing. While FedEx, UPS, and Amazon celebrate a new norm in the shipping industry, their success comes at a dire cost.

Stand Research Group's investigation revealed the scope of air freight cargo's growth. The research supports the need for immediate solutions to correct distortions in the shipping and logistics sector.

## Key Findings

- **As of this report, the United States is responsible for more than 40% of greenhouse gas (GHG) emissions from air freighter emissions globally.**
- **Air freight operators have increased their GHG emissions by 25% compared to 2019**, including almost 20 million tons CO<sub>2</sub> or over 22 million tons CO<sub>2</sub>e.
- **FedEx, UPS, and Amazon Air generated more than 27% of the sector's annual carbon emissions** for global dedicated freighter flights, presenting material obstacles to climate progress.

## Recommendations for Industry

To address the many problems created by the persistent COVID-era surge in air freight, market shapers FedEx, UPS, and Amazon need to act. As a first step, e-commerce companies like Amazon should disclose the carbon cost of air freight shipments to inform customer decisions about delivery options and provide a clearer picture to investors of future risks to business operations. Shipping and logistics companies must promote real solutions to air freight pollution by transitioning non-perishable goods to shipping methods with lower carbon intensity and reducing total carbon emissions in ground transportation.



# I. Introduction

## **Air freight operators polluting for profit**

Prior to the COVID-19 pandemic, air freight was dominated, logically, by perishable goods, time-sensitive deliveries, and luxury items. Unprecedented marine transportation and supply chain disruptions created a historically unique market distortion: Non-urgent, non-perishable, and lower-value goods were increasingly transported via air freight. What many assumed was a pandemic anomaly, however, is actually not only continuing, but in some cases growing.

The COVID-19 pandemic travel restrictions and supply chain disruptions disproportionately benefited a select few air freight operators. Globally, FedEx and UPS led the sector's race to the bottom, comprising 42.4% of the industry's carbon emissions for flights originating in North America. Research shows that these companies have maintained operations as if the pandemic and supply chain disruptions continue today and rampant air freight is a necessity. This new practice has massive climate and human health implications.

Amazon Air is an additional threat to climate progress and doubled its footprint year-over-year during the period 2019-2023. Despite its rhetoric on climate change, the company's own Amazon Climate Pledge, and the climate-focused giving of company founder Jeff Bezos, Amazon's focus on faster delivery makes air freight a requirement, and thus precludes climate pollution reductions.

Air cargo growth also has triggered a significant expansion of air freight hubs among FedEx, UPS, and Amazon Air across North America, Europe, and Asia. As a result, these companies are often burdening local, vulnerable communities with heavy-metal pollutants associated with higher rates of respiratory illness.

## **About this report**

This report is intended to provide decision makers greater detail on the scope and scale of the problem. Section II provides an overview of the problem and details some of the dynamics that have kept aviation emissions elevated post-pandemic. Section III explores the contributions of individual industry actors like FedEx, UPS, and Amazon. Section IV presents a path forward, with specific steps industry leaders need to take in the near-term to correct persistent pandemic-era distortions in the air cargo industry and align the industry's future with the needs of climate and communities.

This report supports what we know to be true: Inaction is not an option. The Stand.earth transportation campaign aims to promote climate-focused innovation and environmental justice in shipping and logistics. Where industry refuses to accept accountability, Stand.earth and its supporters mobilize in support of change.



## II. Air Freight Cargo a Threat to Climate Progress and Public Health

### New norm in air freight industry is a disaster for climate progress

Pandemic-era restrictions on air travel were a leading factor in the distortion of the air freight industry. Prior to the pandemic, freighters and shippers relied on capacity in the belly of passenger planes. Governments restricted air travel to curb the spread of the COVID-19 virus, and travelers turned to domestic and “staycation” tourism as an alternative.<sup>1</sup> In 2020, international demand for passenger flights declined 75% versus the year prior.<sup>2</sup> To compensate for the lost capacity in the belly of passenger flights, freighters and shippers significantly expanded their cargo-only fleets by adding new air freighters and converting passenger jets to cargo duty.<sup>3</sup>

By 2023, the industry had taken on a new shape. In 2023, air freight carbon emissions were up 25% from 2019 at 93.8 million tons. At the same time, belly cargo emissions returned to almost 90% of the sector’s 2019 levels. This suggests the post-pandemic air freight market will carry over most or all of the emissions of the pre-pandemic industry while adding new emissions through expanded use of dedicated fleets.

