



Google's Eco-failures

An Environmental Investigation into Alphabet Inc. 2025





Table of Contents

I.	What is this report and why does it exist?	3
II.	Summary of Findings	4
III.	Why is Google failing on climate? The generative AI bubble	5
	A. What is AI? Why does it use so much power?	5
IV.	Google's unreachable goal: Net-zero carbon by 2030	6
V.	How misleading metrics hide a massive increase in emissions	7
	A. Tool #1: Google drastically underreports emissions	8
	B. Tool #2: Google reports efficiency instead of absolute numbers	9
	C. Tool #3: Google conceals the major source of its emissions	10
VI.	Google uses unproven technologies to distract and delay	11
	A. How Google uses small eco-advances to hide big eco-failures	14
VII.	Google's fast-expanding AI infrastructure	15
	A. Google's AI drives huge spike in emissions; alleged energy efficiency practices are nowhere to be seen	16
	B. How Google depletes precious water resources	18
	C. Google mistreats workers who are integral to its AI training and development	20
VIII.	How Google enables increased fossil fuel production	21
	A. Google's partnership with Aramco	21
	B. Other major partnerships between Google and Oil & Gas	22
IX.	Google has major influence over the information ecosystem, yet isn't doing enough to prevent climate disinformation	23
	A. Climate disinformation on Google Search and Gemini AI	23
	B. Climate disinformation on YouTube and Google ads	25
	C. Climate disinformation linked to transphobia by funding and YouTube's algorithms	26
X.	Google's climate failings are intensified by its acceleration of militarism	27
XI.	Google's rush to please the Trump administration	28
XII.	What do we do now?	29
XIII.	About us	30
	Glossary	31
	Appendix 1. Google Gemini Chat screenshots	33
	Appendix 2. Google AI Overview screenshots	34
	Appendix 3. YouTube Climate disinformation and monetization screenshots	44
	Appendix 4. Recommendations: How Google can clean up its act	46
	Appendix 5. Carbon capture and carbon removal: additional false solutions	48
	Endnotes	51



I. What is this report and why does it exist?

Each year since 2016,¹ Google's executives, on behalf of parent company Alphabet Inc.,² have released a report about the company's environmental performance. These reports are rosy, self-congratulatory affairs, highlighting supposed improvements and seemingly earnest attempts to meet increasingly critical climate goals. These reports have helped Google craft a reputation as a "good actor" on climate and sustainability issues in the world of Big Tech.³

However, **Google's reports conceal important truths about the company's environmental failings.** They say little about Google's continued reliance on energy generated from fossil fuels, ignore the company's contributions to climate disinformation, and mention nothing about its role as a provider of AI tools used to support fossil fuel production by oil and gas giants. We must hold each and every tech company accountable in order to break the destructive alliance between Big Tech and Big Oil and Gas.

Kairos is an organization that is building a multiracial movement to hold the tech industry and its executives accountable. As we have witnessed Big Tech's accelerating impact on the climate, we have escalated our campaigns to hold the industry responsible for its actions. We started digging into Google's environmental record months before the company released its 2025 report, so that we could examine its trends in behavior and transparency over time. Sure enough, the company's newest report is more of the same: Google's emissions are increasing at alarming rates, its energy and water use soaring, and the company's spokespeople are doing everything they can to put a positive spin on a dire situation.

"Google's Eco-Failures" takes a hard look at what Google leadership has said — and just as important, what they have chosen to obscure — in their environmental reports and other materials over the past 14 years. This is especially important this year as we find ourselves in the midst of a broader Big Tech about-face.⁴ Google's climate commitments are part of its larger corporate image, and the company has been shedding its former skin with implications not just for our environment but, at the core, for a world where we can thrive.

The more we know, the more strategic we can be in our collective fight for Google's leadership to reorient their trajectory away from human and planetary destruction. Billions of us use and interact with Google products each day; we deserve to know the truth about how they impact our communities and our planet. "Google's Eco-Failures" is for all of us, as well as for journalists, decision makers, and advocates, who can reference this research when reporting on, regulating, and interacting with Big Tech.

*Feel free to reach out to us with any questions or ideas:
campaigns@kairosfellows.org.*





II. Summary of Findings

These are some of our most important takeaways from investigating Google's climate claims.

We will expand on each in the sections that follow.

- **Google's aggressive investment in Generative AI and its infrastructure is a major factor behind its climate failings.** Google's Scope 2 emissions⁵, which measure the emissions from energy that Google purchases to power its data centers, have increased by 820% since 2010.
- Greenhouse gas emissions are measured in three "scopes." Scope 1, which covers direct emissions from Google's own facilities (not from purchased energy) and vehicles.⁶ Scope 2, which covers indirect emissions primarily from purchased electricity (i.e., energy to power Google's data centers), and Scope 3, which covers indirect emissions from other sources such as suppliers, use of consumer devices, and business travel. **Scope 1—which accounts for less than 0.31% of Google's reported total emissions⁷—is the only emissions metric for which Google has achieved an actual decrease since its 2019 base year.**
- **Google's reported total greenhouse gas emissions increased 1,515% from 2010 to 2024** according to the company's own published data.⁸ In real terms, Google released 21.9 million metric tons more emissions in 2024 than it did 14 years ago. That's like adding 4.7 million cars (for context, San Diego County, the country's fifth largest metro area, has 2.2 million registered cars) to U.S. roads *in one year.*⁹ In 2018, the methodology Google used to calculate Scope 3 emissions changed, but they did not release adjusted figures for the prior years.
- Google's claim that it can achieve net-zero carbon emissions by 2030 relies heavily on speculative technologies, particularly nuclear power, which remains dangerous and toxic – and which experts agree and Google itself admits has been scaling too slowly to make a difference in time. **We found that the company is unlikely to achieve any emissions reductions by 2030.**
- **Google-owned platforms spread lies about climate change.** In violation of its own publisher and ad policies, YouTube, which is also owned by Alphabet, continues to platform and monetize harmful climate denial narratives. In 2025, YouTube leadership further reduced their moderation of harmful content.¹⁰
- In our analysis, we found **that Google's new AI Overviews source answers from known climate disinformation networks** that receive funding from fossil fuel interests over authoritative, accurate sources.
- From 2016 to 2024, **Google's "water withdrawal," which measures how much water they take out of aquifers and reservoirs, increased 340%, to 11 billion gallons.**¹¹ This is more water than 750,000 households, or more people than the entire city of Phoenix, Arizona, use for a year of daily showers.¹²



III. Why is Google failing on climate? The generative AI bubble

Many of the issues we examine in this investigation are longstanding, including Google's failure to moderate disinformation on its platforms, its support for oil and gas production, and its cozy relationship with militarization and policing. But this report focuses primarily on the most rapidly escalating threat to our planet from Google and the tech industry more generally: generative AI products.

Google has been at the forefront of the AI explosion. In 2006, the company was the world's first to build a hyperscale data center, located in The Dalles, Oregon, occupying over 1.3 million square feet, or about the size of 20 football fields, and consuming 30% of the town's water supply.¹³ In 2017, the company introduced transformer architecture, which created the technological foundation of all large language models, such as ChatGPT, DeepSeek, Llama, and Gemini.¹⁴

Google claims that the company is "applying AI to help solve society's biggest challenges and improve lives."¹⁵ But as our investigation shows, Google dove headfirst into the gen AI hype, ballooning its greenhouse gas emissions on the order of millions more tons. This gen AI boom is harming communities via "solutions" that don't help,¹⁶ data centers themselves,¹⁷ and the harmful uses Big Tech has found for AI, such as automating work surveillance, helping fossil fuel companies make more money, and even accelerating genocide.¹⁸ Meanwhile, generative AI "solutions" to climate change remain almost entirely speculative.¹⁹

A. What is AI? Why does it use so much power?

Generative Artificial Intelligence (a machine-learning model that's trained to create new data rather than make predictions using existing data) started picking up steam in 2017.²⁰ Well-known applications of generative AI include OpenAI's ChatGPT and Google's Gemini.²¹ In their battle to secure market dominance over this growing sector, tech companies are currently engaged in massive buildouts of AI technology and infrastructure in the form of data centers.

A data center is, essentially, a giant warehouse housing thousands to tens of thousands of individual computers called servers. The newer, larger iterations are called hyperscale data centers. Data centers have been around since the birth of the internet in the 1990s, and we need them to store our pictures, save our emails, and use the internet. Generative AI, however, has significantly higher energy needs than other data storage uses. Data center growth has skyrocketed since 2017, and they are being built at a pace that far outstrips current demand, in order to secure a potential future profit for their owners.²²

Hyperscale data centers are being built at the expense of our communities; they cause hugely unsustainable energy and water use, leaving communities with higher electricity bills, and even causing electric grid instability.²³ **Because of this build-out, Google—and the rest of Big Tech—is falling further and further behind on achieving its climate commitments.**

The term "AI" is often used in ways that conflate generative AI, which powers chatbots and image generators, with less energy-intensive forms of artificial intelligence like prediction-based machine-learning models. The latter do have some helpful uses in a climate context.²⁴ However, the conflation of the two serves to justify buildup of the former—at the expense of huge amounts of power, land, and water, and with dubious benefit.²⁵ In this investigation, we try to be as specific as possible about whether we are talking about generative AI or AI writ large. Over a third of Google's 2025 report is dedicated to highlighting AI's potential to mitigate the climate crisis, and the report claims astronomical emissions reductions were enabled from five of Google's AI products. From what we can tell, the vast majority of these positive use-cases are traditional AI.



IV. Google's unreachable goal: Net-zero carbon by 2030

"We're not going to hit the climate goals anyway, because we're not organized to do it."

—Eric Schmidt, Google's former CEO, 2024²⁶

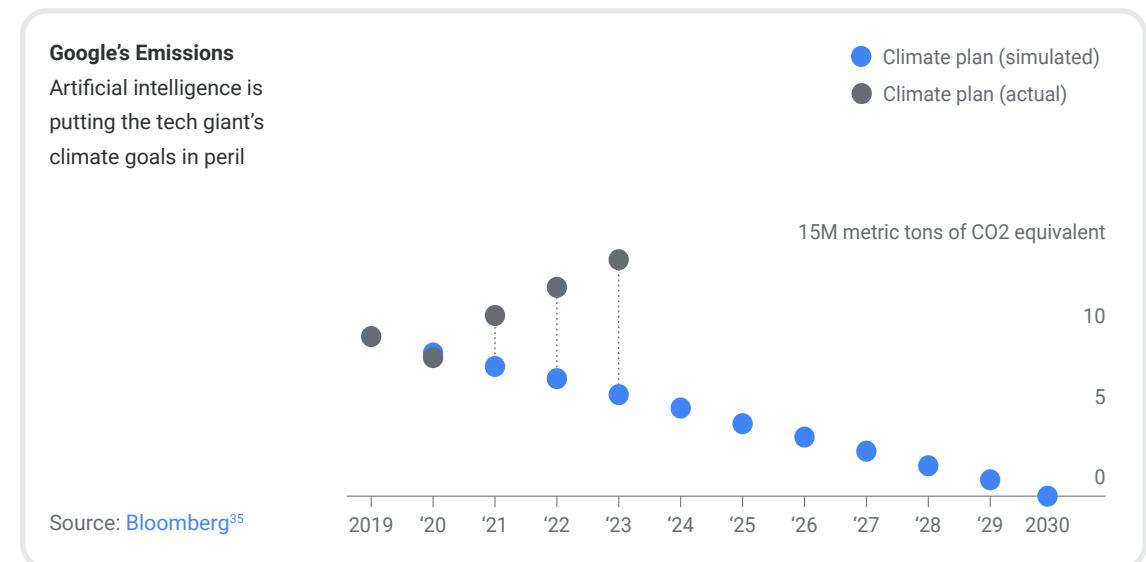
In 2021, Google's leadership set a goal to achieve "net-zero emissions" before 2030. "Net zero" means that the company allegedly intended to balance its emissions of greenhouse gases (GHGs) with its removal of GHGs, so that the total sum is zero. Until 2024, Google prominently discussed its progress towards this goal within the first 10 pages of each report.²⁷ In 2024, Google slightly adjusted its language, revising its goal to say achieving "net-zero emissions by 2030" (emphasis added) instead of "before."²⁸ Before Google published its most recent report, we had concluded that Google's emissions trajectory was rendering this goal almost impossible to reach.

