

Google

Environmental Report

2021



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About this report

Google's 2021 Environmental Report provides an update on the more detailed information about our sustainability strategy that we shared in our [2020 Environmental Report](#). Our 2021 report covers our 2020 fiscal year (January 1 to December 31, 2020) and includes data, performance highlights, and progress against our targets. It also mentions notable targets set in 2021.

This report outlines how we're driving positive environmental impact throughout our business in five key ways: designing efficient data centers, advancing carbon-free energy, creating sustainable workplaces, building better devices and services, and empowering users with technology.

For more information about our overall corporate responsibility initiatives, see Google's [Sustainability](#) and [Commitments](#) websites, as well as [sustainability and related information](#). For more information about our business, see [About Google](#) and [Alphabet's Investor Relations website](#).

Our approach

We believe that every business has the opportunity and obligation to protect our planet. Sustainability is one of our core values at Google, and we strive to build sustainability into everything we do.

We've been a leader on sustainability and climate change since Google's founding over 20 years ago. These are some of our key achievements over the past two decades:

2007: We became the first major company to be carbon neutral for our operations.

2017: We became the first major company to match 100% of our annual electricity use with renewable energy, which we've achieved for four consecutive years.

2020: We issued \$5.75 billion in sustainability bonds—the largest sustainability or green bond issuance by any company in history.

2020: We compensated for our legacy carbon footprint, making Google the first major company to be carbon neutral for its entire operating history.

Our five-year sustainability strategy is focused on three key pillars: accelerating the transition to carbon-free energy and a circular economy, empowering everyone with technology, and benefiting the people and places where we operate (see Figure 1).

Figure 1

FIVE-YEAR SUSTAINABILITY STRATEGY OVERVIEW

We strive to build sustainability into everything we do



Accelerate carbon-free and circular

Decouple business growth from the growth of carbon intensity and material use



Empower with technology

Tackle major sustainability problems and drive net-positive impact using Google technologies, platforms, products, and services



Benefit people and places

Share benefits with the communities of our facilities, users, partners, and suppliers

To accelerate the transition to a carbon-free economy, in 2020, we launched our [third decade of climate action](#), and we're now working toward a new set of ambitious commitments. By 2030, we aim to:

Achieve [net-zero emissions](#) across all of our operations and value chain

Become the first major company to run on [carbon-free energy](#) 24 hours a day, seven days a week, 365 days a year

Enable 5 gigawatts of new carbon-free energy through investments in our key manufacturing regions

Help more than 500 cities and local governments reduce an aggregate of 1 gigaton of carbon emissions annually

To accelerate the transition to a circular economy, we're working to maximize the [reuse of finite resources](#) across our operations, products, and supply chains and to enable others to do the same. We're also working to empower everyone with technology by committing to help 1 billion people make [more sustainable choices](#) by 2022 through our core products.

To benefit the people and places where we operate, we've set goals to replenish [more water than we consume](#) by 2030 and to support water security in communities where we operate. We'll focus on three areas: enhancing our stewardship of water resources across Google office campuses and data centers; replenishing our water use and improving watershed health and ecosystems in water-stressed communities; and sharing technology and tools that help everyone predict, prevent, and recover from water stress.

At Google, we remain steadfast in our [commitment to sustainability](#), and we'll continue to lead and encourage others to join us in improving the health of our planet. We're proud of what we've achieved so far, and we're energized to help move the world closer to a more sustainable and carbon-free future for all.

Performance highlights

The following section provides a snapshot of our performance as of the end of 2020—demonstrating how we're strengthening our business by reducing the environmental impact of our operations and working to empower people everywhere to live more sustainably.

For a more complete overview of our performance over time, see the [environmental data table](#).

DESIGNING EFFICIENT DATA CENTERS

Energy

2x
as energy efficient

On average, a Google data center is twice as energy efficient as a typical enterprise data center.¹

6x
as much computing power

Compared with five years ago, we now deliver around six times as much computing power with the same amount of electrical power.

1.10
average annual PUE

In 2020, the average annual PUE² for our global fleet of data centers was 1.10, compared with the industry average of 1.59³—meaning that Google data centers use about six times less overhead energy.

GHG emissions

0
operational GHG emissions

Whether someone is using Google at home or as part of an organization running Google Cloud or Google Workspace, all products in our Cloud are carbon neutral—meaning that the operational GHG emissions associated with running workloads on our infrastructure have been reduced through procurement of renewable energy and any residual emissions have been compensated for with high-quality carbon credits.⁴

Waste

81%
of waste diverted

In 2020, we diverted 81% of waste from our global data center operations away from landfills.