Shipping by air is much more carbon-intensive by weight on average than other shipping methods. Estimates suggest air freighters can produce up to 80 times more carbon than shipping the same package by sea or truck.<sup>4,5,6</sup> This shift toward the most climate polluting method, air freight, during a climate emergency poses a grave threat.

### Pandemic-era air freight cargo expansion is an ongoing crisis

Pandemic-era restrictions encouraged historic air freight cargo CO<sub>2</sub> emissions growth, with North America-originating flights generating 32.2 million metric tons in 2019 to 39 million metric tons in 2023 (+5.5% average annual growth rate)

Global NO<sub>x</sub> and CO<sub>2</sub> pollution around airports grew 25% during this time as a result of increased air freight cargo traffic

Together, the expansion of dedicated air freight capacity alongside a nearly full recovery of belly freight cargo points to the the emergence of a new climate and human health threat in the air freight market. Today, air freighters are flying more planes, from more places, more often. No longer dependent on passenger flights, air freight operators were operating more than 300,000 flights during 2023 as compared to 2019, representing a flight volume growth of about 30%. Overall, dedicated freighters added over 750 more planes to their fleets and are currently operating from over 300 additional hubs as compared to 2019.

**Table: Trends In Air Shipment (2019-2023)**

	Dedicated Air Freight	Belly Freight
% change in flight volume	29.87%	—
% change in fleet capacity	34.28%	—
# of shipping hubs 2023	1,629	—
2023 CO <sub>2</sub> emissions (million tons)	93.81	66.69
2023 NO <sub>x</sub> emissions (metric tons)	459,563	326,697

Source: internal analysis (see Annex for data sources and assumptions)

## Consequences for climate and communities

The expansion of air freighter operations poses a significant risk to climate and communities. Compared to 2019, the 20 most polluting global cargo airports in 2023 generated an extra 12 million metric tons of CO<sub>2</sub> equivalent from air freight cargo operations alone. Reducing and eliminating these emissions for the purposes of climate progress should be simple given the availability of alternatives.

Air freighter expansion is also a challenge to public health. As air freight operators have expanded their network of shipping hubs, they have brought pollution to more communities. Proximity to these airports has been linked to greater exposure to toxic pollutants, many of which are small enough to reach lower respiratory pathways. This, in turn, contributes to greater risk of disease, hospital admissions, and self-reported lung symptoms.<sup>7</sup>



# III. The Companies Behind the Problem

## Big Three a growing threat to climate progress

FedEx, UPS, and Amazon Air are major contributors to GHG emissions, both globally and in the United States. In 2023, these “Big Three” were responsible for approximately 27% of all global air freight GHG emissions. In the United States, the Big Three generated almost 50% of domestic freighter GHG emissions, or as much as the electricity use for 4.45 million homes in the US.

FedEx and UPS are the largest polluters in the industry, comprising a 24.7% share of the industry’s 2023 carbon emissions, or 23.17 million metric tons CO<sub>2</sub>. During the period 2019-2023, UPS emissions from North America-originating flights grew at an average annual rate of 2%.

While smaller in terms of total emissions, Amazon Air is one of the fastest growing polluters in the industry. In 2019-2023, the company nearly doubled its carbon emissions from North America-origining flights, from 1.2 million metric tons to 2.4 million metric tons CO<sub>2</sub>. Amazon Air’s parent company, online retail giant Amazon, is also responsible for much of the air freight traffic from other major operators.