In its 2025 report, Google's goal is relinquished to the appendix and has been drastically reframed. The section—now titled "carbon reduction moonshot"²⁹ instead of "net-zero emissions" goal—introduces an entirely new emissions metric, "ambition-based," to exclude over 3.6 million metric tons of CO₂ emissions from the goal.³⁰

Between 2019 and 2024, Google's reported GHG emissions increased by 65%, while its energy consumption increased by 157%.³¹ Even though Google moved the goal posts closer, achieving its net zero goal (rebranded as its carbon reduction moonshot) by 2030 will be impossible.³²

Google, like AI competitor Microsoft, has a distorted view of the moon. In reference to Microsoft's own "climate moonshot" Microsoft's President Brad Smith said in 2024, "[T]he moon has moved. It's more than five times as far away as it was in 2020."³³ The moon hasn't moved, Big Tech is simply traveling in the opposite direction.

A chart from Bloomberg in July 2024 that tracks Google's market-based emissions illustrates the enormous gap between the company's plan and their reality.³⁴



Scientists are in broad agreement that to avoid some of the worst-case climate scenarios, we need to cut our use of fossil fuels, which will reduce our anthropogenic [human-caused] emissions of greenhouse gasses.³⁶ Google's energy use currently represents the single largest source of its emissions that they directly control,³⁷ and humankind does not currently have the renewable energy capacity, successful carbon capture technologies, or any other realistically scalable fix that would allow us to lower our emissions in the time frame we need without also cutting our energy use.³⁸ But despite the company's claimed environmental commitment, Google has not directly pledged to reduce its actual energy consumption by any amount in any timeframe.³⁹ The closest step the company has come to such a commitment is its 2021 "net-zero emissions by 2030" goal—the goal they have been subtly walking back in the years since. And even worse, the company's energy needs—and fossil fuel emissions—are growing exponentially.

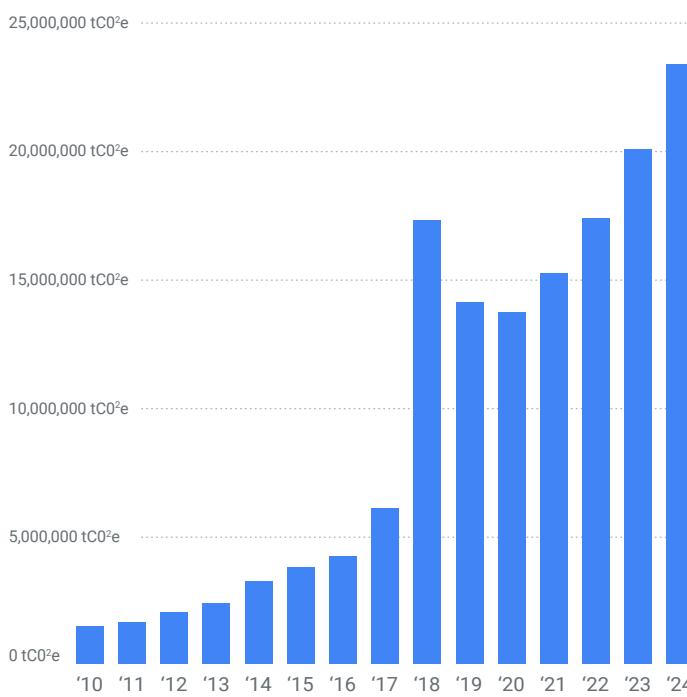


V. How misleading metrics hide a massive increase in emissions

"We've taken significant steps over the past two decades to minimize our GHG [greenhouse gas] emissions."

— Google 2024 Environmental Report⁴⁰

Google's Annual Total Emissions, 2010-2024



The jump in 2018 reflects Google's change in the way it measures scope 3 emissions, but the company did not release corrected numbers for any of its previously reported emissions.

Google's 2025 environmental report adds a chart that was not in their 2024 report. For the first time, Google actually graphs its data centers' energy use: because, the report's authors proudly tell us, those emissions are dropping for the first time.⁴¹ As we will discuss in the following section, this claim is highly misleading.

Google's location-based Scope 2 emissions,⁴² (Scope 2 includes emissions from the energy Google purchases to power their data centers) have actually increased by 820% since 2010. In 2024, Scope 2 accounted for 48.2% of Google's total 2024 emissions. During this same 14-year period, reported total emissions have increased by 1,515% and data center energy usage has increased by 1,282%.⁴³ These figures compare with an 8% increase in total greenhouse emissions from all sources on the planet through the year 2023.⁴⁴

Scope 3 emissions, which include the emissions users generate when using Google products and the emissions generated from the company's supply chain, are the most challenging to measure precisely. Google changed the way it measures Scope 3 emissions in 2018, changing the methodology to "align with industry best practices."⁴⁵ This change caused a big jump in Google's reported emissions (see chart), and may imply that the company underreported Scope 3 emissions prior to 2018. However, the company has not publicly released accurately calculated emissions for the years before 2018. It is possible, but impossible for independent factcheckers to verify, that Scope 3 and therefore total emissions were actually larger than Google reported in 2010–17, and that the company's 14-year increase in total emissions was therefore somewhat lower than 1,515%.

We would welcome Google's comprehensive emissions disclosure, using methodology that aligns with industry best practices, for each of the 14 years in which they have been reporting emissions. Without it, we have calculated emissions trends to the best of our ability using the information Google has provided. Methodology for calculating Scope 1 and Scope 2 emissions has not changed over the 14-year period.

The only other chart Google shares about its Scope 2 energy use (a chart the report's authors like so much they included it twice) seems to show that Google data centers' "energy efficiency" improved by 50% over 14 years.⁴⁶ But the metric Google uses doesn't account for the main energy use within the data centers: the computers. Google's data center energy consumption has actually soared, despite the minor improvement in energy efficiency of the lights and cooling systems that Google does report.



Google uses three statistical tools to hide the truth about its emissions increases:

A. Tool #1: Google drastically underreports emissions

The company discloses only *market-based emissions* for its Scope 2 emissions (emissions from energy purchased to run Google's data centers) avoiding discussion of the more meaningful location-based Scope 2 metric.⁴⁷

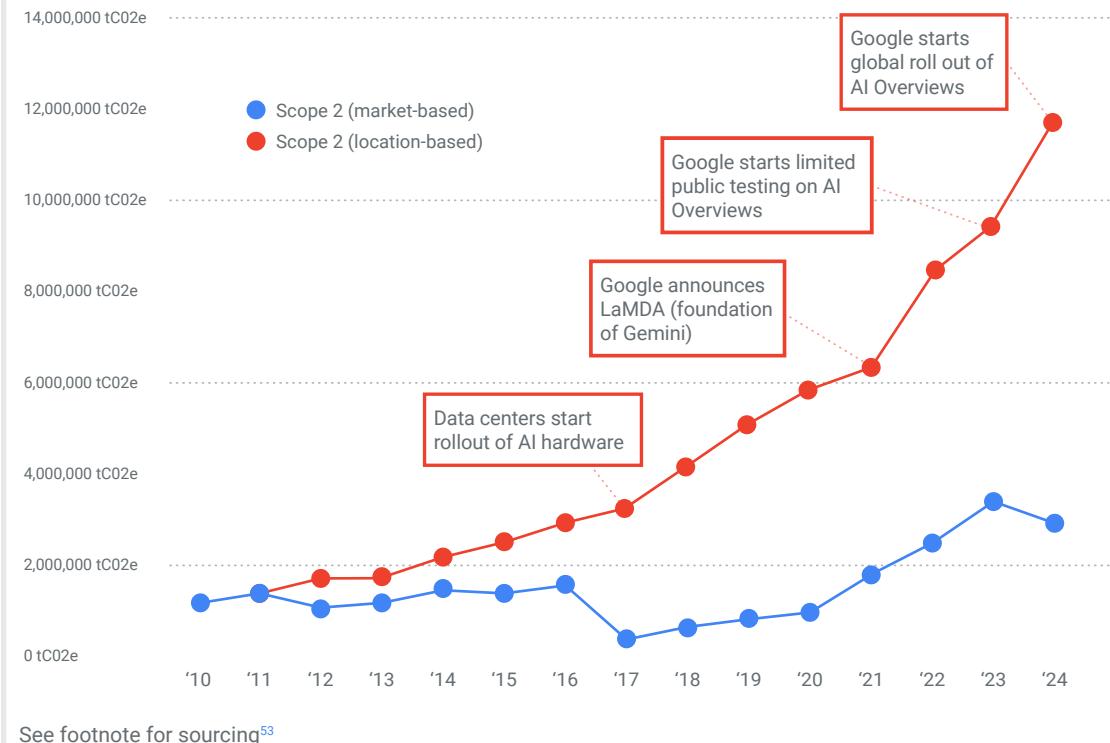
Google's Scope 2 (location-based, including energy purchased to run data centers⁴⁸) emissions **have increased by 121%** since 2019, the base year against which Google compares subsequent GHG emissions.⁴⁹ But like other Big Tech companies, Google downplays the emissions impact of its energy consumption through the use of a "market-based" emissions measurement method.

Market-based reporting allows the company to subtract green energy it buys elsewhere from its net emissions, instead of more accurate location-based calculations, which report emissions produced where each data center is actually located.⁵⁰ The *Guardian* estimated that Google's actual Scope 2 emissions between 2020 and 2023 were 2.7 times higher than the level it reported by using this "creative accounting" technique.⁵¹

Such "creative accounting" allows companies to pollute in one community by using, say, coal power for a data center, then claim to "offset" those emissions by buying solar energy in a completely different location. The "offset" does nothing to ameliorate the health impacts for the communities living near the dirty energy facilities and can have the effect of "writing off" very real environmental consequences in more marginalized communities that suffer disproportionately from asthma, heart disease, and other consequences of air pollution.⁵²

In comparison, location-based reporting reflects the average emissions from energy production on the grid(s) where a company's energy consumption occurs (i.e., if a data center uses energy from a grid powered by coal, that center will produce more emissions than one powered by solar). By using market-based Scope 2 emissions reporting, Google reports an artificially low picture of the company's climate impact.

Reporting only market-based emissions obscures Google's absolute fossil fuel emissions



As the chart above shows, there have been certain points when Google's emissions started to accelerate: first with the rollout of specialized hardware to support AI development in 2017, then with its announcement of LaMDA in 2021 (this became the foundation for Google's Gemini), again when Google started limited public testing of AI Overviews in 2023, and finally in 2024, when Google started its global rollout of AI Overviews in search and Gemini throughout its suite of digital products. Google's own reporting obscures many of these inflection points by compensating with increased purchases of renewable energy under the market-based reporting framework (like 2017).⁵⁴



B. Tool #2: Google reports efficiency instead of absolute numbers

Google talks a lot about improving its energy efficiency. However, **this tells us nothing about actual energy consumed or total emissions released**; absolute numbers are much harder to find in the report.

