

Performance highlights

The following section provides a snapshot of our performance as of the end of 2021—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

GHG emissions

2x
as energy efficient

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

5x
as much computing power

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

1.10
average annual PUE

In 2021, the average annual PUE² for our global fleet of data centers was 1.10, compared with the industry average of 1.57³—meaning that Google data centers use about six times less overhead energy.

0
operational GHG emissions after compensations

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

78%
of waste diverted

In 2021, we diverted 78% of waste from our global data center operations away from landfills.

27%
of components refurbished

In 2021, 27% of components used for server upgrades were refurbished inventory.

4.9million
components resold

In 2021, we resold more than 4.9 million components into the secondary market for reuse by other organizations.

BUILDING BETTER DEVICES AND SERVICES

Target	Deadline	2021 progress ¹⁸	Status
GHG emissions			
Publish product environmental reports for 100% of new flagship consumer hardware products. ¹⁹	2021 (Annual)	We published product environmental reports for each of our flagship Nest and Pixel products that launched in 2021.	●
Materials			
Use recycled or renewable material in at least 50% of plastic used across our consumer hardware product portfolio by 2025. ²⁰	2025	In 2021, we used recycled content across numerous plastic parts in Nest and Pixel products. ²¹	◐
Eliminate plastic from packaging and make packaging 100% recyclable by 2025.	2025	In 2021, we designed Nest and Pixel packaging to minimize the use of plastic. The retail packaging for the Pixel 6, Pixel 6 Pro, and Pixel 5a (5G) use 98% paper- and fiber-based materials.	◐
Include recycled materials in 100% of Google consumer hardware products launching in 2022 and every year after.	2022	We met this target early. All Nest and Pixel devices launched since 2020 include recycled materials. ²²	●
Waste			
Achieve UL 2799 Zero Waste to Landfill certification at all final assembly consumer hardware manufacturing sites by 2022.	2022	In 2021, 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	2021 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 2021, over 40 cities used the Environmental Insights Explorer tool in their climate action planning or for monitoring city climate targets.	◐
Products			
Help 1 billion people make more sustainable choices through our core products by 2022.	2022	We're working toward this target. In 2021, we shared several new ways people can use Google products—such as Google Flights, Google Maps, Google Search, and Google Shopping—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 energy use and GHG emissions, see Alphabet's CDP Climate Change Response on [Google's sustainability reports page](#).

Key performance indicator	Assured for 2021 ²³	Unit	2017	Fiscal year ²⁴			
				2018	2019	2020	2021
OUR OPERATIONS							
GHG EMISSIONS							
Emissions inventory ^{25,26}							
Scope 1	●	tCO ₂ e ²⁷	66,549	63,521	66,686	38,694	45,073
Scope 2 (market-based) ^{28,29}	●	tCO ₂ e	509,334	684,236	794,267	911,415	1,823,132
Scope 2 (location-based)	●	tCO ₂ e	3,301,392	4,344,686	5,116,949	5,865,095	6,576,239
Scope 3 (total) ³⁰		tCO ₂ e	2,719,024	12,900,467 ³¹	11,669,000	9,376,000	9,503,000
Scope 3 (business travel and employee commuting, including teleworking) ³²	●	tCO ₂ e	356,060	463,467	542,000	213,000 ³³	136,000
Scope 3 (other)		tCO ₂ e	2,362,964	12,437,000	11,127,000	9,163,000	9,367,000
Total (Scope 1, 2 [market-based], and 3 [total])		tCO ₂ e	3,294,907	13,648,224 ³⁴	12,529,953	10,326,109	11,371,205
Biogenic emissions	●	tCO ₂	14,708	22,862	21,905	5,417	3,797
Operational emissions ^{35,36}							
Scope 1, 2 (market-based), and 3 (business travel and employee commuting, including teleworking)	●	tCO ₂ e	931,943	1,211,224	1,402,953	1,163,109	2,004,205
Scope 1, 2 (location-based), and 3 (business travel and employee commuting, including teleworking)	●	tCO ₂ e	3,724,001	4,871,674	5,725,635	6,116,789	6,757,312
Emissions reductions and compensations for our operations							
Total emissions reduced by renewable energy PPAs and compensated for by carbon credits	●	tCO ₂ e	-3,724,001	-4,871,674	-5,725,635	-6,116,789	-6,757,312
Emissions reduced by renewable energy PPAs ³⁷	●	tCO ₂ e	-2,792,058	-3,660,450	-4,322,682	-4,953,680	-4,753,107
Emissions compensated for by carbon credits	●	tCO ₂ e	-931,943	-1,211,224	-1,402,953	-1,163,109	-2,004,205
Total operational GHG emissions (after emissions reductions and compensations) ³⁸	●	tCO ₂ e	0	0	0	0	0
Carbon intensity ³⁹							
Carbon intensity per unit of revenue	●	tCO ₂ e/ million US\$	5.19	5.47	5.32	5.21	7.25
Carbon intensity per FTE employee	●	tCO ₂ e/FTE	7.60	8.36	7.96	7.49	12.87
Carbon intensity per megawatt-hour of energy consumed	●	tCO ₂ e/MWh	0.0717	0.0707	0.0675	0.0615	0.1006