23%
of components refurbished

In 2020, 23% of components used for server upgrades were refurbished inventory.

8.2 million
components resold

In 2020, we wiped clean and resold nearly 8.2 million components into the secondary market for reuse by other organizations.

ADVANCING CARBON-FREE ENERGY

Energy

Investment

6 GW of renewable energy

From 2010 to 2020, we signed more than 55 agreements totaling nearly 6 GW of renewable energy, representing a commitment of approximately \$4 billion through 2034.

100% renewable energy

In 2020, we matched 100% of the electricity consumption of our operations with renewable energy purchases for the fourth consecutive year.

55 million MWh of renewable energy

Google is the world's largest annual corporate purchaser of renewable energy, based on renewable electricity purchased in megawatt-hours (MWh). From 2010 to 2020, we purchased a total of more than 55 million MWh of renewable energy through PPAs, via on-site generation, and from the electric grids where our facilities are located.

\$3.3 billion in investment commitments

From 2010 to 2020, we made commitments to invest nearly \$3.3 billion in renewable energy projects with an expected combined capacity of approximately 8.7 GW. These targeted investments go beyond our purchases of renewable energy for our own operational footprint.

GHG emissions

63% cumulative GHG emissions reduction

From 2011 to 2020, our renewable energy purchasing resulted in a cumulative 63% reduction in our Scope 1 and Scope 2 emissions, as compared with a business-as-usual scenario in which we didn't procure renewable energy via PPAs.

87% decrease in carbon intensity

From 2011 to 2020, our carbon intensity per unit of revenue decreased by 87%.

14 years of carbon neutrality

Google has been carbon neutral since 2007. Because of our purchases of renewable energy and procurement of high-quality carbon credits, we have compensated for our operational GHG emissions.

0 legacy GHG emissions

As of September 14, 2020, we had purchased enough high-quality carbon credits to compensate for our entire legacy carbon footprint since our founding, making Google the first major company to be carbon neutral for its entire operating history.

CREATING SUSTAINABLE WORKPLACES

Certifications

17 million ft² LEED-certified

From 2009 to 2020, over 1.5 million m² (17 million ft²) of Google office facilities achieved LEED certification.

27% LEED Platinum

27% of our LEED-certified square footage has achieved a Platinum rating and 58% a Gold rating.

3 campuses with Alliance for Water Stewardship certification

In 2020, we were the first major tech company to achieve Alliance for Water Stewardship certification for our campuses in Mountain View and Los Angeles, California, and Dublin, Ireland.

1st building project with ILFI Zero Carbon Certification

Our London office at 6 Pancras Square was the first building project in the world to receive ILFI Zero Carbon Certification, meaning that it was designed and constructed and operates with zero carbon impact.

Waste

71% landfill diversion

In 2020, we reached a 71% landfill diversion rate for waste from our offices globally.

9.7 million lbs of food waste prevented

From 2014 to 2020, we prevented a total of nearly 4.4 million kg (9.7 million lbs) of waste in our cafés globally by tracking pre-consumer food waste.

Commuting

3,600 EV charging ports at our offices

From 2017 to 2020, we installed more than 3,600 EV charging ports at our offices in the United States and Canada.

BUILDING BETTER DEVICES AND SERVICES

GHG emissions

100%
of shipments are
carbon neutral

All shipments of Made by Google products to and from direct customers are carbon neutral.⁵

38%
emissions reduction per
metric ton shipped

From 2019 to 2020, we reduced total transportation emissions of Google hardware products by 38% per metric ton shipped.

Materials

100%
of Made by Google products
contain recycled materials

All Made by Google products launched since 2020 are built with recycled materials.⁶

100%
recycled aluminum
in Pixel 5 enclosure

Pixel 5 is designed with recycled aluminum to reduce its carbon footprint. The aluminum in the enclosure is 100% recycled content.⁷

Energy

65 billion kWh
of energy savings

From 2011 to 2020, Nest thermostats helped customers cumulatively save more than 65 billion kWh of energy—enough to power all of San Francisco's electricity consumption for over 11 years.

18 billion kWh
of energy savings

In 2020 alone, Nest thermostats helped customers save more than 18 billion kWh of energy—more energy than Google used in 2020.

10%–15%
energy savings

On average, Nest thermostats have proven energy savings of 10%–12% for heating and 15% for cooling,⁸ which means they pay for themselves in under two years.⁹

32 countries
with take-back programs

In 2020, we expanded our take-back program to all 32 countries where we ship Made by Google products, allowing customers to responsibly recycle old and unused devices for free—whether made by Google or not.