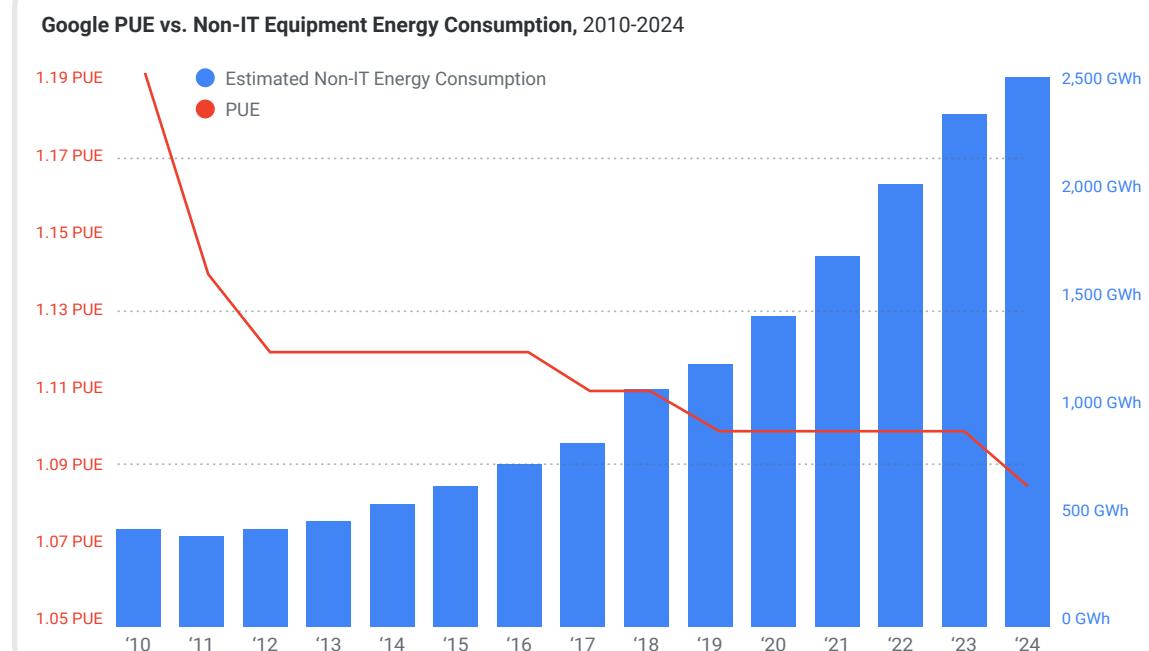
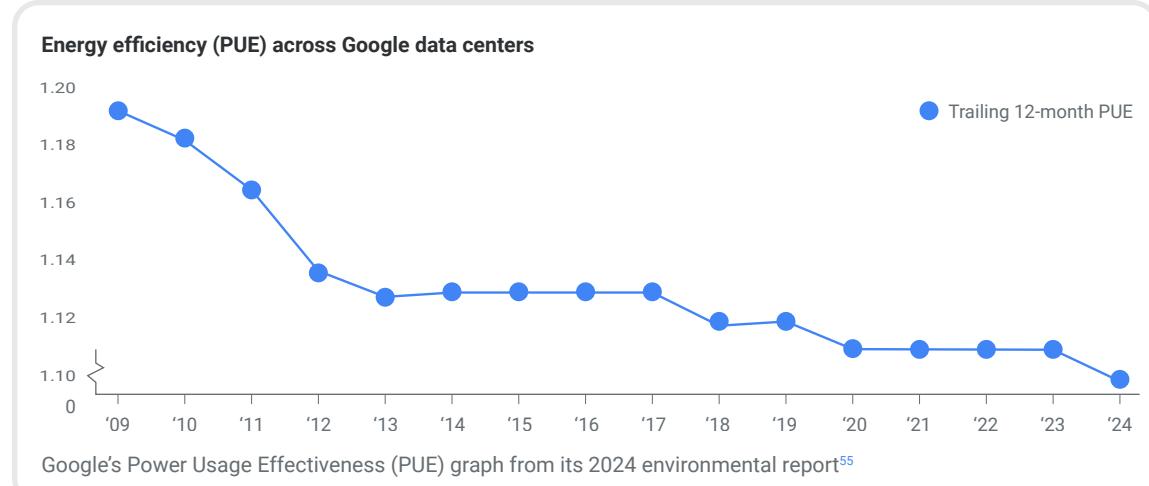
Power Usage Effectiveness (PUE) is a ratio of the energy consumption of data center IT equipment (i.e., computers) to the energy consumption of data centers in total. Because non-IT equipment, like air conditioning and lighting, also use energy, the total data center energy consumption is always higher than IT equipment alone.⁵⁶ All Google's chart illustrates is that the energy use of non-IT equipment decreased from about 20% of Google's total energy consumption in 2009 to about 9% in 2024.

Using hypothetical numbers, increasing a polluting activity by, for example, 500% while improving its efficiency by 50%, *still* greatly increases absolute emissions. As the charts show, this is precisely what Google has done. For example, when describing its alleged data center emissions, Google does not chart the increase in energy use from the computers operating inside its data centers (known as IT equipment), which accounts for an estimated 88% of the Google's Scope 2 GHG emissions and 42% of Google's 2025 All Scopes emissions (Scope 2 location-based).⁵⁷

The two charts Google does provide are:

1. A graph of its total electricity usage, charted from 2010 to 2024, highlighting Google's "Clean energy purchases."⁵⁸ The chart lacks enough detail to be read accurately, including grid lines to determine usage in a given year.
2. PUE, which, as a ratio, tells us only about comparative energy use, not actual energy consumption.⁵⁹

Contrast the misleading presentation above with the chart below, which we compiled from information buried in spreadsheets in the appendices of Google's annual Environmental Reports. This chart estimates how much non-IT energy consumption has increased despite consistent PUE improvements.



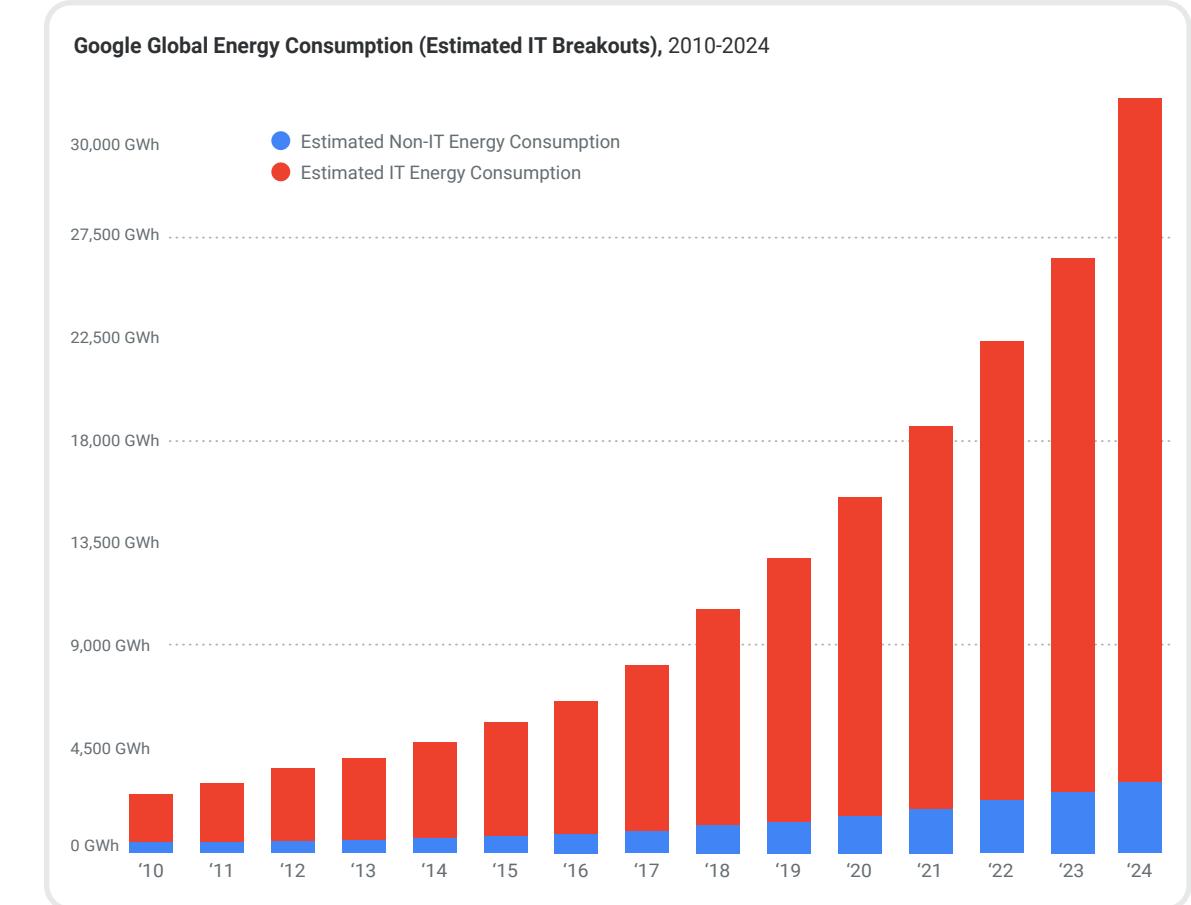


C. Tool #3: Google conceals its major source of emissions

Google provides no charts at all on its largest source of Scope 1 and Scope 2 emissions, the computers (referred to in Google's reports as "IT equipment") used to run its data centers. We calculated an estimate of the energy that Google's IT equipment consumes using the company's Global Energy Consumption and PUE.⁶⁰

As the above chart shows, "non-IT equipment" accounts for only a fraction of Google's Global Energy Consumption, meaning that any improvement made to PUE makes little impact on Google's total energy consumption. **In fact, since 2010, the company's total energy consumption has increased 1,282%, despite PUE improvements.**⁶¹

The emphasis on PUE is doubly misleading because the entire decrease in real energy consumption for non-IT equipment occurred in 2011. That year, PUE went from 1.19 to 1.14,⁶² showing a non-IT energy decrease of 26.3 gigawatt-hours (GWh).⁶³ Even this sounds more impressive than it is; in 2011 alone, Google executives flew a total of 491 private jet trips, burning an estimated 855,000 gallons of jet fuel and consuming over 33.8GWh of energy.⁶⁴ Google could have saved more energy by simply grounding the private jets it uses to move its top executives around the world. 33.8GWh is equivalent to the entire amount of clean energy the US was able to add to the grid in 2023.⁶⁵





VI. Google uses unproven technologies to distract and delay

"Additional external factors—largely outside our direct control—are converging to create significant uncertainty, including the **slower-than-needed deployment of CFE [carbon free energy] technologies**, AI's energy demands, policy uncertainties, resource-challenged markets, and more."

— Google 2025 Environmental Report⁶⁶ (emphasis added)



2018 was the last year that the Google Environmental Report prominently featured "renewable energy."⁶⁷ Starting in 2019, Google changed its goal, now aiming to rely on "carbon-free energy" by 2030.⁶⁸ Google defines "carbon-free energy" as "any type of electricity generation that doesn't directly emit carbon dioxide, including (but not limited to) solar, wind, geothermal, hydropower, and nuclear. Sustainable biomass and carbon capture and storage (CCS) are special cases considered on a case-by-case basis, but are often also considered carbon-free energy sources."⁶⁹

This subtle but important shift in language lets Google make unrealistic claims about specific technological fixes that were not considered "renewable energy" under their previous goal, among them the use of biomass, "renewable diesel," CCS, and nuclear power, despite documented problems with these technologies and the lack of evidence that they are scalable, safe, or reliable.

Google's emphasis on nuclear energy as a clean energy "solution" is particularly concerning, given the growing consensus among both scientists and business experts that their successful deployment on scale, if it is to ever occur, cannot be achieved in the near or mid-term future. A recent in-depth review of clean energy opportunities from corporate consulting firm McKinsey & Company concludes that "technologies including carbon capture, utilization and storage (CCUS), nuclear power, and green hydrogen—all of which have high capital costs, complex infrastructure requirements, and ongoing research and development—have advanced more slowly than anticipated."⁷⁰

McKinsey contrasts the extremely slow pace of carbon capture implementation with the reality that solar and wind power have "scaled faster than expected." The McKinsey study was published two weeks before Google issued its environmental report. Google's failure to take advantage of McKinsey's insights on clean energy opportunities is especially concerning given the partnership between the two companies, which "span[s] Google Cloud's portfolio of solutions" including cooperation on development of "digital and AI transformations."⁷¹





Nuclear Power

What it is

Nuclear power is a type of energy powered by splitting apart specific types of atoms, most commonly uranium, in a reactor. That process releases heat and radiation, and the heat produced is used to turn water into steam, which then is harnessed for energy. The atoms need to be “enriched” to be split apart, which makes them radioactive. Nuclear energy has been around since 1951, after the technology was first developed to make nuclear weapons.⁷² As a fuel source, its dangers have made it widely unpopular. Most of us have heard of nuclear power because of the times it’s been implicated in deadly meltdowns, including at Three Mile Island in Pennsylvania, Chernobyl in Ukraine, and Fukushima in Japan.⁷³

Why it won’t work

- The most recent nuclear reactor to come onboard in the U.S. was completed in Georgia in 2024. The reactor took 15 years to build and cost \$35 billion; both the timeline and the budget for the plant were double what was projected.⁷⁴ The project was so expensive that the original contractor declared bankruptcy during production.⁷⁵
- Google and other energy-guzzling companies in search of silver-bullet solutions have been touting “small modular reactors” (SMRs) as supposedly faster to scale and safer than traditional nuclear plants. Yet there are only two operable in the entire world, and only an additional five are under construction, meaning that the claims about them are almost entirely speculative.⁷⁶ With commercial operation at scale not possible until after 2030, SMRs face a number of concerns about their ability to operate as planned, including economic viability, safety, and ability to be built with the speed that is their supposed advantage.⁷⁷
- The two SMRs that are actually operational, one in Russia and one in China, are underperforming and faced construction timelines on par with other types of nuclear plants. The plants took 17 years and 9 years, respectively, between permitting and grid connection. Both continued to perform at very low load capacity years after coming on-grid. The combination of underperformance and construction delays has meant that neither is more economically competitive than traditional nuclear plants.⁷⁸
- **Nuclear power plants produce radioactive waste products that remain toxic for hundreds of thousands of years.** If the radioactive waste isn’t stored safely for generations (and there is no proven way to do so), it can contaminate soil and increase cancer risks in humans and animals.⁷⁹ Studies suggest SMRs may produce a factor of 2 to 30 times more radioactive waste than older models.⁸⁰
- Uranium is the most commonly used element to generate nuclear power, and its extraction is dangerous for both miners and nearby communities.⁸¹ Much of the uranium mined in the U.S. also threatens native sovereignty and disproportionately causes negative health effects, including elevated cancer rates and birth defects, in Indigenous communities.⁸²

“The only role [Small Nuclear Reactors] SMRs can play in having the world move towards net zero is a negative one,” argues Ramana. . . First, the money invested in SMRs would save far more carbon if it were invested in accelerating the switch to renewables. . . Second, building nuclear reactors is extremely time-consuming. A nuclear plant takes around a decade from the start of construction to producing electricity – and that start is often delayed by another decade to get the requisite planning and financing. “This compounds the problem of the economic opportunity cost.”