**FedEx, UPS, and Amazon Air are leading the air freight sector’s race to the bottom**

FedEx, UPS, and Amazon Air are leading the air freight sector’s race to the bottom, responsible for over 27% of North America-originating sector emissions in 2023

Amazon is the primary obstacle to progress in reducing aviation emissions, driving increased air freight cargo demand and shaping the industry toward high-speed delivery at all costs

Amazon also operates its own highly polluting air freighter operation, Amazon Air, which is third largest and fastest growing operator in the United States

Among the companies surveyed, the Big Three also fall short in terms of their commitments to address the climate risk associated with their large and growing emissions. We assessed a range of steps companies can take to curb emissions and align operations with the goal of limiting the impacts of climate change. Among the companies investigated, Amazon presents a clear threat to climate progress given its emissions volume and growth, and its lack of clear climate commitments.

## Amazon shifting market and consumer expectations toward faster delivery

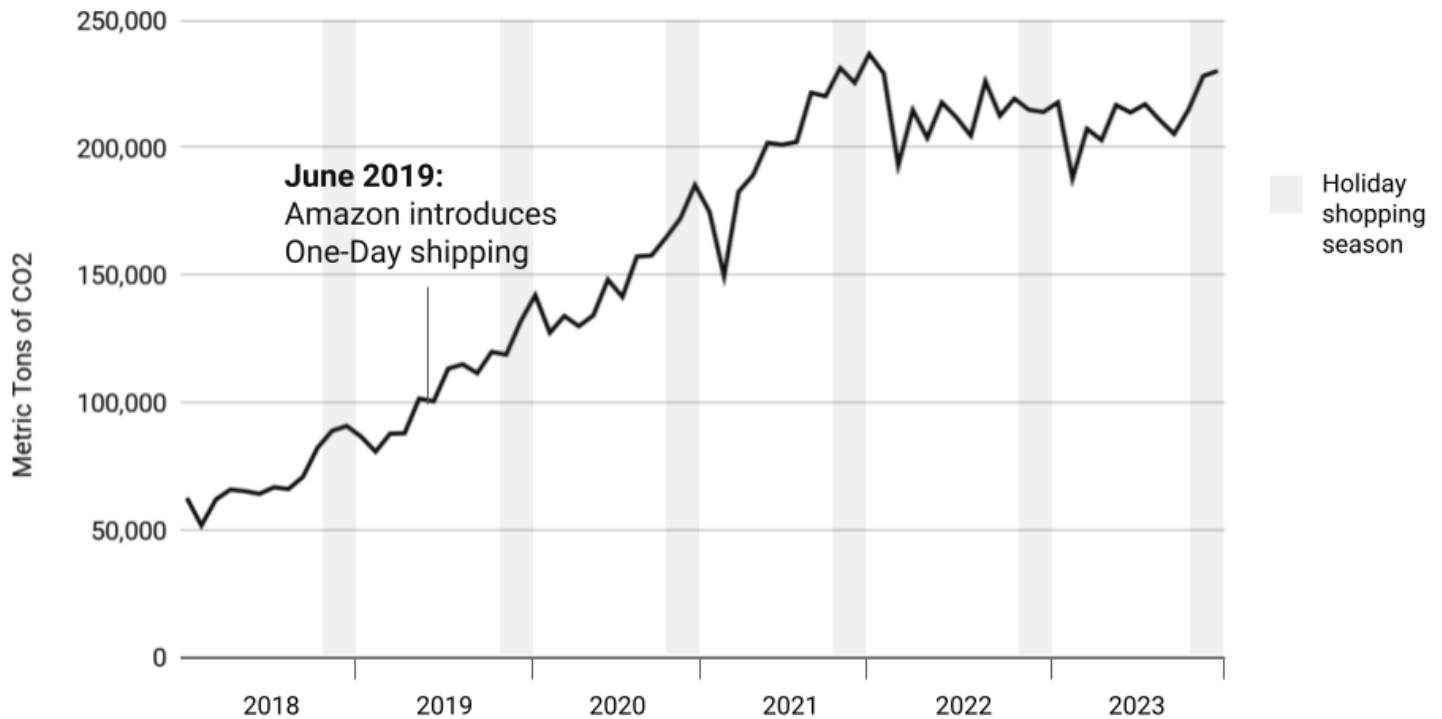
The emergence of same- and next-day delivery as a standard in e-commerce is one important dynamic in the upward trend in air freight emissions. Consumer expectations have shifted in part because of Amazon’s dominance and the popularity of One-Day shipping for members of the company’s flagship Prime program.