Key performance indicator	Assured for 2021	Unit	Fiscal year				
			2017	2018	2019	2020	2021
ENERGY							
Energy use							
Energy consumption ⁴⁰	●	MWh	8,029,409	10,572,485	12,749,458	15,439,538	18,571,659
Total electricity consumption	●	MWh	7,609,089	10,104,295	12,237,198	15,138,543	18,287,143
Electricity consumption (U.S.)	●	MWh	5,533,783	7,085,620	8,489,242	10,789,194	12,903,398
Electricity consumption (international)	●	MWh	2,075,306	3,018,675	3,747,956	4,349,349	5,383,745
Energy efficiency							
Average annual fleet-wide PUE across Google data centers		PUE	1.11	1.11	1.10	1.10	1.10
Renewable energy							
Renewable energy contracts (cumulative)		MW	2,960	3,837	5,401	5,746	7,233
Total renewable electricity purchased	●	MWh	7,609,089	10,104,295	12,237,198	15,138,543	18,287,143
Renewable electricity (PPAs and on-site)	●	MWh	6,244,788	8,246,508	9,721,283	12,076,382	14,118,248
Renewable electricity (grid)	●	MWh	1,364,301	1,857,787	2,515,915	3,062,161	4,168,895
Electricity purchased from renewable sources ^{41,42}	●	%	100	100	100	100	100
Carbon-free energy across Google data centers (hourly) ⁴³		%	–	–	61	67	66
WASTE							
Waste generated							
Waste generated		Metric tons	53,363	57,113	48,126	28,864	28,153
Waste diversion							
Total landfill diversion rate ⁴⁴		%	83	80	77	77	77
Landfill diversion rate (data centers)		%	91	87	90	81	78
Landfill diversion rate (offices)		%	78	76	71	71	64
Pre-consumer food waste prevented in cafés (cumulative)		kg	1,990,868	3,019,252	4,152,872	4,439,479 ⁴⁵	4,439,479 ⁴⁶
Data center hardware refurbishment and reuse							
Components used for server upgrades that were refurbished inventory		%	11	19	19	23	27
Components resold into the secondary market		Million components	2.1	3.4	9.9	8.2	4.9 ⁴⁷
WATER							
Operational water ^{48,49}							
Water withdrawal	●	Million gallons	3,071	4,170	5,161	5,689	6,297
Water consumption	●	Million gallons	–	–	3,412	3,749	4,562
Water discharge	●	Million gallons	–	–	1,749	1,940	1,735

Key performance indicator	Assured for 2021	Unit	Fiscal year				
			2017	2018	2019	2020	2021
WORKPLACES							
Green building certifications							
LEED-certified office space (cumulative)		m²	1,034,875	1,294,161 ⁵⁰	1,438,257	1,557,606	1,704,922
Platinum (cumulative)		%	28	29	29	27	26
Gold (cumulative)		%	56	57	56	58	60
Certified and Silver (cumulative)		%	16	14	15	15	14
Sustainable commuting							
EV charging ports at offices in the United States and Canada (cumulative) ⁵¹		Ports	2,077	2,722	3,419	3,617	3,998
Emissions avoided due to employee EV commuting in the United States and Canada ⁵²		tCO ₂ e	2,891	4,103	6,258	1,892	3,468
Employee shuttle commuting trips in the Bay Area ⁵³		Million trips	3.8	4.0	4.3	0.7	0.1
Employee shuttle riders in the Bay Area (peak daily) ⁵⁴		Unique riders	10,000	11,000	11,900	11,700	1,664
Emissions avoided due to employee shuttle trips in the Bay Area ⁵⁵		tCO ₂ e	33,241	40,309	43,242	7,000	881
Urban ecology							
Native trees planted on our Bay Area campuses (cumulative)		Trees	1,411	1,602	2,191	2,191 ⁵⁶	2,509
Native habitat restored and created on our Bay Area campuses (cumulative)		Acres	7	9	12	12 ⁵⁷	15
BEYOND OUR OPERATIONS							
INVESTMENTS							
Equity investments in renewable energy ⁵⁸							
Combined renewable energy capacity (cumulative)		GW	3.7	3.7	3.7	3.7	3.7
TECHNOLOGY							
Tools							
Cities and regions covered by the Environmental Insights Explorer (cumulative) ^{59,60}		Cities and regions	–	5	117	3,000	41,700
Products							
Household energy saved by Nest thermostat customers (cumulative)		GWh	17,480	29,894	47,020	65,153	86,711