Waste

EMPOWERING USERS WITH TECHNOLOGY

Products

1 billion km
of transit results
on Google Maps

Google Maps provides, on average, more than 1 billion kilometers' (621 million miles') worth of transit results per day, helping to limit carbon emissions by giving people access to mass transit options, bike routes, and traffic information.

180,000
EV charging locations
on Google Maps

By the end of 2020, Google Maps contained nearly 180,000 EV charging locations globally.

400 cities
using Environmental
Insights Explorer

By the end of 2020, more than 400 cities worldwide were using the Environmental Insights Explorer, a tool that empowers city planners and policymakers with actionable data to help reduce global emissions.

170 million
rooftops mapped
with solar data

By the end of 2020, Project Sunroof contained data for more than 170 million rooftops across 21,500 cities, helping users estimate the impact and potential savings from installing solar panels.

Tools (continued)

40 petabytes
of freely available
geospatial data

Earth Engine has enabled tens of thousands of active users around the world to easily analyze over 40 petabytes¹⁰ of freely available geospatial information, resulting in a deeper understanding of the planet.

Programs

€10 million
Impact Challenge
on Climate

In 2020, Google.org launched the Impact Challenge on Climate, committing €10 million to fund bold ideas that aim to use technology to accelerate Europe's progress toward a greener, more resilient future.

Progress against targets

As a data-driven company, we believe it is critical to regularly track progress toward our commitments and share updates with our stakeholders. The following section provides an overview of our 2020 progress toward our various environmental targets.

For a more complete overview of our performance over time, see the [environmental data table](#).

DESIGNING EFFICIENT DATA CENTERS				
Target	Deadline	2020 progress	Status	
Energy				
Maintain or improve average annual fleet-wide PUE across Google data centers year over year.	2020 (Annual)	In 2020, the average annual PUE for our global fleet of data centers was 1.10. Since 2012, our average annual fleet-wide PUE has stayed at or below 1.12, even as demand for our products has dramatically risen.	●	
Certifications				
Maintain ISO 50001 energy management system certification for Google-owned data centers that meet certain operational milestones.	2020 (Annual)	In 2020, we maintained our ISO 50001 certification for our operational European data centers. We were the first major internet company to achieve a multi-site energy management system certification to ISO 50001, which we first attained in 2013.	●	
Waste				
Achieve Zero Waste to Landfill for our global data center operations.	Not applicable	In 2020, our global landfill diversion rate for data center operations was 81%.	◐	
Water				
Replenish 120% of the water we consume, on average, across our offices and data centers.	2030	This target was set in 2021.	◐	

● Achieved ◐ In progress ◑ Missed

ADVANCING CARBON-FREE ENERGY

Target	Deadline	2020 progress	Status
Energy			
Match 100% of the electricity consumption of our operations with renewable energy purchases.	2020 (Annual)	In 2020, we purchased enough renewable energy, from sources such as wind and solar, to match 100% of the electricity consumption of our data centers and offices. We were the first company of our size to reach this milestone back in 2017, and we've achieved it for four consecutive years. ¹¹	●
Operate on carbon-free energy 24/7 by 2030.	2030	In 2020, on an hourly basis, 67% of our data center electricity use was matched with regional carbon-free sources.	◐
Enable 5 GW of new carbon-free energy in our key manufacturing regions by 2030.	2030	We're working toward this target.	◐
GHG emissions			
Achieve net-zero emissions across all of our operations and value chain by 2030.	2030	This target was set in 2021.	◐
Maintain carbon neutrality for our operations.	2020 (Annual)	In 2020, we purchased enough renewable energy and high-quality carbon credits to compensate for all our operational GHG emissions. Google has been carbon neutral since 2007—for 14 consecutive years.	●
Compensate for our legacy carbon footprint since our founding through high-quality carbon credits.	2020	As of September 14, 2020, we had purchased enough high-quality carbon credits to compensate for our entire legacy carbon footprint since our founding, making Google the first major company to be carbon neutral for its entire operating history.	●

CREATING SUSTAINABLE WORKPLACES

Target	Deadline	2020 progress	Status
Commuting			
Reduce single-occupancy vehicle commuting at our Bay Area headquarters ¹² to 45% of workers commuting on any given day.	Not applicable	We're working toward this target.	◐
Provide EV charging stations for 10% of total parking spaces at our Bay Area headquarters.	Not applicable	Of the total parking spaces at our Bay Area headquarters, more than 7% were designated EV parking spaces with charging stations in 2020.	◐
Certifications			
Pursue the ILFI Living Building Challenge Certification for our Charleston East and Bay View campuses—two of Google's first ground-up development projects at our Bay Area headquarters.	2023	At our Charleston East campus, we're working to achieve the Living Building Challenge Materials Petal (which includes Red List Free materials and net-zero waste), and at our Bay View campus, we're working to achieve the Living Building Challenge Water Petal (which includes net-positive water use).	◐

