

Boeing: Greenhouse Gas Emissions Supplement to the 2023 Sustainability Report Scopes 1 - 3

This supplement to Boeing's 2023 Sustainability Report provides additional detail and context for understanding our disclosure of greenhouse gas (GHG) emissions. Boeing has been sharing our Scope 1, Scope 2 and Scope 3 – Category 6 (Business Travel) emissions for over a decade, and our efforts to increase fuel efficiency of our aircraft and conserve energy at our operational sites have been priorities for years. We more recently calculated and disclosed Scope 3 – Category 11 (Use of Sold Products) GHG emissions, including sold commercial aircraft in the 2021 Sustainability Report and both sold commercial and defense aircraft premiering in the 2022 Sustainability Report and continue to do so in the 2023 Sustainability Report. To provide context, this supplement includes emissions calculations for previous years. We are providing this as part of our stakeholder-oriented reporting, as we continue to work toward ambitious external and internal emissions reduction goals.

History

In 2007-2008, Boeing released our first Environment Report, announcing significant strides in our governance as well as our goals for performance. For example, we set up a policy council, led by Boeing's then President & CEO, to ensure that strategy and performance targets were set and monitored at the highest levels of company leadership, and we set the standard for ISO 14001 conformance at all of our major manufacturing sites by the end of 2008. For our metrics, we set five-year targets to improve energy efficiency and GHG emissions intensity by 25%, while acknowledging the need to reduce on an absolute basis, as well as targeting other environmental performance improvements. We also joined the U.S. Environmental Protection Agency (EPA) Climate Leaders program, committing to reduce the company's environmental impact by completing a companywide GHG emissions inventory, establishing reduction targets, and reporting progress to the EPA on an annual basis.¹

Since that initial commitment, we've done just that: set targets, measured and disclosed GHG emissions publicly. Our primary avenue for disclosure has been the CDP climate questionnaire. As CDP questions have grown in scope since 2008, so has our disclosure (see our most recent CDP reporting [here](#)). We have regularly published our stakeholder priorities within our environmental and sustainability reporting, and GHG and climate topics are viewed as not only some of the most important environmental priorities for stakeholders but also crucial to our business success.

Industry Performance

We have always worked to increase the fuel efficiency of aircraft and have made substantial progress with each new generation of products. Aircraft and engine manufacturers have made long-term investments in technological innovation to reduce fuel burn and carbon emissions. In the past two decades, these investments are already decoupling the growth in carbon dioxide (CO₂) emissions from the growth in overall air traffic—with the rate of CO₂ growth less than half of that of traffic growth before the COVID-19 pandemic. We continue to heavily invest in technological innovations to achieve further reductions, in alignment with our customers as they achieve better fuel efficiency through newer products and operational efficiencies reducing fuel consumption, airline costs, and carbon emissions. Boeing's commitment to continued safe and sustainable air travel supports aviation's global climate strategy, and we share regular updates on that progress in our annual Sustainability Report.

¹ EPA ended the Climate Leaders program in 2011

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The commercial aviation industry set the world's first sectoral targets for CO₂ reductions in 2009. The industry surpassed the first climate goal (1.5% per year fuel efficiency gains), with an average year-over-year fuel efficiency improvement above 2% between 2009 and 2019.² The industry set an even more ambitious target for civil aviation in October 2021 at the annual general meeting of the International Air Transport Association (IATA). This target, Fly Net Zero, is the ambition by commercial airlines to achieve net zero carbon by 2050. This pledge brings air transport in line with the objectives of the Paris Agreement to limit global warming to 1.5°C. More details of our strategy for sustainable aerospace are in pages 27-49 of the 2023 Sustainability Report.

Performance in Boeing Operations

In Boeing's factories and worksites, energy efficiency helps drive our competitiveness—and our GHG emissions reduction. In 2022, Boeing was recognized as an EPA ENERGY STAR Partner of the Year. We are also accelerating our use of renewable electricity, and have set a target of 100% renewable electricity by 2030, which includes the purchase of renewable electricity and renewable energy credits. Boeing is a member of both the EPA Green Power Partnership program and the Renewable Energy Buyers Alliance, a community of large energy buyers accelerating a lower-carbon energy future. We supplemented our conservation and renewable energy efforts by securing carefully-selected, third-party-verified offsets to achieve net zero emissions across manufacturing and other work sites every year since 2020. Learn more about our progress on Scope 1 and Scope 2 emissions and our 2030 goals on pages 12 and 53-55 of the 2023 Sustainability Report.

Emissions Calculations

Boeing calculates emissions in accordance with the Greenhouse Gas Protocol. Scope 1 emissions are those under our direct control, associated with our facilities and our vehicles across the enterprise. Scope 2 covers indirect emissions associated with purchased electricity.³ Scope 3 emissions are from sources that are not under Boeing's operational control, but instead occur in the value chain. There are 15 categories of Scope 3 emissions, and we currently have quantified, audited data for two of them: Category 6 (Employee Business Travel) and Category 11 (Use of Sold Products).