In 2019, Amazon announced it would improve its delivery speed from two days to one.<sup>8</sup> Amazon also offers same-day delivery options for a growing number of products and cities. Today, Amazon’s Prime program offers free same- or next-day delivery to more than 200 million members globally. In the United States alone, an estimated 180 million Prime members<sup>9</sup> received over 4 billion items via One-Day shipping in 2023.<sup>10</sup>

Other e-commerce companies and big box retailers are competing to match Amazon’s delivery speed and attract and retain loyal customers.<sup>11</sup> As a result, consumers factor delivery speed into their purchasing decisions, while the companies offering the shortest window between purchase and delivery are failing to disclose the polluting impact or offer alternatives for customers who might also factor in climate impact.

The evolution of one-day shipping from a differentiator to table stakes has created headwinds for emissions reduction efforts. Amazon first introduced two-day shipping in 2005, offering customers the option of free, fast deliveries on eligible orders. The program expanded, and so did the emissions from Amazon’s sprawling shipping and logistics network. 14 years later, in June 2019, the introduction of one-day shipping created more demand for air transport, alongside the pandemic-related air disruption of other shipping methods. Against this background, carbon emissions from the Amazon Air fleet have dramatically increased.

## Prime Air CO<sub>2</sub> Emissions Climbing Amid One-Day Shipping Growth (2018-2023)



### Opportunities for industry action

Concentration in the air freight cargo industry offers FedEx, UPS, and Amazon Air an opportunity to lead the sector toward alignment with climate and public health imperatives. As the Amazon case study demonstrates, a single company can influence consumer habits. By adopting greater transparency on the true costs of air freight shipping, and providing full accounting of their GHG emissions, the Big Three would inform best practices for long-term sustainable business operations in a warming world. Smaller industry players would be encouraged to follow suit.





# IV. Innovating Aviation to Prevent Climate Breakdown

## Industry facing a problem of its own creation

With 99.8% of aviation fuel produced from fossil fuels<sup>12</sup> and the scaling of low carbon replacements still many years if not decades away, near-term strategies to reduce air cargo shipments remain critical to curb rising air cargo GHG emissions and air pollution. To date, the Big Three have not detailed how they plan to address the real and growing risk of carbon emissions to their business operations or, ultimately, the planet.

As a first step toward innovating to meet climate goals, industry leaders need to improve transparency about efforts to meet emissions targets, including important 2030 milestones. A full accounting would include estimated traffic and carbon emissions growth projections alongside a timeline for the adoption of real solutions to emissions reductions.

### *Transparency in emissions accounting*

A full accounting of GHG emissions is critical to addressing the climate and local air pollution impacts of air freight cargo. Important research on the full impacts of expanded air freight operations is difficult due to the lack of transparency by the industry's leading polluters. The Big Three have a particular responsibility to shareholders and customers to improve the quality and scope of their emissions reporting.

### *Real solutions to emissions reduction*

Decarbonizing the aviation sector is a unique challenge because of the lack of low-carbon fuel alternatives. In its most recent Synthesis Report, The Intergovernmental Panel on Climate Change (IPCC) categorizes aviation emissions as "hard-to-abate." That said, some solutions offer a better pathway than others.

- Non-Air Shipping – Industry's best near-term option to reduce air cargo demand is to shift cargo shipments from to lower-carbon modes of transport such as marine shipping or rail. Shifting the air cargo of dedicated air freighters, which handle 70-75% of air cargo shipments from supply chains in Asia to customers in Europe and North America, represents a significant opportunity to reduce demand and slash air cargo emissions, particularly from air freighters. Furthermore, this is a solution many companies can adopt today. It is also critical that these companies materially enhance their investment in electrifying rail and trucks today to meaningfully align their operations with the goal of decarbonizing shipping-related emissions. Last mile delivery vehicles in particular should be zero emission by 2030.
- Electrification – The IPCC has identified electrification as potential pathways for the aviation sector to decrease its dependence on fossil based liquid fuels.<sup>13</sup> The solutions this could produce are years off, and companies have not shown sufficient investment in their development and adoption.
- Sustainable Aviation Fuel (SAF) – The aviation industry has identified SAF—a broad category of aviation fuels produced from non-fossil fuel based sources—as the aviation sector's preferred near-term option. This false solution gives the industry a longer runway to conduct business as usual while promising the technological solution to the problem it is creating is just around the corner. In truth, SAF has important caveats that make its role in emissions reduction unlikely if not impossible. First, there is no standard chemical composition for SAF. The fuel is produced in many ways, using multiple products and feedstocks, based on local availability. The result is that different types of fuel have very different emissions profiles.