● Achieved ◐ In progress ◑ Missed

BUILDING BETTER DEVICES AND SERVICES

Target	Deadline	2020 progress	Status
GHG emissions			
Achieve carbon neutrality for 100% of shipments of Made by Google products to and from Google's direct customers by 2020.	2020	We met this target early. All shipments of Made by Google products to and from direct customers have been carbon neutral since October 2019.	●
Publish product environmental reports for 100% of flagship consumer hardware products launching in 2020 and beyond.	2020	In 2020, we published product environmental reports for each of our flagship products.	●
Materials			
Use recycled or renewable material ¹³ in at least 50% of plastic used across our consumer hardware product portfolio by 2025. ¹⁴	2025	In 2020, we used post-consumer recycled content across numerous plastic parts in Pixel and Nest products. ¹⁵	◐
Eliminate plastic from packaging and make packaging 100% recyclable by 2025.	2025	In 2020, we designed Pixel and Nest packaging to minimize the use of plastic. The retail packaging for the Pixel 4a, Pixel 4a (5G), and Pixel 5 use 98% paper and fiber-based material.	◐
Include recycled materials in 100% of Made by Google products launching in 2022 and every year after.	2022	We met this target early. All Made by Google products launched since 2020 are built with recycled materials. ¹⁶	●
Waste			
Achieve UL 2799 Zero Waste to Landfill certification at all final assembly consumer hardware manufacturing sites by 2022.	2022	In 2020, we achieved certification to the UL 2799 Zero Waste to Landfill certification standard for several final assembly manufacturing sites.	◐

EMPOWERING USERS WITH TECHNOLOGY

Target	Deadline	2020 progress	Status
Tools			
Help more than 500 cities and local governments globally reduce an aggregate of 1 gigaton of carbon emissions annually by 2030.	2030	In 2020, cities around the world had started using the Environmental Insights Explorer tool for their climate action planning efforts.	◐
Products			
Help 1 billion people make more sustainable choices through our core products by 2022.	2022	We're working toward this target and now offer multiple new ways that people can use Google products, such as Google Maps and Google Flights, to make more sustainable choices.	◐

● Achieved ◐ In progress ◑ Missed

Environmental data

The following table provides an overview of our performance over time and includes both environmental data for our global operations (including our data centers, offices, networking infrastructure, and other facilities) and data beyond our operations (including our investments and technology). The majority of our environmental data covers Alphabet Inc. and its subsidiaries, including Google LLC. All reported data is global and annual unless otherwise specified.

We obtain third-party assurance from an independent, accredited auditor for specific environmental data as part of our [Independent Accountants' Review](#), including select GHG emissions, energy, and water metrics as indicated in the table below.

For more information on our 2020 energy use and GHG emissions, see [Alphabet's 2021 CDP Climate Change Response](#).