—M. V. Ramana, the Simons Chair in Disarmament, Global and Human Security at the School of Public Policy and Global Affairs at the University of British Columbia, Canada, Energy Monitor⁸³



“Renewable Diesel”

What it is

Renewable diesel is a fuel made from plant and animal-based fats and oils, refined so it can be used in place of gas-based diesel fuel.⁸⁴ Google reports that it is starting to use this energy source in U.S. and European data centers, citing its “lower life cycle carbon emissions compared to fossil fuels.”⁸⁵

Why won’t it work

Biodiesel and renewable diesel are hard to scale and not cost-effective. Scaling up the production of soybean and palm oils, as well as diverting agricultural land to produce plants exclusively for fuel, can lead to deforestation and food price spikes.⁸⁶

Google’s 2024 report heavily promoted Carbon Capture and Storage and Nature-based carbon removal, but these two speculative technologies were virtually absent from the 2025 report. This may imply that Google itself realized these two technologies are not making meaningful contributions to their net-zero goal. (*For more information on these two additional speculative technologies that Google invests in, see Appendix 5.*)

Google’s 2024 report heavily promoted Carbon Capture and Storage and Nature-based carbon removal, but these two speculative technologies were virtually absent from the 2025 report. This may imply that Google itself realized these two technologies are not making meaningful contributions to their net-zero goal. (*For more information on these two additional speculative technologies that Google invests in, see Appendix 5.*)





A. How Google uses small eco-advances to hide big eco-failures

The appendices of Google's annual Environmental Reports contain detailed statistics on global energy and water consumption. However, the discussions in the bodies of the reports focus on small, anecdotal examples of eco-positive projects undertaken by the company without indicating how the impacts of these efforts do or do not compare with the company's massive GHG emissions increase.



Google's 2025 Environmental Report features a number of snapshots of environmentally positive projects scattered around the world, including:

- An "enhanced geothermal" power plant in Nevada that came on-grid in 2023.⁸⁷
- A rainwater retention pond at a data center in South Carolina.⁸⁸
- A groundwater re-charge project in California's Central Valley.⁸⁹
- An "egret hours" program for birding at its Mountain View Campus.⁹⁰
- AI-driven demand forecasting to reduce food waste for Google campus kitchens.⁹¹

Here's what Google doesn't say:

- How much capital has been devoted to these projects, which would allow us to compare the company's investment in environmentally positive projects with Google's planned \$75 billion capital investment in AI projects in total.
- How much or little impact each project has on Google's total energy and water consumption.
- What Google is or is not doing to scale the models mentioned.

Without these details, these projects appear to be little more than eco-distractions from Google's far more concerning business practices as usual.

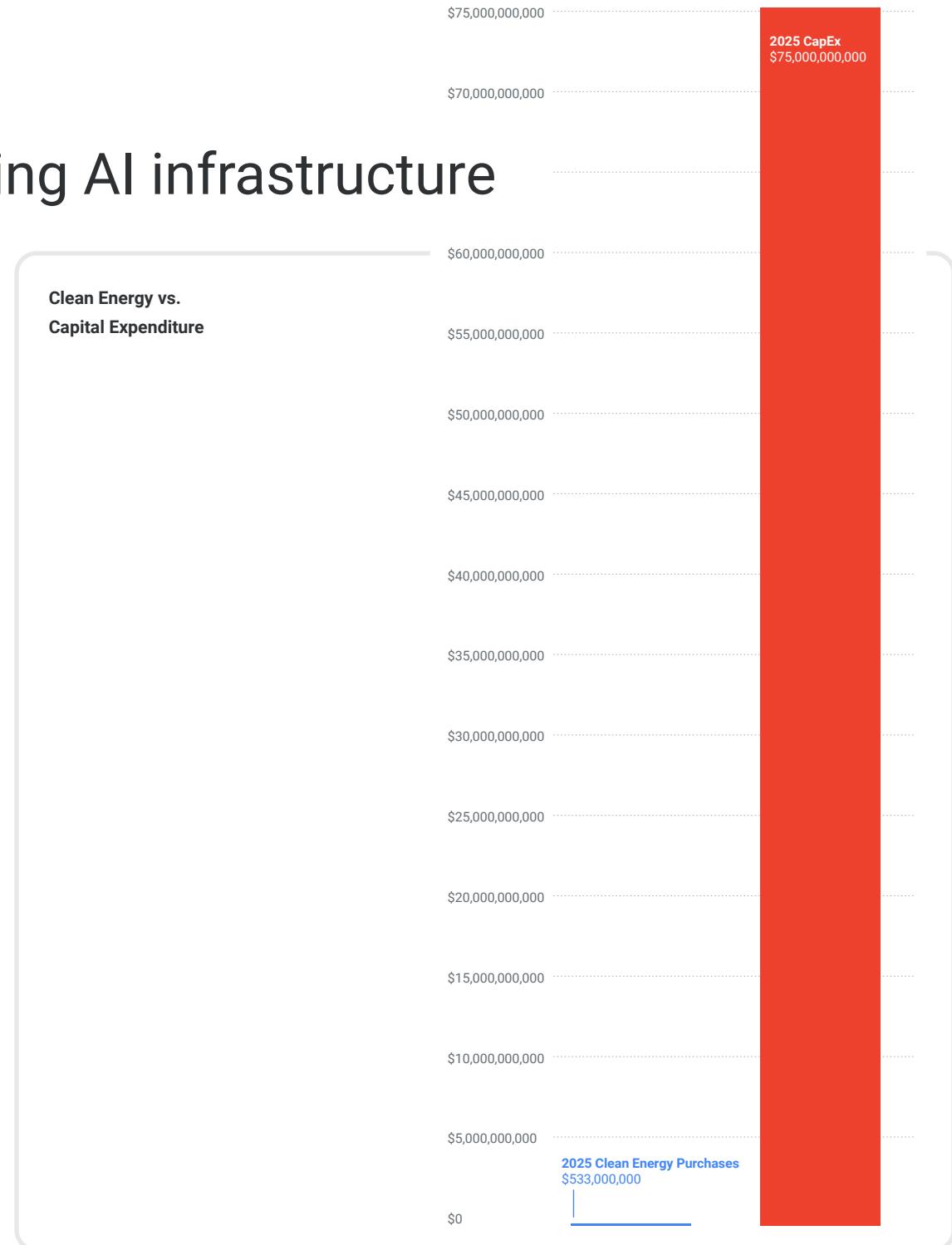


VII. Google's fast-expanding AI infrastructure

Google, like its Big Tech peers, is rapidly increasing its investment in Generative AI infrastructure. In 2025, the company plans to invest \$75 billion in Gen AI with a primary focus on “building out data center capacity as AI infrastructure,” according to CEO Sundar Pichai.⁹² This compares with capital expenditures of \$32.3 billion in 2023 and \$52.5 billion in 2024.⁹³

Google does not report capital expenditures for clean energy development. This is understandable, since the company relies for energy primarily on power purchases that would appropriately be reported in its operating budget. However, company statements on clean energy spending indicate that it amounts to a tiny fraction of its finances dedicated to undertake new projects (such as data center buildout) and/or investments, known as Capital Expenditure (CapEx).⁹⁴ For the 30-year period between 2010 and 2040, Google estimates it will spend more than \$16 billion to purchase clean energy. This averages out to \$533 million per year, less than 1% of the amount it plans to spend on AI buildout in 2025 alone.⁹⁵

To put this into perspective, to the right is a chart comparing the company’s 2025 AI Capital Expenditure budget with its average annual spending to purchase clean energy.





A. Google's AI drives huge spike in emissions; alleged energy efficiency practices are nowhere to be seen

Google's claim:

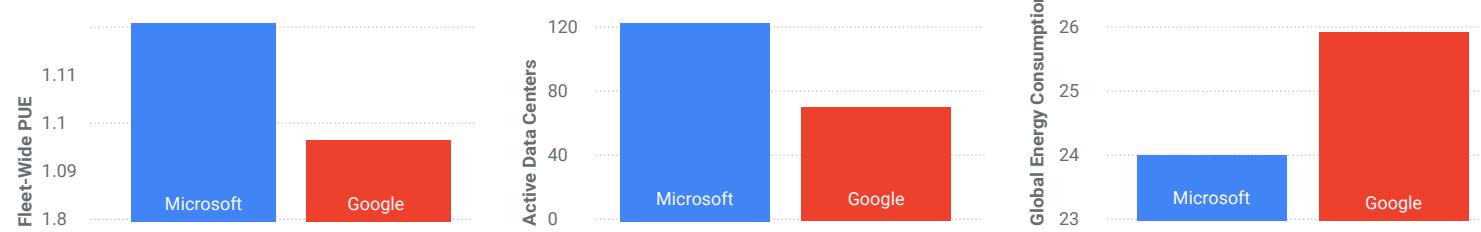
"Google data centers—which power all of our products including Search, YouTube, Google Cloud, Gemini, and more—are some of the most efficient in the world. They deliver over six times more computing power per unit of electricity than they did just five years ago."

- Google's 2025 Environmental Report

Google's reality:

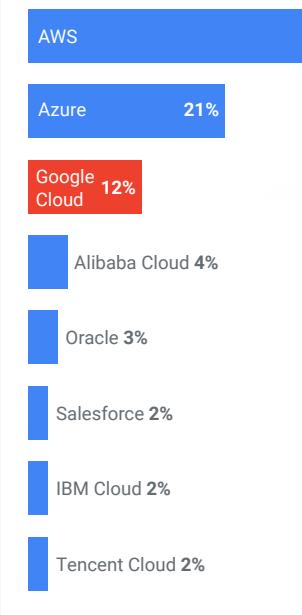
Available data suggests that Google actually consumes more energy than leading competitor Microsoft, even though it has fewer data centers (66 vs. 124)⁹⁶ with a lower fleet-wide PUE (1.09 vs. 1.12)⁹⁷, and serves a smaller share of the Global Cloud Market (12% for Google Cloud Platform vs. 21% for Microsoft Azure).⁹⁸ Google reports using 2.52 terawatt-hours (TWh) more energy globally than Microsoft in 2024; this difference could satisfy the energy needs of more than 240,000 U.S. homes for a year.⁹⁹

Despite operating more data centers than Google, Microsoft had lower global energy consumption in 2024.



Google's global energy consumption of 32.72 TWh in the year 2024 could have supported the electrical needs for the more than 4.5 million people who live in New Hampshire, Vermont, Rhode Island, and Hawaii combined, with over 500 GWh to spare. The company's energy consumption has ballooned so much it now tops that of at least 15 U.S. states.¹⁰⁰

Amazon and Microsoft Stay Ahead in Global Cloud Market
Worldwide market share of leading cloud infrastructure service providers in Q4 2024