## Sustainable Aviation Fuel – The Devil’s in the Details

Category	Feedstock	Climate Potential
<b>First-Generation Biofuels</b>	Food crop biomass (corn, palm, soy, etc.)	<b>Low</b> – limited climate benefit on lifecycle basis relative to fossil fuels, often resulting in the conversion of food croplands and forests
<b>Second-Generation/ Advanced Biofuels</b>	Non-food biomass (agricultural residue, waste cooking oil, switchgrass, etc.)	<b>Medium</b> – marginal improvement on first-generation, limited by the potential to increase deforestation
<b>Synthetics and E-Fuels</b>	Atmospheric CO <sub>2</sub> , synthesized using renewable or hydroelectric energy sources	<b>Medium-High</b> – highest potential to reduce emissions, but limited by technological immaturity and dependence on renewable hydrogen energy

- The industry’s embrace of SAF is not matched by the level of clarity on fuel type, nor by action to date on securing a supply. Of the four global carriers, only DHL has purchased SAFs in meaningful volume, providing details on the volume and source of SAF contracts it has signed thus far, with over 400 million gallons of SAFs under contract.

### Climate Risk is Business Risk

Emissions are more than a climate problem. For global air freight operators, the need to reduce emissions could mean material risk to sustainable business operations over the long-term as more of the industry’s customers begin to enact meaningful climate plans. There are signs that suggest large consumer goods manufacturers are already beginning to reconsider their reliance on air freight in the context of their public commitments to reduce GHG emissions by 2030. For example, fashion retailer Lululemon<sup>14</sup> and tech giant Apple have announced their intention to reduce their use of air freight cargo for global shipments as a way to achieve climate goals.<sup>15</sup>

### A Critical Window for Action

2030 is an important deadline for global efforts to limit emissions. Many companies referenced in this report have made rhetorical commitments to reducing emissions over the second half of the decade, but their air freight operations demonstrate little progress has been made. Amazon Air, in particular, is going in the wrong direction with double-digit annual emissions growth.

There is an opening in this sector for operators to compete on the basis of their alignment with climate targets. Instead, industry leaders have only offered more hot air, with savvy branding and marketing touting their climate concern without backing it by measurable commitments.



# Endnotes

1. ["COVID-19 staycations and the implications for leisure travel"](#), Helyon 8.10, October 2022.
2. ["2020 Worst Year in History for Air Travel Demand"](#), IATA, February 2020.
3. [Airports, air pollution and climate change](#), ODI Policy Brief, February 2024.
4. [Long-term potential for increased shipping efficiency through the adoption of industry-leading practices](#), The International Council on Clean Transportation, July 2013.
5. [How shipping, including short sea shipping, compares favourably to other modes of transport on CO2 emissions](#), European Community Shipowners' Associations, 2020.
6. [Emission calculator for greenhouse gases and exhaust emissions](#), EcoTransIT World, Accessed June 6, 2024.
7. ["A review of health effects associated with exposure to jet engine emissions in and around airports"](#), Environmental Health, 2021.
8. ["Amazon Prime's one-day shipping is already rolling out"](#), The Verge, May 2019.
9. ["We Definitely Spoke Too Soon - Amazon Prime Membership Picks Up Again"](#), Consumer Intelligence Research Partners, LLC. April 2024.
10. ["Amazon Prime growth takes off again. A record 75% of Americans use it"](#), Business Insider, April 2024.
11. ["Walmart Matches Amazon With One-Day Shipping on Many Items"](#), Bloomberg, May 2019.
12. ["Achieving 5% carbon reduction by 2030"](#), Airline, January 2024.
13. [IPCC Sixth Assessment Report, Working Group III: Mitigation of Climate Change](#), Intergovernmental Panel on Climate Change, 2022
14. [Impact Report 2022](#), Lululemon, 2022.
15. [Environmental Progress Report](#), Apple, May 2024.