Key performance indicator	Assured for 2020 ¹⁷	Unit	2016	2017	Fiscal year ¹⁸ 2018	2019	2020
OUR OPERATIONS							
GHG EMISSIONS							
Emissions inventory^{19,20}							
Scope 1	●	tCO ₂ e ²¹	66,218	66,549	63,521	66,686	38,694
Scope 2 (market-based) ²²	●	tCO ₂ e	1,518,643	509,334	684,236	794,267	911,415
Scope 2 (location-based)	●	tCO ₂ e	2,902,554	3,301,392	4,344,686	5,116,949	5,865,095
Scope 3 (total) ²³		tCO ₂ e	1,292,268	2,719,024	12,900,467 ^{24,25}	11,669,000	9,376,000
Scope 3 (business travel and employee commuting, including teleworking) ²⁶	●	tCO ₂ e	314,028	356,060	463,467	542,000	213,000 ²⁷
Scope 3 (other)		tCO ₂ e	978,240	2,362,964	12,437,000 ²⁸	11,127,000	9,163,000
Total (Scope 1, 2 [market-based], and 3 [total])		tCO ₂ e	2,877,129	3,294,907	13,648,224 ^{29,30}	12,529,953	10,326,109
Biogenic emissions	●	tCO ₂	9,480	14,708	22,862	21,905	5,417
Operational emissions^{31,32}							
Scope 1, 2 (market-based), and 3 (business travel and employee commuting, including teleworking)	●	tCO ₂ e	1,898,889 ³³	931,943	1,211,224	1,402,953	1,163,109
Scope 1, 2 (location-based), and 3 (business travel and employee commuting, including teleworking)	●	tCO ₂ e	3,282,800	3,724,001	4,871,674	5,725,635	6,116,789
Emissions reductions and compensations							
Total emissions reduced by renewable energy PPAs and compensated for by carbon credits	●	tCO ₂ e	-3,282,800	-3,724,001	-4,871,674	-5,725,635	-6,116,789
Emissions reduced by renewable energy PPAs ³⁴	●	tCO ₂ e	-1,383,911	-2,792,058	-3,660,450	-4,322,682	-4,953,680
Emissions compensated for by carbon credits	●	tCO ₂ e	-1,898,889	-931,943	-1,211,224	-1,402,953	-1,163,109
Total operational GHG emissions ³⁵	●	tCO ₂ e	0	0	0	0	0
Carbon intensity³⁶							
Carbon intensity per unit of revenue	●	tCO ₂ e/ million US\$	17.6	5.19	5.47	5.32	5.21
Carbon intensity per FTE employee	●	tCO ₂ e/FTE	23.4	7.60	8.36	7.96	7.49
Carbon intensity per megawatt-hour of energy consumed ³⁷	●	tCO ₂ e/MWh	0.243	0.0717	0.0707	0.0675	0.0615

Key performance indicator	Assured for 2020	Unit	2016	2017	Fiscal year 2018	2019	2020
ENERGY							
Energy use							
Energy consumption ³⁸	●	MWh	6,513,719	8,029,409	10,572,485	12,749,458	15,439,538
Total electricity consumption	●	MWh	6,209,191	7,609,089	10,104,295	12,237,198	15,138,543
Electricity consumption (U.S.)	●	MWh	4,522,314	5,533,783	7,085,620	8,489,242	10,789,194
Electricity consumption (international)	●	MWh	1,686,877	2,075,306	3,018,675	3,747,956	4,349,349
Energy efficiency							
Average annual fleet-wide PUE across Google data centers		PUE	1.12	1.11	1.11	1.10	1.10
Renewable energy							
Renewable energy contracts (cumulative)		MW	2,611	2,960	3,837	5,401	5,746
Total renewable electricity purchased	●	MWh	3,770,571	7,609,089	10,104,295	12,237,198	15,138,543
Renewable electricity (PPAs and on-site)	●	MWh	2,817,913	6,244,788	8,246,508	9,721,283	12,076,382
Renewable electricity (grid)	●	MWh	952,658	1,364,301	1,857,787	2,515,915	3,062,161
Electricity purchased from renewable sources ^{39,40}	●	%	61	100	100	100	100
Carbon-free energy across Google data centers (hourly) ⁴¹		%	–	–	–	61	67
WASTE							
Waste generated							
Waste generated		Metric tons	43,058	53,363	57,113	48,126 ⁴²	28,864
Waste diversion							
Total landfill diversion rate ⁴³		%	81	83	80	77	77
Landfill diversion rate (data centers)		%	86	91	87	90	81
Landfill diversion rate (offices)		%	78	78	76	71	71
Pre-consumer food waste prevented in cafés (cumulative)		kg	980,291	1,990,868	3,019,252	4,152,872	4,439,479 ⁴⁴
Data center hardware refurbishment and reuse							
Components used for machine upgrades that were refurbished inventory		%	22	11	19	19	23
Components resold into the secondary market		Million components	2.1	2.1	3.4	9.9	8.2
WATER							
Operational water⁴⁵							
Water withdrawal ⁴⁶	●	Million gallons	2,500	3,071	4,170	5,161	5,689
Water consumption ⁴⁷	●	Million gallons	–	–	–	3,412	3,749
Water discharge ⁴⁸	●	Million gallons	–	–	–	1,749	1,940

