

Boeing Scopes 1-3 Greenhouse Gas Emissions Supplement to the 2024 Sustainability and Social Impact Report

Introduction

This supplement to Boeing's [2024 Sustainability & Social Impact 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. We more recently calculated and disclosed Scope 3 – Category 11 (Use of Sold Products) GHG emissions, for both sold commercial (first shared in 2021) and defense aircraft (2022) and continue to do so in the 2024 Sustainability & Social Impact Report. Our commitment to enhancing fuel efficiency in our aircraft and conserving energy at our operational sites has been a longstanding priority. This supplement includes emissions calculations for previous years and provides additional information about our methodology. We provide this as part of our stakeholder-oriented reporting, as we continue support of the commercial aviation industry's ambition to be net zero by 2050 and our own Scope 1 and 2 reduction goals.

Approach to GHG Strategy

Boeing considers climate change to be an urgent issue and strives to reduce operational GHG emissions, both during times of growth and during challenging times. In 2018, we set a 2025 Scope 1 and 2 GHG reduction goal with a 2017 baseline. In addition, we established a 2030 Scope 1 and 2 GHG goal during the COVID-19 pandemic, when manufacturing rates were impacted by global conditions. As such, we selected a 2017 baseline as it represented more “normal” operating conditions within the global economy. Our strategy for our operational GHG goals (Scope 1 and Scope 2 emissions) align to a 1.5 degrees Celsius global warming potential scenario, in support of the global climate goals. We have achieved our 2025 Scope 1 and 2 GHG reduction target and continue to focus on driving progress to our 2030 target. We disclose our GHG data annually in our sustainability reporting and the CDP climate questionnaire.

In Boeing's factories and worksites, energy efficiency helps drive our competitiveness and our GHG emissions reduction. We are accelerating our procurement of renewable electricity and have set a target of 100% renewable electricity by 2030, which includes the purchase of renewable electricity and Renewable Energy Certificates. 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. Learn more about our progress on Scope 1 and Scope 2 emissions and our 2030 GHG goal on pages 7-8 of the [2024 Sustainability and Social Impact Report](#).

We have continued working to increase the fuel efficiency of aircraft and have made substantial progress. Boeing and its suppliers 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 emissions from aviation rising only half as much as the increase in air travel. 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, which reduce fuel consumption, airline costs, and carbon emissions. For defense products, we are actively working with and listening to our government customers to understand and support their requirements. 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 reporting.

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 2019.¹ 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 the commercial aviation industry to achieve net zero carbon by 2050. This pledge brings commercial air transport in line with the objectives of the Paris Agreement to limit global warming to 1.5°C.

¹ Source: IATA. <https://www.iata.org/contentassets/dcd25da635cd4c3697b5d0d8ae32e159/iata-agm-resolution-on-net-zero-carbon-emissions.pdf>

Boeing Scopes 1-3 Greenhouse Gas Emissions Supplement to the 2024 Sustainability and Social Impact Report

Governance and Risk Management

The Board of Directors has extensive oversight of strategy development, company culture, political and charitable contributions, corporate sustainability and key strategic, operational and compliance risks. Boeing has established processes to identify, assess, mitigate and manage risk. The Board has delegated to the Audit Committee primary responsibility for oversight of the company’s policies, practices and guidelines with respect to risk assessment and risk management, including assessing key strategic, operational and compliance risks.

Please see Pages 9-11 of our [2024 Sustainability & Social Impact Report](#) for further details about sustainability governance and risk management.

Methodology

Boeing calculates emissions in accordance with the Greenhouse Gas Protocol (GHG Protocol) ², which was developed by the World Resources Institute (WRI) in partnership with the World Business Council for Sustainable Development (WBCSD). 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.” Our verified emissions for 2017-2023 are shared in the emissions table below, and in our updated published [third-party statements](#).

Scope & Category of Emissions (Million MT CO ₂ e)	2023	2022	2021	2020	2019	2018	2017 ^c
Scope 1 ^a	0.536	0.642	0.612	0.554	0.609	0.622	0.634
Scope 2 (Market-Based)	0.380	0.401	0.447	0.526	0.606	0.594	0.609
Consolidated Scope 1 and Scope 2 (gross)	0.916	1.043	1.059	1.08	1.215	1.216	1.243
Scope 3 (Total Categories 6 and 11)	448	385	300	243	510	719	758
Category 6: Business Travel	0.254	0.186	0.088	0.092	0.290	0.320	0.285
Category 11: Use of Sold Products	448 ^b	385 ^b	300 ^b	243 ^b	510 ^b	719 ^b	758
Direct Combustion	390	335	261	212	445	627	660
Indirect Fuel Production	59	50	39	32	66	93	98
Total of All Calculated Emissions	448	385	300	243	510	719	758

^a Reported 2023 Scope 1 emissions exclude emissions not directly attributable to site-specific operations

^b Totals may not appear to match sum of direct & indirect emissions due to rounding. Boeing is in the process of reviewing prior year stated emissions to ensure accuracy.