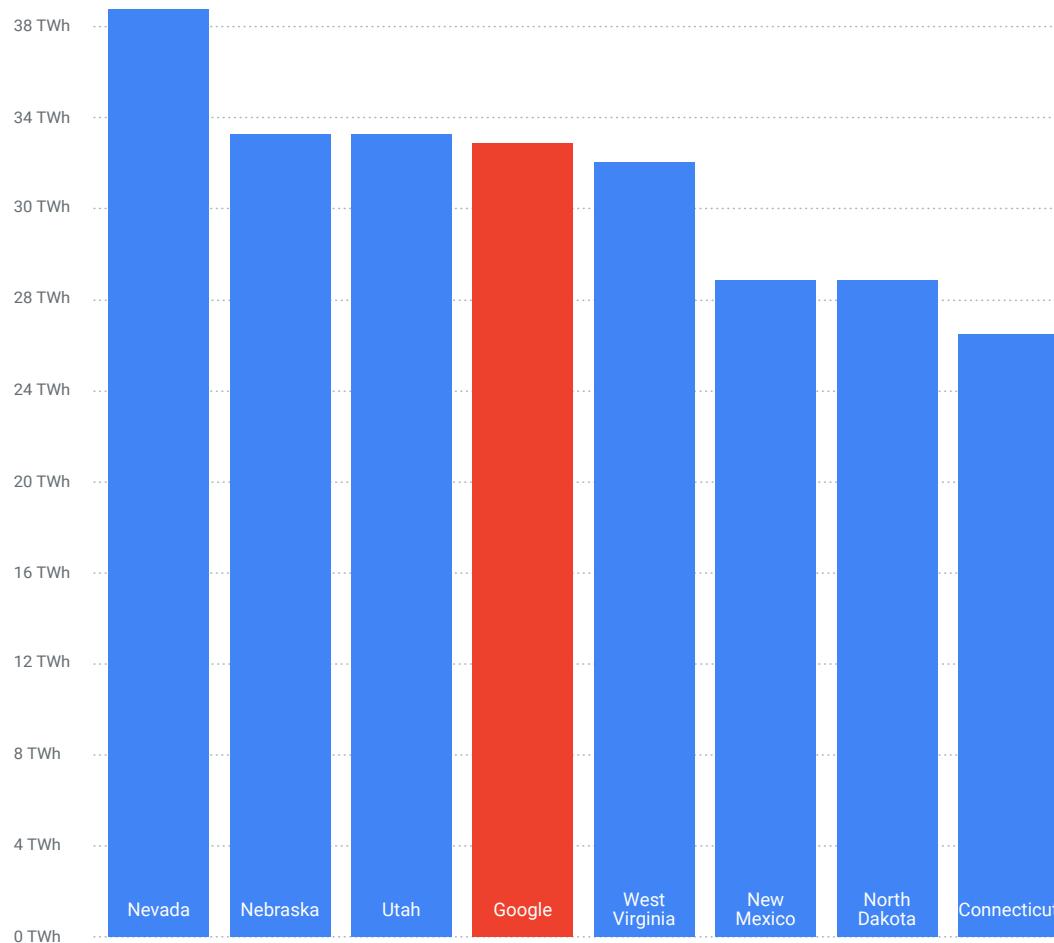



Cloud infrastructure service revenues in Q4 2024:
\$91,000,000,000

Source: [Synergy Research Group](#)



Google Energy Compared to US State Electricity Consumption (TWh)



Even Gemini (Google's flagship AI model¹⁰¹) agrees the company is unlikely to meet its goal given the energy demands of AI development.¹⁰²

AI Overview

Google is facing significant challenges in achieving its net-zero emissions goal by 2030, as indicated by its recent environmental report. While Google has made strides in offsetting its emissions and transitioning to renewable energy, surging emissions due to the energy demands of AI development are hindering its progress. ¹⁰³

Here's a more detailed look at the situation:

Ambitious Goals:

Google initially set a goal to achieve net-zero emissions by 2030. This included running on 24/7 carbon-free energy where it operates and reducing emissions by 50% compared to 2019. ¹⁰⁴

AI's Impact:

The rapid growth in AI development has significantly increased Google's energy consumption and emissions. This is due to the large-scale data centers and supercomputers required to train AI models. ¹⁰⁵

Escalating Emissions:

Google's 2024 environmental report revealed a 48% increase in carbon emissions since 2019, largely due to AI. This increase also includes a 37% rise in Scope 2 emissions (market-based). ¹⁰⁶

Stalled Progress:

While Google has made progress in offsetting past emissions and transitioning to renewable energy, the current emissions growth casts doubt on achieving its 2030 net-zero target. ¹⁰⁷

Challenges Ahead:

Google faces challenges in predicting the future environmental impact of AI and in finding solutions for some global challenges, such as transitioning to 24/7 carbon-free energy. ¹⁰⁸



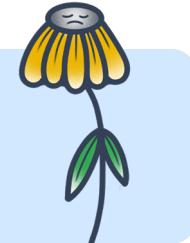
Sundar Pichai, Google's CEO at Google I/O 2025¹⁰³



B. How Google depletes precious water resources

"Our cooling technology decisions look at the local environment—balancing the availability of carbon-free energy and responsibly sourced water—to minimize the net climate impact both today and in the future."

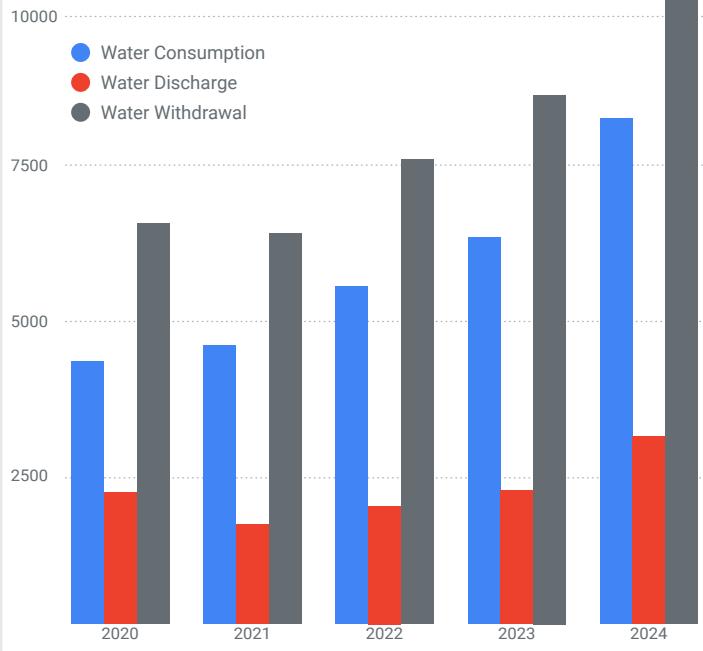
— Google's Water Risk Framework¹⁰⁴



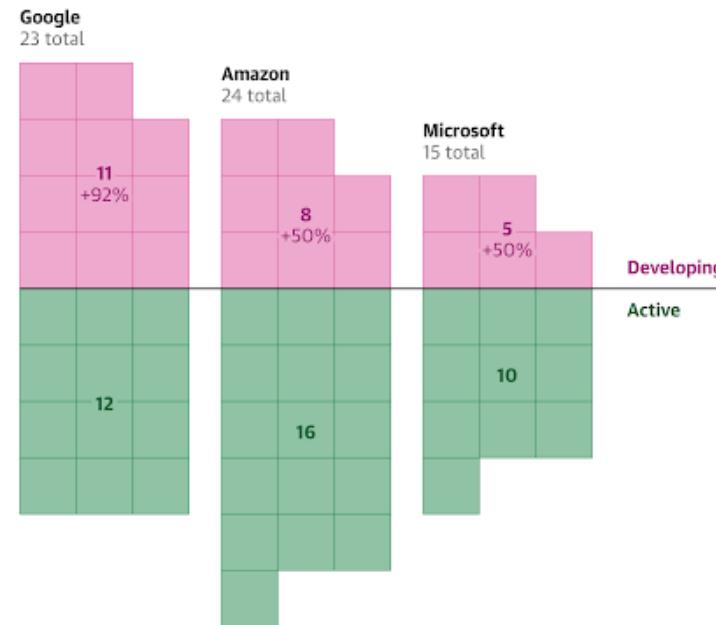
Google's reported fresh water use continues to surge,¹⁰⁵ fueled by their growing fleet of data centers, which often use water to cool their servers. Google's water withdrawals increased 27% in the last year alone. In 2024, the company withdrew over 11 billion gallons of water,¹⁰⁶ enough to supply the potable water needs for the 2.5 million people and 5,500 industrial users in Boston and its suburbs for 55 days.¹⁰⁷

Despite Google's claims that it considers local environments in locating data centers, in 2024, 28% of Google's freshwater withdrawals came from watersheds with medium (14%) and high (14%) water scarcity.¹⁰⁸ An investigation by The Guardian found that Google is the most likely company among its peers to build in dry areas in the US.¹⁰⁹ Google's continued expansion in desert regions is particularly concerning because, as the United Nations recently reported, "extreme weather events are making water more scarce, more unpredictable, more polluted, or all three."¹¹⁰ As of April 2025, Google had 68 active data centers worldwide and was developing 49 more.¹¹¹

Google's Water Use From 2019-2024, million gallons



Google leads its peers in developing data centers in water-scarce areas of U.S.

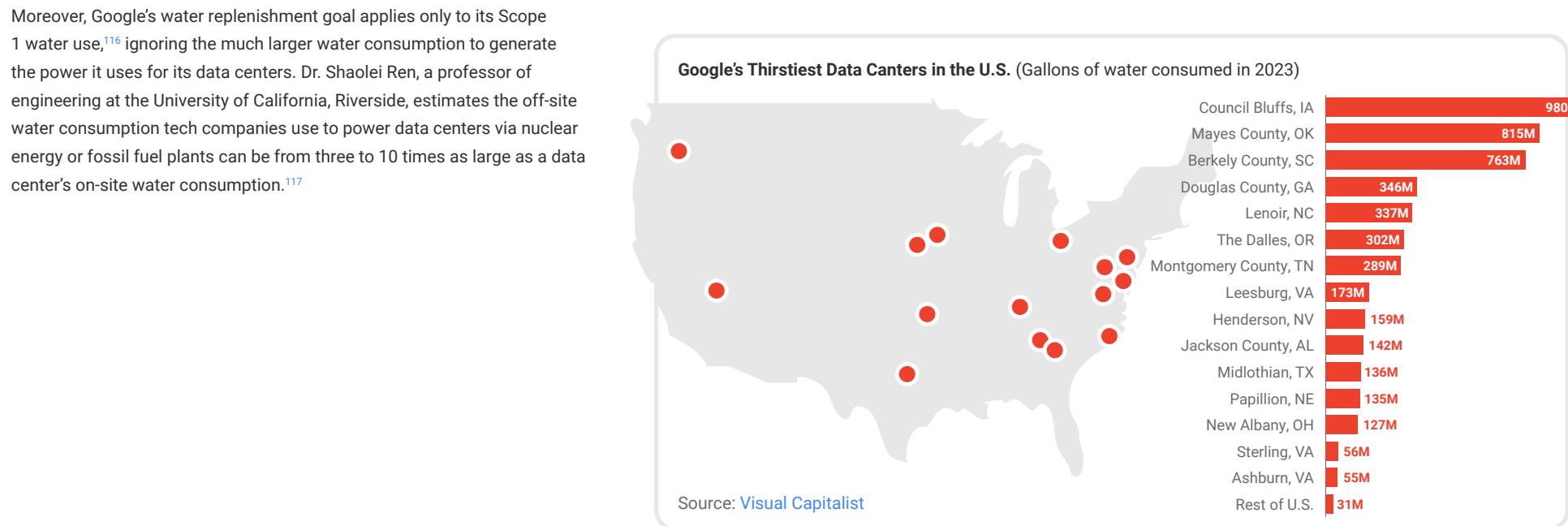




Google's first hyperscale data center complex, in a high desert Oregon community called The Dalles, has more than tripled its water consumption since 2012; by 2023, the facility was consuming 30% of the town's total water.¹¹³ Yet the 302 million gallons of water that this data center complex consumed represented less than 5% of the total water Google consumed that year to power its data centers, and the company's thirstiest data center consumes 3 times more water than The Dalles.¹¹⁴

In its 2025 environmental report, Google announced that it had "replenished" 68% of its water consumption. This is a confusing metric to interpret from the start, because "consumption" is already an additive measure taken by subtracting "discharge," or wastewater that is returned to the watershed, from "withdrawals." Replenishment is another sort of offset, where Google funds a variety of water stewardship projects—wetland restoration, toilet leak detection, and irrigation projects among them—and uses the annual water savings calculated from their completion to "offset" its actual water use.¹¹⁵ This is problematic for the same reasons carbon offsets are, in that the projects completed elsewhere do not repair the harm done at the source, and may be impossible to adequately measure.