Key performance indicator	Assured for 2020	Unit	Fiscal year				
			2016	2017	2018	2019	2020
WORKPLACES							
Green building certifications							
LEED-certified office space (cumulative)		m ²	865,493	1,034,875	1,294,161 ⁴⁹	1,438,257	1,557,606
Platinum (cumulative)		%	34%	28%	29%	29%	27%
Gold (cumulative)		%	54%	56%	57%	56%	58%
Certified and Silver (cumulative)		%	12%	16%	14%	15%	15%
Sustainable commuting							
EV charging ports installed at offices in the United States and Canada (cumulative) ⁵⁰		Ports	1,646	2,077	2,722	3,419	3,617
Emissions avoided due to employee EV commuting in the United States and Canada ⁵¹		tCO ₂ e	2,142	2,891	4,103	6,258	1,892 ⁵²
Employee shuttle commuting trips in the Bay Area		Million trips	3.7	3.8	4.0	4.3	0.7 ⁵³
Employee shuttle riders in the Bay Area (peak daily)		Unique riders	9,000	10,000	11,000	11,900	11,700 ⁵⁴
Emissions avoided due to employee shuttle trips in the Bay Area		tCO ₂ e	33,656	33,241	40,309	43,242	7,000 ⁵⁵
Urban ecology							
Native trees planted on our Bay Area campuses (cumulative)		Trees	96	1,411	1,602	2,191	2,191 ⁵⁶
Native habitat restored and created on our Bay Area campuses (cumulative)		Acres	1	7	9	12	12 ⁵⁷
BEYOND OUR OPERATIONS							
INVESTMENTS							
Equity investments in renewable energy⁵⁸							
Combined renewable energy capacity (cumulative) ⁵⁹		GW	3.7	3.7	3.7	3.7	3.7
TECHNOLOGY							
Tools							
Rooftops mapped for solar potential by Project Sunroof (cumulative)		Million rooftops	60	67	107	170	170
Cities covered by Project Sunroof (cumulative)		Cities	7,300	8,900	21,500	21,500	21,500
Cities covered by the Environmental Insights Explorer (cumulative)		Cities	–	–	5	117	3,000
Products							
Household energy saved by Nest thermostat customers (cumulative)		GWh	10,270	17,480	29,894	47,020	65,153