^c baseline year

Operational Control

The Boeing Company has chosen to use operational control as the primary approach in determining inclusion in its GHG emissions inventory for Scopes 1 and 2. Boeing has integrated the sites/buildings into the corporate reporting inventory through adoption of the corporate greenhouse gas accounting and reporting process. A comprehensive list of owned and leased buildings over which Boeing has operational control is developed annually and used to support our reporting.

Exclusions

The following exclusions are applied to the organization boundary— retired or vacant buildings, government owned, joint ventures, vendor or unknown buildings, residences not labeled as home offices, and areas less than 50 square feet.

For Scope 3 Category 11 Use of Sold Products for Defense, Boeing excludes space, detonation emissions, land and marine vehicles.

² [Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard](#)

Boeing Scopes 1-3 Greenhouse Gas Emissions Supplement to the 2024 Sustainability and Social Impact Report

Scope 1

Scope 1 GHG emissions are those under our direct control, associated with our facilities and our vehicles across the enterprise.

For Scope 1, the primary emissions source is the combustion of fossil fuels. Fuel emissions are calculated based on the total fuels delivered to the site or source. The total fuel delivered to the site or source (either based on actual or estimated quantities) are converted to mass emissions estimates using the appropriate emission factors as referenced in the hierarchy noted below. The inventory includes the emissions from the total fuel delivered and consumption by small sources (including heaters, electrical generators, pumps, and other internal combustion equipment), but the equipment is not individually inventoried. This scope also includes: direct emissions from use of Boeing owned off-road vehicles used at Boeing sites, and on-road vehicles used on and/or off Boeing sites; fugitive emissions from refrigerant leaks; and fugitive emissions from use of chemicals with global warming potentials. Scope 1 emissions are calculated based on actual delivery/consumption data or estimated. The total is summed and included in the GHG Inventory.

Enterprise GHG emissions from operations are calculated after the conclusion of the reporting year. Emissions from natural gas and electricity usage at 37 of our highest energy usage sites (Core Metric Sites) are calculated and monitored internally on a monthly basis through the use of utility bills and are continuously validated and updated throughout the reporting year. The emissions factors for these energy sources are validated at least annually and updated when appropriate following guidance from the GHG Protocol.

The majority of our direct GHG emissions are from stationary combustion sources. Data from these sources come from monthly utility bills, consumption data from meter readings or records provided by site representatives. Emissions from building heating and cooling where purchased utility records are not available are estimated based on square footage and building use/type using factors from EIA's CBECS. If data is not available in time for reporting, estimation is made based on prior year consumption. Information on jet fuel consumption, including defueling, refueling, paybacks and distinction between Boeing fuel and customer-purchased fuel, is obtained from invoices. In all cases, procedures are in place to assure the correct separation between fuel used by The Boeing Company and fuel supplied through The Boeing Company for customer use. Additionally, Executive Flight Operations logs fuel use in corporate aircraft domestically and outside the United States. For direct emissions from fugitive sources and processes, totals are calculated from the chemical quantities multiplied by a Global Warming Potential factor.

Scope 2

Scope 2 GHG emissions covers indirect emissions associated with purchased electricity.³

For Scope 2 Location- and Market-based emissions, indirect emissions from purchased electricity are calculated and included in the emissions inventory. We apply emissions factors in accordance with the hierarchy noted below on the basis of purchased electricity, reported in units of megawatt hour. Scope 2 market-based emissions reflect the application of Renewable Energy Certificates, supplier specific emission factors, and residual mixes as applied per the hierarchy below. Emissions from building heating and cooling where purchased utility records are not available are also calculated. Emissions are estimated based on square footage and building use/type using factors from Energy Information Administration's Commercial Buildings Energy Consumption Survey's data. Seldom, when data is not available in time for reporting, estimation is made based on prior year consumption. The resulting estimated natural gas emissions are included in Scope 1, and estimated electricity emissions are included in Scope 2.

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

Boeing Scopes 1-3 Greenhouse Gas Emissions Supplement to the 2024 Sustainability and Social Impact Report

Emissions from purchased electricity records for Core Metric Sites represent two thirds of total reported Enterprise emissions (Scope 1 + Scope 2 (market)), or approximately 1,200 buildings. For smaller sites (including in the US, UK, India, Australia, and others), we collect data from in-country environmental, health and safety representatives. For buildings where no records are available, (e.g., leased office space), energy use is estimated. Currently, electricity usage from 338 buildings is estimated.

Scope 3

Boeing currently reports on a subset of GHG Protocol Scope 3 Categories, including Categories 6 Business Travel and 11 Use of Sold Products. Scope 3 Category 11 for our commercial products represents an estimated 90% of Boeing's total inventoried emissions, making it the only material Scope 3 category, and is therefore defined as the only relevant category of Scope 3 emissions for Boeing under the Climate Action 100+ Net Zero Benchmark. We assess and refine our approach to calculating relevant categories of Scope 3 emissions to align with developments in industry standards and best practices.