Moreover, Google's water replenishment goal applies only to its Scope 1 water use,¹¹⁶ ignoring the much larger water consumption to generate the power it uses for its data centers. Dr. Shaolei Ren, a professor of engineering at the University of California, Riverside, estimates the off-site water consumption tech companies use to power data centers via nuclear energy or fossil fuel plants can be from three to 10 times as large as a data center's on-site water consumption.¹¹⁷





C. Google mistreats workers who are integral to its AI training and development

Worker treatment cannot be divorced from environmental impact. While organized workers are often instrumental in driving positive environmental change in their companies,¹¹⁸ Google relies on a mostly contracted workforce to train its AI and to staff its data centers. More than half of the company's global workforce are classified as temporary workers, contractors, or vendor employees.¹¹⁹ Workers are addressing this. For example, workers at Hitachi-owned vendor GlobalLogic who train Google's Gemini AI are organizing a union to address lack of benefits, job insecurity, and pay disparities, with workers performing equivalent work being paid anywhere from \$16 to \$21 per hour.¹²⁰ GlobalLogic has fired multiple workers in retaliation for organizing, perhaps anticipating that if workers gain formal union recognition, Google will cut the contract with GlobalLogic, as it did with vendor Appen after workers organized.¹²¹ Yet Google workers have also secured victories, winning a union contract at Google vendor Accenture and improving the company's approach to job cuts for full-time employees.¹²² Unlike peer-company Microsoft, Google has not taken a union-neutral stance to its workforce's organizing efforts and has hired consulting firms specifically to fight unions.¹²³



VIII. How Google enables increased fossil fuel production

Another major and underexamined way that Big Tech companies, including Google, drive the climate crisis is through cloud contracts with oil and gas companies. These contracts help oil corporations reduce costs and increase production capacity. In 2020, Google said it would stop building custom A.I./ML tools for oil exploration, extraction, and drilling,¹²⁴ but fossil fuel firms can still use Google Cloud to cut costs, boost production, and extend the industry's lifespan.¹²⁵ These contracts enable emissions on a vast scale—far exceeding data center energy use¹²⁶—yet these “enabled emissions” are not tracked in Google’s environmental reporting. The company has offered little transparency or follow-up on its pledge since 2020.¹²⁷

Interestingly, Google’s 2025 report *does* include accounting for “enabled emissions reductions.” Using extremely lax methodology, it estimates a net energy saving of 26 tCO₂e, an enormous number, from five of its products. The methodology appears to be extremely generous in ways that do not reflect reality, for instance, assuming every single Nest thermostat user is opting in to energy-saving features, and including the renewable energy from every wind and solar project from 2020–2024 for which they determined Google Earth Pro has played a large enough role in its siting (how they determine this is unspecified).¹²⁸

Independent verification is impossible, and Google caveats the numbers extensively in the footnotes despite their prominent placement in the main text, saying that “[e]nabled emissions reductions estimates include inherent uncertainty due to factors that include the lack of primary data and precise information about real-world actions and their effects. The data and claims have not been verified by an independent third-party” and “[w]e expect these estimates to evolve over time.”¹²⁹

It is dishonest to boast of enabled emissions reductions without also accounting for enabled emissions from Google’s contracts with oil and gas and other partnerships which cause increased consumption of fossil fuels.¹³⁰ (See Section below: “*Google’s climate failings are intensified by its acceleration of militarism.*”) Here are a few of the partnerships we have been able to uncover between Google and Big Oil.

A. Google’s partnership with Aramco

Google’s cloud platform plays an important and growing role supporting and optimizing the operations of Saudi-owned Aramco, the world’s largest oil producer. Google claims that it only works with the “green parts” of oil and gas companies: “We sell our services to oil and gas companies not for exploration and production but to the environmentally clean or green parts of these companies for work that they’re doing. We’re also helping oil and gas companies decarbonize in a variety of different places,” Google Cloud CEO Thomas Kurian said in 2022. “We have said that again and again that we don’t work with the oil and gas division within Aramco.”¹³¹

It is within the slim realm of possibility that Kurian’s claim about Aramco was accurate when he said it in 2022, but the very next year, Google and Saudi Aramco announced plans to open Google’s **first “cloud region” in Saudi Arabia “in partnership with state-owned Saudi Aramco.”**¹³² This partnership is based in Dammam, a desert governorate in the county’s Eastern Province. Dammam is not only the birthplace of the Saudi oil industry, it is also a major growth area for Saudi fossil fuel production, with reserves sufficient to keep the oil flowing until 2044.¹³³

During President Trump’s May 2025 visit to Saudi Arabia, Google announced a massive operational increase in Dammam: a \$10 billion joint venture with the state-owned Public Investment Fund “to build and operate a global artificial intelligence (AI) hub.”¹³⁴

As reporter Vivienne Walt revealed in *Fortune* magazine, Aramco “is betting on AI” to extend fossil fuel production far into the future.¹³⁵ Players across the oil and gas industry are using AI to find new oil reserves and drill them more quickly.¹³⁶

“In the midst of urgent global efforts to tackle climate breakdown, oil and gas companies are using AI to supercharge their fossil fuel extraction in a last ditch cash grab before oil and gas is consigned to the past.”

-Malina McLennan, Global Witness¹³⁷



B. Other Major Partnerships between Google and Oil & Gas

Note: Since the following deals were announced years ago, Google has provided little to no mention of them in corporate filings or other reports.



Chevron

Since 2018, Chevron has used Google's AutoML Vision AI tools to parse Chevron's vast data sets and revisit potential drilling sites to find new drillable oil and gas reserves where the data was formerly considered too hard to interpret.¹³⁸



TotalEnergies

Announced in 2018, Google's partnership allows TotalEnergies' geologists to work with experts in Google Cloud's Advanced Solutions Lab for subsurface data modeling, in order to explore and assess oil and gas fields faster and more effectively.¹³⁹



Repsol

Repsol worked with Google to use big data and AI to "maximize the performance and efficiency" of its Tarragona oil refinery in Spain.¹⁴⁰ The improvements were estimated to generate an extra \$20 million per year for the complex.¹⁴¹



Schlumberger

In 2019, oil field services company Schlumberger announced that Google Cloud would be its preferred cloud service provider and deployed a suite of applications designed to optimize exploration and production for oil and gas clients.¹⁴²





IX. Google has major influence over the information ecosystem, yet isn't doing enough to prevent climate disinformation

"When people come to our products and platforms looking for answers, we aim to provide high-quality, authoritative, and decision-useful information."

— Google, 2024 Environmental Report¹⁴³



Google occupies a dominant position in the global information ecosystem. The company owns the top two most visited websites in the world ([Google.com](#) and [YouTube.com](#)),¹⁴⁴ as well as the #1 web browser (Google Chrome),¹⁴⁵ #1 mobile operating system (Android),¹⁴⁶ and top digital advertising services (Google Ad Manager and AdX).¹⁴⁷ Thus, how the company chooses to present and moderate information is a major part of its impact on climate; fossil fuel interests have spent millions of dollars to intentionally sow disinformation that undermines public will for climate action.¹⁴⁸

The company uses its massive platform to allow disinformation to spread, a trend that is, alarmingly, continuing as the company unrolls AI Search tools at the same time as it relaxes moderation standards on YouTube.¹⁴⁹ In 2022, one year after Google announced policies to forbid climate disinformation content, they remained a top vendor for known disinformation networks. A study by Dewey Square Group¹⁵⁰ found that Google's ad network hosted 49% of outgoing U.S. ad traffic on websites that accounted for 97.7% of the total projected weekly visits to the climate disinformation websites they analyzed. Another study, in 2024, found that YouTube platformed and monetized a climate disinformation network even after it was revealed that they were under investigation by the Department of Justice for accepting \$10 million from a Russian influence operation.¹⁵¹ Our research found continued presence and monetization of climate disinformation, and Google's AI tools present new ways fossil fuel-funded disinformation networks are able to present themselves as legitimate sources.

A. Climate disinformation on Google Search and Gemini AI

Google's 2024 Environmental Report cites "information quality" as one of three main "Global challenges" for climate mitigation. The report's authors explain that "deliberately false or misleading information about climate change can make it difficult for people to distinguish credible sources, undermine public trust in science, hinder informed decision making, and impede effective climate action."¹⁵²

Curiously, its 2025 report does not mention information quality at all, despite notable continued instances of climate disinformation causing real-world harm within the last year.¹⁵³ Google does highlight AI tools it is developing to allegedly help communities under threat from extreme weather, without ever acknowledging the role its own platforms play in platforming disinformation that makes people less safe during extreme weather events, and hindering climate action by platforming fossil fuel-funded disinformation networks.¹⁵⁴

In March 2025, Google rolled out a new Gen AI-powered summary feature for its Search tool powered by Gemini.¹⁵⁵ We tested this tool in May 2025,¹⁵⁶ and it cited an article from the Heritage Foundation as its top source for two queries about wind power. The Heritage Foundation, the extremist think tank behind Project 2025, is a climate-denial outlet that receives substantial funding from fossil fuel interests, including the Koch family and Shell Oil.¹⁵⁷ We compiled these two AI Overviews as examples below. (See Appendix 3 for full screenshots.)



AI Overview

Wind turbines have several environmental drawbacks, including **potential harm to wildlife (especially birds and bats), noise pollution, habitat loss, and the environmental impact of their production and disposal**. While they offer a clean energy alternative, these negative impacts are a significant consideration.



Learn more

Here's a more detailed look at the environmental drawbacks:

Wildlife Impacts:

Wind turbines can kill birds and bats that fly into their spinning blades. Additionally, noise and shadow flicker can disrupt habitats and affect animal behavior.

Noise Pollution:

Wind Turbines: Not Green, Not Reliable | The Heritage Foundation

Aug 2, 2024 — Onshore wind farms require eight times the amount of critical minerals as...



Can wind turbines harm wildlife? | U.S. Geological Survey - USGS.gov

A key challenge facing the wind industry is the potential for turbines to adversely affect wild...



We asked: "Are wind turbines bad for the environment?"

AI Overview's response:

"While wind turbines offer a renewable and clean energy source, **they do have some environmental impacts, including potential harm to wildlife, particularly birds and bats, and the need for land use.** [Emphasis added by Gemini.] However, when compared to traditional fossil fuel power plants, wind energy has a significantly lower carbon footprint and does not produce air or water pollution during operation."

We asked: "Why are wind turbines so bad for the environment?"

AI Overview's response:

"Wind turbines have several environmental drawbacks, including **potential harm to wildlife (especially birds and bats), noise pollution, habitat loss, and the environmental impact of their production and disposal.** [Emphasis added by Gemini.] While they offer a clean energy alternative, these negative impacts are a significant consideration."

Both summaries cite the Heritage Foundation's think-piece "Wind Turbines: Not Green, Not Reliable" above both the United States Geological Service and the Union of Concerned Scientists. The anti-renewable energy opinion piece falsely touts gas and oil as cleaner alternative sources of energy than wind in line with its funders' interest in maintaining markets for gas and oil.¹⁵⁸

Including climate disinformation as one of its major sources led to inaccurate, biased AI overviews in response to both prompts. These summaries fall short in the following ways:

- Both fail to indicate the drastic reduction in harm from wind power over fossil fuel power generation methods, including for birds and bats.¹⁵⁹
- Both highlight in bold the most controversial and biased sections of the first paragraph.

Wind power is not particularly contentious; fossil fuel interests exploit potential concerns with the technology, including wildlife mortality, to protect their own oil and gas interests.¹⁶⁰ Scientific experts largely agree that wind power is sustainable, renewable, and one of the best alternatives we have to fossil fuels.¹⁶¹

Interestingly, Google is not delivering these harmful claims because it lacks the ability to identify and cite scientifically accurate sources. In fact, the company's own factchecking tool accurately notes that claims like "Wind energy is a bigger problem for birds than other sources of energy like fossil fuels" and "renewable energy is 'avian ecocide'" lack context.¹⁶² To debunk these claims, Google's Fact Check Tool cites an article that correctly contextualizes bird deaths due to wind power (.27 per gigawatt) in comparison to other energy sources, like nuclear power (.6 per gigawatt) and fossil fuels (9.4 deaths per gigawatt) – both of which kill significantly higher numbers of birds.¹⁶³



"[W]e have a monetization policy for Google advertisers, publishers, and YouTube creators that prohibits ads for, and monetization of, content that contradicts well-established scientific consensus around the existence and causes of climate change."

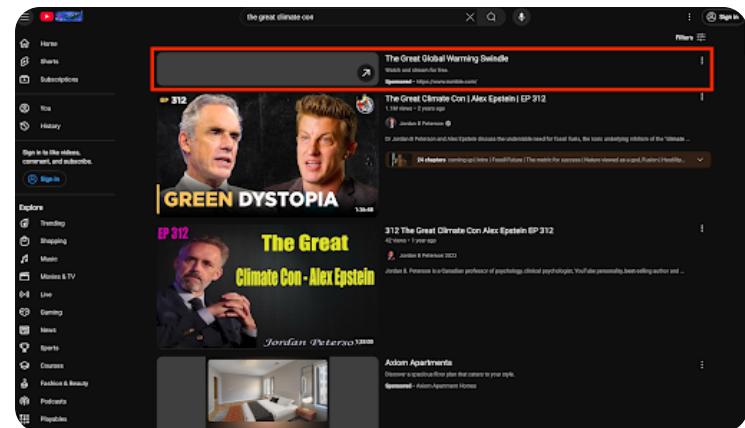
— Google, 2024
Environmental Report¹⁶⁴

B. Climate disinformation on YouTube and Google ads

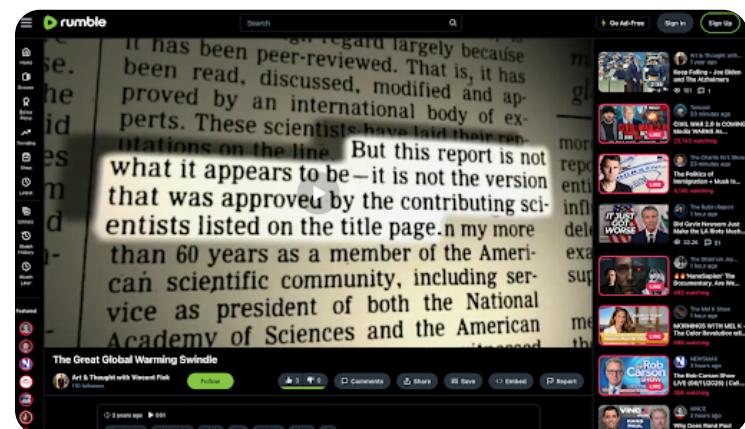
Google's publisher policy states that the company does "not allow content that contradicts authoritative scientific consensus on climate change," and that such videos will not run with ads that would allow the creators to make money off the disallowed content, a process known as monetization.¹⁶⁵ Yet a brief search we performed on YouTube reveals that many creators deny or contradict consensus about climate change and still reach hundreds of millions of users around the world.¹⁶⁶ Even worse, these videos are often monetized, and have been for years.¹⁶⁷

While searching for climate disinformation videos, we found a YouTube ad in rotation in May, 2025 promoting a 2007 anti-climate video called "The Great Global Warming Swindle." Clicking the ad redirects the viewer to Rumble, a video-sharing site *The New York Times* calls "the Right-Wing YouTube," where the hour-long anti-climate video can be viewed.¹⁶⁸ This is a clear example of Google's YouTube platforming and profiting from the promotion of anti-climate content in direct violation of its own publisher policies.