Appendix

Endnotes

1. According to Google's own analysis of our more efficient servers, power infrastructure, and cooling systems, compared with data center industry averages.
2. PUE is a standard industry ratio that compares the amount of non-computing overhead energy (used for things like cooling and power distribution) to the amount of energy used to power IT equipment. A PUE of 2.0 means that for every watt of IT power, an additional watt is consumed to cool and distribute power to the IT equipment. A PUE closer to 1.0 means nearly all the energy is used for computing.
3. According to the [Uptime Institute's 2020 Data Center Survey](#), the global average PUE of respondents' largest data centers was around 1.59.
4. Carbon credits are reductions in GHG emissions made to compensate for emissions that occur elsewhere. For each metric ton of carbon dioxide equivalent reduced, one carbon credit is created. References to "carbon offsets" (as mentioned in prior reports) have been updated to "carbon credits" in Google's 2021 Environmental Report.
5. We procure high-quality carbon credits to compensate for the carbon emissions from all Google-owned shipments of consumer hardware, including to and from retail partners, distributors, and Google Store customers. Because shipping devices to customers falls outside the scope of Google's operations, these efforts go beyond Google's long-standing commitment to operational carbon neutrality.
6. Made by Google products are designed with 9%–68% recycled content across their respective plastic parts. This does not include plastics in printed circuit boards, labels, cables, connectors, electronic components and modules, optical components, electrostatic discharge components, electromagnetic interference components, films, coatings, and adhesives.
7. Back housing only. Recycled aluminum is approximately 58% of enclosure based on weight.
8. [Energy Savings from the Nest Learning Thermostat: Energy Bill Analysis Results](#), Nest Labs, February 2015.
9. Independent studies showed that Nest saved people an average of 10% to 12% on heating and 15% on cooling. Using typical energy costs, we've estimated average savings of \$131 to \$145 a year. That means the Nest Learning Thermostat can pay for itself in under two years. Individual savings are not guaranteed.
10. One petabyte is 10¹⁵ bytes, or 1 million gigabytes, of digital information. It's equal to approximately 2.5 months of uninterrupted, uncompressed, high-definition (1920 x 1080 pixels) video data.
11. Google was the largest organization, in terms of electricity consumption, to achieve a 100% renewable energy match.
12. In this report, "Bay Area headquarters" refers to our operations in both Mountain View and Sunnyvale.
13. Renewable material consists of plastic made from bio-based material.
14. Minimum percentage of recycled or renewable plastic content calculated as a percentage of total plastic (by weight) in all products manufactured in 2025. The following may be excluded from the calculation of percentage: printed circuit boards, labels, cables, connectors, electronic components and modules, optical components, electrostatic discharge components, electromagnetic interference components, films, coatings, and adhesives.
15. See note 6 above.
16. See note 6 above.
17. Ernst & Young LLP reviewed select quantitative performance indicators for the fiscal year ended December 31, 2020. See the related [Independent Accountants' Review Report](#). Another third party verified the following emissions in prior years: Scope 1, Scope 2 (market-based), Scope 2 (location-based), Scope 3 (business travel and employee commuting), and biogenic. For more information, see our prior annual [Environmental Reports](#).
18. Alphabet's fiscal year is from January 1 to December 31.
19. GHG emissions are calculated according to *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)*, developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). For more information on our methodology, including a breakdown of Scope 3 categories, see [Alphabet's 2021 CDP Climate Change Response](#).
20. Scope 1 emissions are direct emissions from sources we own or over which we have operational control, such as company vehicles or generators at Google's offices and data centers. Scope 2 emissions are indirect emissions from the production of electricity we purchase to run our operations and the production of space heating for our offices. The location-based category reflects the average carbon intensity of the electric grids where our operations are located and, thus, where our energy consumption occurs. The market-based category incorporates our procurement choices, i.e., our renewable energy purchases via contractual mechanisms like PPAs. Scope 3 emissions are indirect emissions from other sources in our value chain, such as business travel or our suppliers.
21. CO₂e is a quantity that describes, for a given mixture and amount of GHG, the amount of carbon dioxide that would have the same global warming potential (GWP), i.e., the ability of a gas to trap heat in the atmosphere when measured over a specified timescale (generally, 100 years). Some GHGs are more potent than others, as measured by their GWP. Carbon dioxide is the baseline and thus has a GWP of 1.
22. Since 2010, we've procured renewable energy for our operations, and in 2012, we began publishing how this reduces our overall emissions. Until 2015, there was no guidance from the Greenhouse Gas Protocol on how to account for these emissions reductions, so we developed our own methodology, whereby on an annual basis we assigned renewable electricity procured against electricity consumed (in megawatt-hours) in the closest data center to the renewable energy project. In 2015, the Greenhouse Gas Protocol released new Scope 2 guidance for the accounting of purchased electricity, steam, heat, and cooling, which we adopted, starting with 2015 data. Our pre-2015 methodology differed from the Greenhouse Gas Protocol's in that we did not use residual mixes, which avoid double-counting of claimed renewable energy attributes.
23. See note 19 above.
24. In 2018, to align with industry best practices for Scope 3 reporting, we extended our reporting boundaries to include emissions associated with food served in our offices, hardware manufacturing emissions beyond Tier 1 suppliers (full upstream to the point of extraction), use of sold products, and end-of-life treatment of sold products. Google's hardware includes data center servers, networking equipment, and consumer hardware products. These extended categories have been reported annually from 2018 onward.
25. We've restated our 2018 Scope 3 (other) emissions due to changes in our calculation methodology and improvements in data quality, resulting in a corresponding restatement of our 2018 Scope 3 (total) and 2018 Total (Scope 1, 2 [market-based], and 3 [total]) emissions.
26. In 2020, due to the global pandemic, we began to estimate and report on our emissions associated with teleworking (i.e., employees working remotely). We applied the estimation methodology outlined in *EcoAct's Homeworking Emissions Whitepaper* to our annual average workforce in 2020 to estimate the GHG emissions generated by employees working remotely from their homes. Teleworking emissions are reported as part of our Scope 3 emissions for employee commuting, per Greenhouse Gas Protocol's Technical Guidance for Calculating Scope 3 Emissions (version 1.0). For a breakdown of our operational Scope 3 emissions by category, see our 2020 [Independent Accountants' Review Report](#).
27. In 2020, we began reporting teleworking emissions as part of our Scope 3 employee commuting emissions. Scope 3 (business travel and employee commuting) emissions reported prior to 2019 do not include teleworking emissions.
28. See note 25 above.