Category 6 - Business Travel

For Scope 3 Category 6 (Business Travel), indirect emissions from employee business travel, including commercial air travel and business car rentals, are calculated and reported. Commercial air travel is estimated from total miles flown. GHG emissions from air travel are calculated with the WRI calculation tool for transportation resources. Business car rental emissions are estimated from the total miles traveled and car class as reported to The Boeing Company by car rental companies. The calculation does not include the emissions from other modes of travel, such as rail or ride-share.

Category 11 - Use of Sold Products

For Scope 3 Category 11 (Use of Sold Products), we use published delivery data from Boeing Commercial Airplanes, published and non-published delivery data for Boeing Defense, Space & Security and informed assumptions about our products' performance and longevity. Emissions are calculated for both delivered commercial and defense aircraft. We use EPA emissions factors and assume no benefit from sustainable aviation fuel (SAF). We disclosed Scope 3 Category 11 emissions for commercial aircraft for the first time in 2021 and added defense aircraft in 2022.

In accordance with the GHG 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 GHG Protocol directs reporting organizations to include the projected lifetime emissions of products sold in the reporting year. We continue to evaluate appropriate emissions calculations and approaches for value stream emissions.

Boeing Commercial Airplanes Longevity Assumptions

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

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 reporting.

Boeing Scopes 1-3 Greenhouse Gas Emissions Supplement to the 2024 Sustainability and Social Impact Report

Emissions Factors and Sources

- Scope 1: Emission factors (EF) for direct emissions are sourced from the Environmental Protection Agency (EPA), the United Nations' (UN) Intergovernmental Panel on Climate Change (IPCC), Carbon Reduction Commitment (CRC), Energy Efficiency Scheme (UK) and Department of Climate Change, Energy, the Environment and Water (Australia).
- Scope 2 (Location): The location-based method applies the following hierarchy: first, regional EF, e.g. EPA eGRID, then national EF, e.g. IEA.
- Scope 2 (Market): Generation-only emission factors for the market-based method are first sourced for specific geographies (Seattle, Snohomish and Manitoba) where appropriate and applicable, Renewable Energy Certificates (RECs) are attributed; then the EPA's eGRID Emission Factors (EF); then European residual mixes for European operations; and finally the International Energy Agency's (IEA) national EF.

Scope	Emission Factors	Source
Scope 1	Environmental Protection Agency (EPA); US 40CFR98 table C-1, C-2	https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98?toc=1
	National Greenhouse and Energy Reporting Scheme (NGER)	https://cer.gov.au/schemes/national-greenhouse-and-energy-reporting-scheme
	National Inventory Report: Greenhouse Gas Sources and Sinks in Canada	https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html
	Streamlined Energy and Carbon Reporting (SECR)	https://www.gov.uk/government/publications/academy-trust-financial-management-good-practice-guides/streamlined-energy-and-carbon-reporting
	United Nations' (UN) Intergovernmental Panel on Climate Change (IPCC)	https://www.ipcc.ch/data/
	US Energy Information System	https://www.eia.gov/international/data/world
Scope 2 Location & Market	EPA eGRID	https://www.epa.gov/energy
	National Greenhouse and Energy Reporting Scheme (NGER)	https://cer.gov.au/schemes/national-greenhouse-and-energy-reporting-scheme
	National Inventory Report : Greenhouse Gas Sources and Sinks in Canada	https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html
	Streamlined Energy and Carbon Reporting (SECR)	https://www.gov.uk/government/publications/academy-trust-financial-management-good-practice-guides/streamlined-energy-and-carbon-reporting
	International Energy Agency	https://www.iea.org/data-and-statistics/data-product/emissions-factors-2022
	US Energy Information System	https://www.eia.gov/international/data/world
Scope 2 Market	The Climate Registry	https://cris4.org/(S(acwlcikyplc30bhg23jjumb1))/frmLILogin.aspx
	Snohomish PUD	https://www.snopud.com/community-environment/clean-energy/carbon-emissions-data/
	Association of Issuing Bodies, European Residual Mixes	https://www.aib-net.org/facts/european-residual-mix

Boeing Scopes 1-3 Greenhouse Gas Emissions Supplement to the 2024 Sustainability and Social Impact Report

Recalculation & Restatement Procedure

We follow the GHG Protocol Corporate Standard⁴ or significant changes that may trigger a base-year recalculation including the following:

- Structural changes to ownership or control (e.g., mergers, acquisitions, divestitures, and outsourcing and in-sourcing of emitting activities)
- Changes in state of leased assets (ending leases or obtaining new leases)
- Changes in calculation methodology or improvement in the accuracy of emission factors or activity data
- Discovery of significant errors

If any of the changes listed above are relevant and impact the base year in excess of a 5% Scope 1 and Scope 2 significance threshold, the base year and all subsequent years are updated to reflect the latest changes in methodology and data accuracy.

Learn More

Boeing's [2024 Sustainability and Social Impact Report](#) further highlights our ambitions and progress.

⁴ WRI/WBCSD 2004