In addition to profiting itself, Google pays climate disinformation creators directly by sharing revenue from ads placed on their videos. A 2015 video from Glenn Beck, far-right radio host and founder of BlazeTV, features Beck interviewing Peter Thiel, cofounder of PayPal and former boss of YouTube's co-founders. In the video, Thiel proclaims the "climate change debate" to be "pseudo-science."¹⁶⁹ This 10-year old video was monetized as of June 2025 with multiple ads, including one from website-building software Wix. Other monetized disinformation featured ads from well-known companies including Dick's Sporting Goods, Motorola US, and Planet Fitness.¹⁷⁰ Many of the outlets behind the videos we found, including PragerU and John Stossel, are funded by fossil fuel interests¹⁷¹ and, along with BlazeTV, have been elevated by advocacy organizations to Google as sources of disinformation for years.¹⁷² We found these examples with just a very brief search; Google could do the same, and the true scope of the problem is assumed to be much greater.

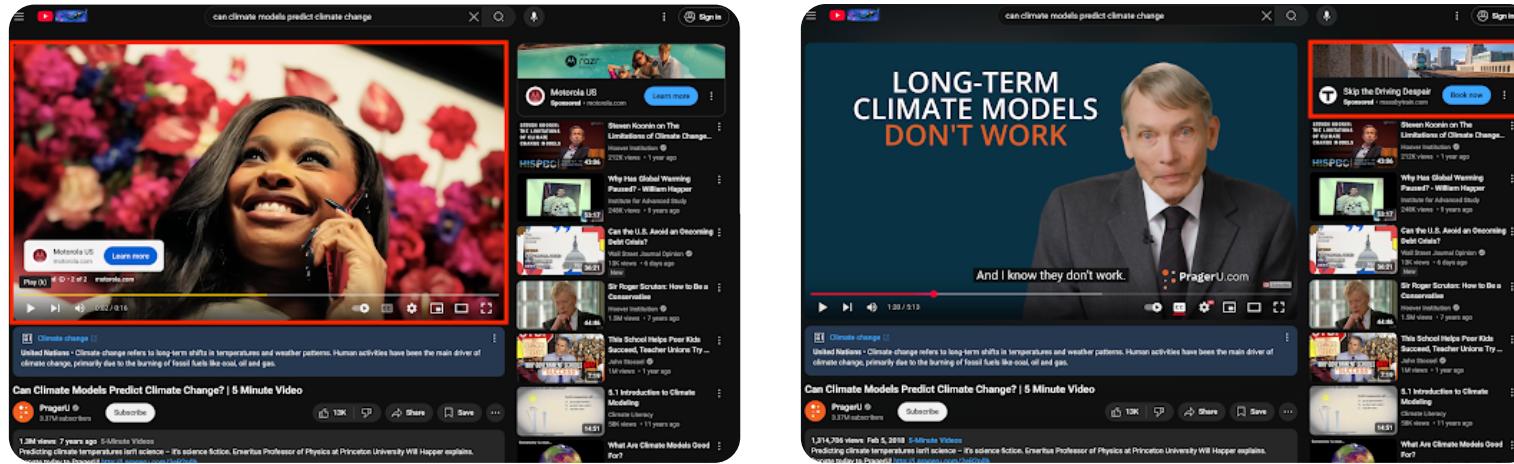


A paid ad for a climate denial video runs on YouTube, in direct violation of their publisher policies.



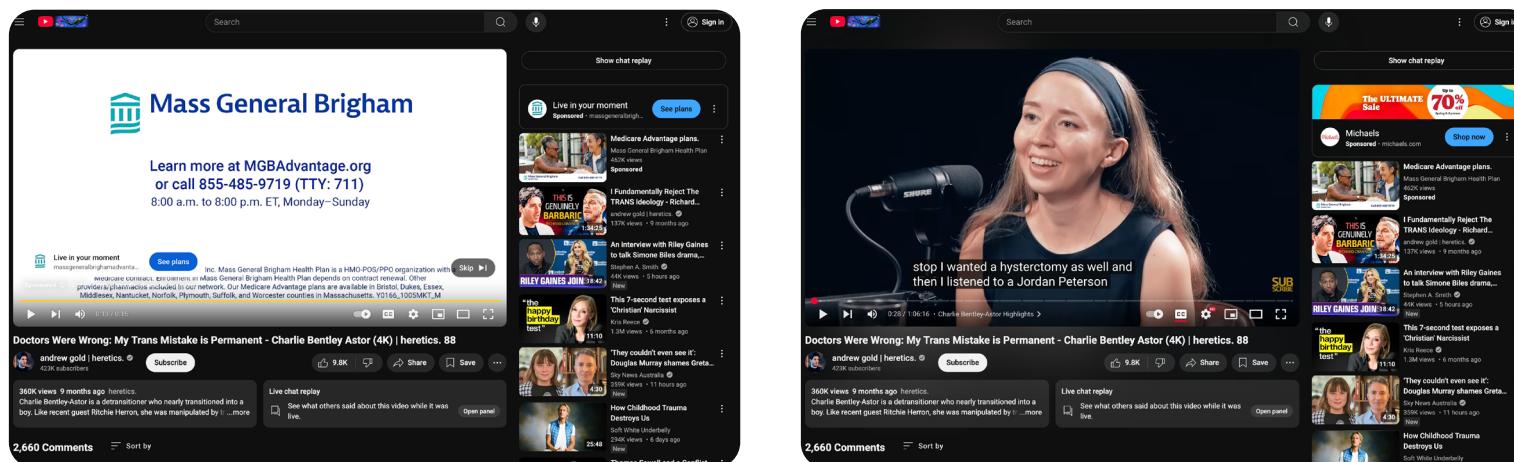


C. Climate disinformation is linked to transphobia by funding and YouTube's algorithms



A 2025 study found that 80% of anti-trans organizations receive funding from fossil fuel companies, reflecting a larger trend of fossil fuel companies bankrolling right-wing social positions that undermine human rights.¹⁷³ With its recommendations, YouTube's algorithm is helping to secure this link.

Disturbingly, after roughly two hours of watching climate disinformation content on a fresh browser,¹⁷⁴ YouTube began suggesting transphobic videos on the YouTube homepage, adjacent to an ad from Clif Bar.¹⁷⁵ The transphobic video (below) is monetized by two ads. One is from Michaels, a well-known national chain of arts and crafts stores. The other advertisement is from the Mass General hospital system, a leading provider of gender-affirming care and the largest employer in Massachusetts.¹⁷⁶





X. Google's climate failings are intensified by its acceleration of militarism

"Google's pivot from refusing to build AI for weapons to stating an intent to create AI that supports national security ventures is stark. Militaries are increasingly using AI in war, where their reliance on incomplete or faulty data and flawed calculations increases the risk of civilian harm. Such digital tools **complicate accountability** for battlefield decisions that may have life-or-death consequences."

— Human Rights Watch, responding to Google's February 4, 2025, updates to its Responsible AI Principles.¹⁷⁷

Google's climate commitments don't exist in a vacuum; they are part of the company's larger ethos. This larger context matters because Google is engaged in a more expansive about-face, with further consequences for both our environment and, more fundamentally, a livable world for all of us.

Much like Google's Cloud contracts with fossil fuel companies, Google's contracts for military use enable emissions and harms that would not be possible without the company. The organization Scientists for Global Responsibility estimates that war is responsible for more than 5.5% of global greenhouse gas emissions, or more than every single country except China, the United States, and India.¹⁷⁸ And, like the climate crisis, we at Kairos care about combating war because of its effects on people as well as the places they live and the planet at large. Google's increasing support for war and militarism is directly at odds with a livable climate.

In February 2025, Google updated its AI principles to remove language promising not to pursue:¹⁷⁹

- "Technologies that cause or are likely to cause overall harm"
- "Weapons or other technologies whose principal purpose or implementation is to cause or directly facilitate injury to people"
- "Technologies that gather or use information for surveillance violating international law and human rights"

Google's abdication of its responsible AI policies coincided with the start of the second Trump administration, when Trump quickly moved to rescind former President Biden's executive order on AI safety. The rollback eliminated "key regulatory guardrails intended to prevent the reckless deployment of AI in sensitive areas such as warfare and law enforcement."¹⁸⁰

Google, like its Big Tech peers, is aligning with the new administration to pursue AI applications for government and military use amid a manufactured global AI race. But while Google is newly emboldened, human-rights watchdogs have long considered its surveillance-based business model "incompatible with the right to privacy," according to Amnesty International, which goes on to argue that the company "poses a threat to a range of other rights including freedom of opinion and expression, freedom of thought, and the right to equality and non-discrimination."¹⁸¹

For example, in 2021, even before Google rolled back its AI principles, it licensed Google Cloud services for the Israeli government and military through Project Nimbus,¹⁸² despite its knowledge that "Google Cloud services could be used for, or linked to, the facilitation of human rights violations, including Israeli activity in the West Bank."¹⁸³ After the most recent escalation began following October 7, 2023, Google "rushed to sell AI tools" to the Israeli military even while publicly distancing itself after widespread employee outrage.¹⁸⁴

Google has been complicit in many aspects of Israel's ongoing attacks against Gaza—now accepted as a genocide by many international human rights experts¹⁸⁵—from Google Photos being used to create registries for Israeli surveillance of Palestinians, to firing 50 of their own employees for protesting their partnership with Israel, to the company providing advanced Google Gemini services to the Israeli Defense Fund in 2024.¹⁸⁶ Google also announced a Cloud contract with Lockheed Martin, the world's largest military company, only a few weeks after rolling back its ethical guideline on AI for military uses.¹⁸⁷



Google's UK-based AI startup DeepMind, which it acquired in 2014, has been through a similar journey away from commitments for responsible use. In 2015, DeepMind CEO Demis Hassabis explained that the acquisition terms with Google stipulated that "no technology coming out of Deep Mind will be used for military or intelligence purposes."¹⁸⁸ Now, "the same AI systems developed under Hassabis's watch are being sold, via Google, to militaries such as Israel's—whose campaign in Gaza has killed tens of thousands of civilians,"¹⁸⁹ as well as the U.S. army and When asked about the reversal, Hassabis said the world became "a much more dangerous place," which required DeepMind's position to shift.¹⁹⁰

"The destruction of the natural environment in Gaza is now very well-documented. It is not collateral or incidental, but deliberate."

— Saeed Bagheri, lecturer in international law at the University of Reading in the U.K.¹⁹¹

"As recently as November 2024, by which time a year of Israeli airstrikes had turned much of Gaza to **rubble**, documents show Israel's military was still tapping Google for its latest AI technology. Late that month, an employee requested access to the company's **Gemini AI technology** for the IDF, which wanted to develop its own AI assistant to process documents and audio, according to the documents."