# Annex

## Data and Assumption

1. Data on emissions were obtained from two sources.
  - a. Cirium aviation analytics provided data for 2019-2023 for four companies - Amazon Air, Federal Express, UPS and DHL - aggregated at a monthly level for number of flights traveled between airports, estimated emissions for each flight by plane type between these airports, and estimated fuel use. Wherever individual company data are used, it is from Cirium aviation.
  - b. IBA groups NetZero aviation intelligence and advisory access for flight level data on estimated emissions for 2019-2023. This interactive and user friendly platform includes data on regional travel, aviation for passenger and desiccated freighter, as well as plane type. Overall freighter, passenger and aviation emissions are based on IBA analysis.
2. Belly cargo estimates
  - a. Third party data reflect dedicated freighters only. To assess belly cargo, estimates from the report by ICCT in 2019<sup>1</sup> were applied to passenger aviation estimates for 2023
  - b. Belly cargo numbers for the pandemic years were not estimated as there was business disruption and thus would not be reflective of a 'normal' year.
  - c. Belly cargo averaged at 8.77% of passenger emissions for 2018 and 2019 (ICCT 2019). This average was applied to passenger emissions for 2023 (IBA group) to obtain 66.69 MtCO<sub>2</sub>.
3. Equivalencies:
  - a. Fuel use and CO<sub>2</sub>e
    - i. Using industry standards provided by IBA group:
      1. Fuel use = CO<sub>2</sub> / 3.16
      2. CO<sub>2</sub>e = fuel use \* 3.84
    - ii. Fuel use for landing and take off (LTO) was assumed to be 10% of full flight fuel use, as is taken as industry standard
  - b. Pollutant estimates
    - i. Grams per kilogram of fuel used for NO<sub>x</sub> and PM<sub>2.5</sub> were taken as the average for all flights in the ICCT 2019 report. Underlying data for the report were shared by ICCT to use in our estimation.
  - b. Estimates for passenger cars
    - i. Grams of pollutant per mile, and yearly average miles driven for passenger cars were taken from [US BTS](#)
  - d. Coal plant equivalents for CO<sub>2</sub> emissions were taken from the US EPA GHG equivalencies calculator

---

1. <https://theicct.org/wp-content/uploads/2021/06/CO2-commercial-aviation-oct2020.pdf>

## Limitations

All third-party data used in the report is presumed to be correct. For assumptions and model details by these data providers, please refer to the respective websites of Cirium and IBA group. It is not within scope of this project to assess the validity of their models and assumptions, but rather the goal was to use their estimates to understand the trends in freighter aviation over time. This is especially evident for Amazon Air (Amazon Prime) as all of their aircraft are operated by contracted partners, such as Air Transport International and Atlas Air. It is unknown if the data providers were able to accurately differentiate between flights that each of these partners operate for Amazon versus for other clients, as well as data might be missing for its Delivery Service Providers (DSPs).



## June 2024

### Primary authors:

Joshua Archer

### Lead researcher:

Devyani Singh

### Contributors:

Cari Barcas

Gary Cook

Victoria Leistman

Logan McIntosh

Todd Paglia

Shane Reese

Sara Stith

Kendra Ulrich

### Designer:

Justin Lu

The data in this report have been prepared using best practices and due diligence using information available at date of publication. All information is subject to change. All data are obtained from public sources including but not limited to government data, company websites, academic literature and third-party research institute reports, or from emissions factors or conversion formulas derived from said data. If you represent an organization that appears in this report or associated documents that you believe is misrepresented, supplemental information can be sent to [SRG@Stand.earth](mailto:SRG@Stand.earth).