Each year, we calculate the previous calendar year's emissions (as well as any revised or restated emissions for other years), and receive third-party verification of our GHG data and calculation methodology to the level of "limited assurance" before publication. Our 2023 verified emissions for 2017-2022 are shared in the emissions table below, and in our updated published third-party statements. We have also verified and are restating our 2021 Scope 3 – Category 6 (Employee Business Travel) to reflect corrections made to internal reporting systems.

² Source: IATA/ATAG analysis. https://aviationbenefits.org/media/167517/aw-oct-final-atag_abbb-2020-publication-digital.pdf#page=15

³ Boeing does not purchase heat, steam, or cooling, so these are not part of our Scope 2 calculations.

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We regularly refine our approach to calculating relevant categories of Scope 3 emissions, aligned with industry standards and best practices. Our recent CDP climate reports provide a clear example: we disclosed Scope 3 – Category 11 (Use of Sold Product) emissions for the first time in 2021 and added defense aircraft in 2022. In accordance with the Greenhouse Gas Protocol, the minimum boundary of Category 11 includes direct use-phase emissions of sold products, but companies may also account for indirect use-phase emissions of sold products — in this case, emissions associated with the production and delivery of the fuel that is combusted. The protocol directs reporting organizations to include the projected lifetime emissions of products sold in the reporting year. Using published delivery data from Boeing Commercial Airplanes, published and non-published delivery data for Boeing Defense, Space & Security aircraft, and informed assumptions about their performance and longevity, we calculated emissions for delivered commercial aircraft and defense aircraft.⁴ We used EPA emissions factors, included indirect use-phase emissions and assumed no emissions benefit from sustainable aviation fuel (SAF), even though SAF can reduce CO₂ emissions from flying by up to 80% over the fuel's life cycle. We continue to evaluate appropriate emissions calculations and approaches across our value stream.

Boeing Commercial Airplanes Longevity Assumptions

Design	Lifetime
Single-Aisle	22.8 years
Twin-Aisle	21.5 years
Freighter	29.6 years

In our effort to expand our emissions inventory to include Category 11 (Use of Sold Products) for both commercial and defense products, we chose to assure the accuracy of our approach by engaging a third-party auditor for a limited assurance verification, a standard practice for our CDP reporting.

The impact of the grounding of the 737 MAX through most of 2020 and into 2021, as well as the extraordinary challenges to the aviation industry caused by the COVID-19 pandemic, combined to make 2020 and 2021 some of the most challenging years in our company's history. Boeing's GHG emissions show the effects of these challenges on operations (Scopes 1 and 2) and on business travel and sold products (Scope 3). To provide context for these anomalous years, we also calculated and received verification for revised commercial products emissions data from previous years, back through 2017, which we selected because it also serves as the base year for our operational Scope 1 and 2 goals. We also developed a methodology for calculating defense product emissions, based on service life and average fuel flow, and included emissions from defense aircraft for the first time in Boeing's 2022 Sustainability Report and in this supplement.

⁴ 2022 and previous years' commercial delivery data are available at <https://www.boeing.com/commercial/#/orders-deliveries>. Delivery data, when public, for defense aircraft are in each year's Annual Report.

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Boeing GHG emissions (million metric tons CO₂e)^a

Scope & Category of Emissions	2022	2021	2020	2019	2018	2017
Scope 1	0.642	0.612	0.554	0.609	0.622	0.634
Scope 2 (Market-Based)	0.401	0.446	0.526	0.606	0.593	0.609
Scope 3 (Total Categories 6 and 11)	385	300	243	510	719	758
Category 6: Business Travel	0.186	0.088	0.092	0.290	0.320	0.285
Category 11: Use of Sold Products	385 ^b	300 ^b	243 ^b	510 ^b	719 ^b	758
Direct Combustion	335	261	212	445	627	660
Indirect Fuel Production	50	39	32	66	93	98
Total of All Calculated Emissions	386	301	244	512	721	760

^a data are presented with appropriate level of accuracy and significant figures

^b totals may not appear to match sum of direct & indirect emissions because of rounding

The Path Forward

Boeing has set product targets in alignment with the commercial aviation industry's global sectoral ambitions for net zero commercial aviation by 2050. For defense products, we are actively working with and listening to our government customers to understand and support their future requirements. We've set targets for our operations based on benchmarking against leading industrial and corporate performers and by using the scientific basis relevant to the time when we set the goals. Boeing's 2023 Sustainability Report highlights our ambitions, and we will share any additional metrics and milestones toward our goals in our next report. We affirm the importance of transparency with all of our stakeholders, and our climate disclosures will continue to be responsive to the input from our employees, customers, communities, suppliers, regulatory and government officials and our finance community.