29. See note 24 above.
30. See note 25 above.
31. We calculate total operational emissions as the sum of Scope 1, Scope 2 (location-based or market-based), and Scope 3 (business travel and employee commuting, including teleworking) emissions, which have been third-party assured by Ernst & Young LLP as shown in its 2020 [Independent Accountants' Review Report](#).
32. See note 27 above.
33. In 2016, we adopted the industry practice of including only operational emissions in our carbon neutrality commitment. For more information, see our 2017 white paper, [10 Years of Carbon Neutrality](#). In 2020, we extended our operational emissions boundary to include teleworking emissions. The operational emissions included in our carbon neutrality commitment now include Scope 1, Scope 2 (market-based), and Scope 3 (business travel and employee commuting, including teleworking).
34. Emissions reduced by renewable energy PPAs are calculated by subtracting Scope 2 market-based method (MBM) GHG emissions from Scope 2 location-based method GHG emissions, thereby representing emissions reductions from renewable energy PPAs and MBM emission factors.
35. See note 33 above.
36. Carbon intensity metrics are based on gross global combined Scope 1 and market-based Scope 2 emissions.
37. In 2019, we updated our megawatt-hour carbon intensity metric to include all of our gross Scope 1 and market-based Scope 2 emissions divided by our total energy consumption, rather than limiting this intensity figure to our data centers.
38. Total energy consumption includes all fuel and natural gas consumption, purchased electricity, purchased heating, and all electricity generated on-site from renewable and non-renewable sources.
39. Percentage of renewable energy is calculated on a calendar-year basis, comparing the volume of renewable electricity (in megawatt-hours) procured for our global operations (i.e., renewable energy procured through our PPA contracts, on-site renewable energy generation, and renewable energy in the electric grids where our facilities are located) with the total volume of electricity consumed by our operations. This metric includes all renewable energy purchased, regardless of the market in which the renewable energy was consumed. Prior to 2016, we were not accounting for the renewable electricity purchased through grid electricity.
40. The Greenhouse Gas Protocol's [Scope 2 Guidance](#) requires energy attribute certificates to be sourced from and applied to the same market in which the reporting entity's electricity-consuming operations are located. This guidance does not recognize existing renewable energy on the electric grids where an entity's operations are located.
41. Our carbon-free energy (CFE) percentage measures the degree to which our electricity consumption on a given regional grid is matched with CFE on an hourly basis. This is calculated using both CFE under contract by Google as well as CFE coming from the overall grid mix. For more information, see our 2021 white paper, [24/7 Carbon-Free Energy: Methodologies and Metrics](#).
42. We've revised total waste generated for 2019 due to a calculation error. This correction resulted in a decrease in total waste generated for 2019 from 51,617 metric tons to 48,216 metric tons.
43. Landfill diversion is calculated as waste diverted to a more sustainable pathway than landfill or incineration without energy recovery.
44. In 2020, pre-consumer food waste prevented in our cafés was tracked only from January to March due to limited café operations during the global pandemic.
45. In 2019, we aligned our water reporting with industry standards to disclose three water indicators: total water withdrawal, as well as consumption and discharge.
46. In 2016, 2017, and 2018, water withdrawal was reported as water consumption. Beginning in 2019, we restated the 2016, 2017, and 2018 values as water withdrawal.
47. 2019 was the first year we disclosed gross global water consumption and gross global water discharge data; data for these indicators is not available for prior years.
48. See note 47 above.
49. 2018 is the first year that reflects a refinement in Green Business Certification Inc.'s methodology for determining LEED-certified office space.
50. This figure indicates the number of ports for ChargePoint stations in the United States and Canada, which represent the majority of our EV charging ports in those countries. We began installing EV charging ports in Canada in 2017.
51. Emissions avoided are estimated using data from the reported ports for ChargePoint stations in the United States and Canada only.
52. While Google's total number of installed EV charging ports in the United States and Canada increased in 2020, the ports experienced limited use from March to December due to the global pandemic, resulting in a decrease in emissions avoided due to employee EV commuting.
53. In 2020, due to the global pandemic, our Google shuttle buses in the Bay Area were in operation only from January to March.
54. See note 53 above.
55. See note 53 above.
56. All ecology projects that were scheduled for completion in 2020 were delayed due to the global pandemic.
57. See note 56 above.
58. In addition to our renewable energy contracts, Google also invests in renewable energy projects around the world that are not used to mitigate our emissions.
59. This indicator represents the expected combined capacity of contracted renewable energy projects in which we have an equity investment, even if we're a minority owner.

Glossary

CFE: carbon-free energy

CO₂e: carbon dioxide equivalent

EV: electric vehicle

ft: foot

FTE: full-time equivalent

GHG: greenhouse gas

GW: gigawatt

GWh: gigawatt-hour

GWP: global warming potential

ILFI: International Living Future Institute

ISO: International Organization for Standardization

kg: kilogram

km: kilometer

kWh: kilowatt-hour

lb: pound

LEED: Leadership in Energy and Environmental Design

m: meter

MBM: market-based method

MW: megawatt

MWh: megawatt-hour

PPA: power purchase agreement

PUE: power usage effectiveness

tCO₂: metric tons of carbon dioxide

tCO₂e: metric tons of carbon dioxide equivalent

WBCSD: World Business Council for Sustainable Development

WRI: World Resources Institute



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On the cover:

Our office at 6 Pancras Square in London. This was the first building project in the world to receive ILFI Zero Carbon Certification.