— Gerrit De Vynck, reporter for *The Washington Post*¹⁹²

XI. Google's rush to please the Trump administration

Facing antitrust suits that threaten its entire business model, Google, like others in Big Tech, has a vested interest in working with the Trump administration. Google CEO Sundar Pichai met with Trump at Mar-a-Lago in December 2024¹⁹³ and attended Trump's inauguration in January 2025.¹⁹⁴ Alphabet was among several Big Tech companies to donate \$1 million to Trump's inauguration;¹⁹⁵ this sum was more than triple its \$285,000 donation for Trump's 2017 inauguration¹⁹⁶ and roughly triple its donation to Biden's inauguration in 2021.¹⁹⁷ Google's money and public support directly undermines the company's environmental commitments, as Trump's administration dismantles environmental programs and agencies and rolls back environmental protections.¹⁹⁸

The Trump administration could pose a threat to Google's plans to scale carbon capture and storage (CCS), by reducing funding from the Department of Energy and throwing federal tax credits into question.¹⁹⁹ Trump has also canceled green energy grants, slashed climate research programs, and pulled the U.S. out of international climate negotiations.²⁰⁰



Google CEO Sundar Pichai (second from left) appears with Donald Trump Jr., Elon Musk, Usha Vance and Doug Burgum during the 60th Presidential Inauguration in the Rotunda of the U.S. Capitol in Washington, D.C. on Jan. 20th, 2025. (Kenny Holston/The New York Times via AP, Pool)



XII. What do we do now?



We now know some of the extent of Google's duplicity, but getting them to come clean will not be easy. We have some ideas for Google, but it will be up to us – all of us – to hold them to account. Google has the infrastructure, it has the capital, and it has the expertise. What the company's leadership lacks is the will—and they won't get there without public pressure.

We will continue to advocate for Google to adopt policies and practices that support us, our communities and our climate. Here are a few things we can all do to turn up the heat:

1. Join us in fighting for change. Sign on at noclimateresultsfound.com.
2. We have compiled a comprehensive list of policy recommendations for Google (see [Appendix 4](#)). They fall into a few broad categories:
 - Google must increase transparency and honesty in their environmental reporting.
 - Google must scale their compute (and data center expansion) to planetary limits.
 - Google must address its energy use and drastically cut its use of fossil fuels.
 - Google must address its unsustainable water use.
 - Google must enforce and strengthen measures to end climate disinformation on all Google platforms.
 - Google must address the impact of enabled emissions by ending cloud contracts with Oil & Gas and militaries.
 - Google must prioritize human rights and affected communities in policy decisions.
3. Google's Gen AI-accelerated climate impact has concrete infrastructure: the data centers being built out around the globe. We can fight their proliferation. Learn how: dirtydatacenters.com and kairosfellows.org/fightdatacenters
4. Reach out to collaborate or with any questions: campaigns@kairosfellows.org



XIII. About us

Written by Kairos Fellowship with research support from Small World Strategy.

Reviewers and Contributors: [Kairos Fellowship](#), [Enabled Emissions Campaign](#), and [Alphabet Workers Union-CWA Local 9009](#). This investigation was supported by [Climate Action Against Disinformation](#). Initial research was supported by [The Sunrise Project](#).



Glossary

Anthropogenic Emissions

The IPCC defines "anthropogenic emissions" as "emissions of greenhouse gases (GHGs), precursors of GHGs and aerosols caused by human activities. These activities include the burning of fossil fuels, deforestation, land use and land-use changes (LULUC), livestock production, fertilization, waste management, and industrial processes."²⁰¹

Base Year

A reference point in the past to which current emissions can be compared. For Google, this year is 2019.²⁰²

Capital Expenditure (CapEx)

The funds used by a company to undertake new projects or investments.²⁰³

Carbon-Free Energy ("CFE")

Google defines "carbon-free energy" as "any type of electricity generation that doesn't directly emit carbon dioxide, including (but not limited to) solar, wind, geothermal, hydropower, and nuclear. Sustainable biomass and carbon capture and storage (CCS) are special cases considered on a case-by-case basis, but are often also considered carbon-free energy sources."²⁰⁴

Enabled Emissions

The additional GHG emissions produced by increases in fossil fuel extraction and production through the use of technologies such as AI and cloud computing. These real emissions are currently not accounted for in any Scope.²⁰⁵

Gemini

Google's flagship generative AI model that powers Gemini Chat, Search AI Overviews, and more.²⁰⁶

Generative Artificial Intelligence (Gen AI, sometimes AI)

A form of machine-learning that's trained on massive datasets to create new data.²⁰⁷

Global Energy Consumption

The total energy consumption in Google's global operations. Not to be confused with the slightly different "total electrical consumption," which does not include non-electrical energy sources such as fuel.²⁰⁸

Greenhouse Gas (GHG)

Gaseous constituents of the atmosphere, both natural and human caused, that cause the greenhouse effect. The primary GHGs in Earth's atmosphere are "water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and ozone (O₃)."²⁰⁹ The U.S. Environmental Protection Agency (EPA) states that "GHG emissions are often measured in carbon dioxide equivalent (CO₂e). To convert emissions of a gas into CO₂ equivalent, its emissions are multiplied by the gas's Global Warming Potential (GWP). The GWP takes into account the fact that many gases are more effective at warming Earth than CO₂, per unit mass."

The Intergovernmental Panel on Climate Change (IPCC)²¹⁰

The IPCC is the leading international body for assessing climate change science. It was established in 1988 by the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO). The IPCC was created to provide policymakers with regular scientific assessments on climate change, its implications, and potential future risks, as well as to recommend pathways for adaptation and mitigation.

IT Equipment and Non-IT Equipment

IT equipment represents technology that's used for computing in a data center, specifically computers (also called servers). Non-IT equipment is anything not directly used for computing, such as temperature control systems (heating and cooling), and lighting.²¹¹

Location-Based and Market-Based emissions

Google defines location-based emissions as "the average carbon intensity of the electric grids where our operations are located" and market-based emissions as augmenting location-based through the incorporation of its "procurement choices, namely our renewable energy purchases via contractual mechanisms like PPAs [Power Purchase Agreements]."²¹²

Monetization (specifically, YouTube monetization)

Advertisers pay Google to place an ad on a YouTube video. When this ad is viewed by a user, the creator of the video gets a percentage of the revenue Google earned from the paid ad placement. When both YouTube and the creator allow advertisements on a video, the video is considered monetized. If YouTube later decides a video is not advertiser friendly, it can limit or completely disable ad revenue on the video through a process unofficially known as "demonetization."²¹³

Net Zero Emissions ("Net zero")

According to the IPCC, "Net zero emissions are achieved when anthropogenic emissions [GHG emissions caused by human activities] of greenhouse gases to the atmosphere are balanced by anthropogenic removals [withdrawal of GHGs from the atmosphere as a result of deliberate human activities] over a specified period." Google says its definition aligns with the IPCC's definition.²¹⁴



Predictive Machine-Learning Model

(“traditional AI,” sometimes “AI”)

Before Gen AI, this type of model is what was often meant by “AI.” Machine-learning enables computers to imitate the way humans learn, perform tasks autonomously, and to improve their performance and accuracy through training performed on millions of examples. The result of this training is a predictive model that can help identify patterns based on the original set of examples. *MIT News* gives an example of “using millions of examples, to predict whether a certain X-ray shows signs of a tumor or if a particular borrower is likely to default on a loan.”²¹⁵

Power Usage Effectiveness (“PUE”)

Represents the ratio of energy consumption by data center IT equipment to total data center energy consumption. As data center efficiency improves (i.e. by reducing non-IT equipment energy consumption), PUE will continue to reduce, with the theoretical best PUE being 1, where all energy consumed by a data center is used by IT equipment. *Example:* A data center consumed 150 MWh for the year, 150 MWh was consumed by IT equipment, the data center’s PUE is 1 (150 MWh / 150 MWh).²¹⁶

Renewable Energy

The United Nations defines “renewable energy” as “energy derived from natural sources that are replenished at a higher rate than they are consumed.” Examples include solar, wind, geothermal, hydropower, ocean energy, and bioenergy.²¹⁷

Scopes All (“All scopes emissions” or “Total emissions”)

All Scopes emissions represent the sum total of all GHG emissions in all three scopes. When Google defines its “total emissions,” it uses market-based data for all Scopes.²¹⁸

Whenever possible, this report uses location-based emissions data.

Scope 1 emissions

Google’s Scope 1 emissions are “direct [GHG] emissions from sources such as company vehicles or generators at our offices and data centers. They represent direct emissions from owned Global Facilities, including fuel use from backup generators, fuel consumption from our operated vehicles and aircraft, methane and nitrous oxide from biogenic fuel sources, natural gas usage, and refrigerant leakage.”²¹⁹

Scope 2 emissions

Google’s Scope 2 emissions are “indirect [GHG] emissions from purchased electricity; natural gas use, and refrigerant leakage in our leased offices; purchased steam, hot water, and chilled water from district energy systems.” Scope 2 can be measured in two ways, location-based and market-based.²²⁰

Scope 3 emissions

Google describes its Scope 3 emissions as “indirect [GHG] emissions from other sources in our value chain, such as our suppliers, the use of our consumer devices, and business travel.”²²¹

Water Consumption

Google describes water consumption as withdrawal minus discharge.²²² The Global Reporting Initiative (GRI) defines water consumption as “sum of all water that has been withdrawn and incorporated into products, used in the production of crops, or generated as waste, has evaporated, transpired, or been consumed by humans or livestock, or is polluted to the point of being unusable by other users, and is therefore not released back to surface water, groundwater, seawater, or a third party over the course of the reporting period.”²²³

Water Discharge

Google’s water discharge is “based on actual metered or invoiced data when it’s available. Where actual potable water discharge isn’t available, [Google applies] an industry-standard 90% discharge flow factor to a facility’s water withdrawal to estimate water discharge. For irrigation water, [Google applies] a 0% discharge flow factor to a facility’s water withdrawal to estimate water discharge [and applies] this estimation process to all offices and to potable and irrigation water withdrawal at data centers used for domestic purposes (i.e., water not used for IT cooling) where actual discharge data isn’t available.”²²⁴ The GRI defines water discharge as the “sum of effluents, used water, and unused water released to surface water, groundwater, seawater, or a third party, for which the organization has no further use, over the course of the reporting period.”²²⁵

Water Withdrawal

Google’s water withdrawal is “based on actual metered or invoiced data when it’s available.”²²⁶ The GRI defines water withdrawal as the “sum of all water drawn from surface water, groundwater, seawater, or a third party for any use over the course of the reporting period.”²²⁷



Appendix 1. Google Gemini Chat Screenshots

The screenshot shows the Gemini AI interface. At the top, there's a navigation bar with a menu icon, the word "Gemini", "About Gemini", and a "Sign in" button. Below the navigation bar, the main content area has a dark background. A question is asked: "Will Google achieve its 2030 goals?". The response discusses the company's commitment to sustainability and the challenges posed by AI's environmental impacts. It lists three key areas for achieving net-zero: innovating energy-efficient AI models, accelerating grid decarbonization, and effective carbon removal solutions. The text concludes that while Google has a history of leadership in corporate sustainability, the rapid expansion of energy-intensive AI presents a significant challenge. At the bottom, there's a "Sources" button, a "Gemini" icon, a prompt input field with placeholder text "Enter a prompt for Gemini", and a microphone icon.

Will Google achieve its 2030 goals?

While Google has demonstrated a strong commitment to sustainability and has made significant investments in renewable energy and efficiency, the surge in emissions driven by AI presents a formidable challenge. The company itself acknowledges that achieving net-zero by 2030 "will not be easy" and that its approach will need to "continue to evolve" to navigate the uncertainty around AI's environmental impacts. ☁

Their ability to achieve these goals will depend on:

- **Innovating energy-efficient AI models:** Developing AI chips and algorithms that require less energy. ☁
- **Accelerating grid decarbonization:** Ensuring that the grids where they operate can supply 24/7 carbon-free energy to meet their growing demand. This requires significant investment in renewable energy sources and energy storage solutions. ☁
- **Effective carbon removal solutions:** Scaling up reliable and verifiable carbon removal technologies.

It's a complex and ambitious undertaking. While Google has a history of leadership in corporate sustainability, the rapid expansion of energy-intensive AI means they are facing an uphill battle to meet their 2030 targets.

[Sources](#)

G :

+ ⚙ Enter a prompt for Gemini

Gemini can make mistakes, so double-check it



Appendix 2. Google AI Overview Screenshots

Wind Turbines

Google Are wind turbines bad for the environment? Sign in

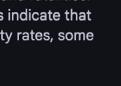
All Images Short videos Forums News Videos Shopping More Tools ▾

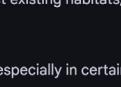
AI Overview

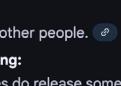
While wind turbines offer a renewable and clean energy source, they do have some environmental impacts, including potential harm to wildlife, particularly birds and bats, and the need for land use. However, when compared to traditional fossil fuel power plants, wind energy has a significantly lower carbon footprint and does not produce air or water pollution during operation. 

Here's a more detailed look at the environmental impacts of wind turbines:

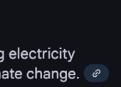
Potential Negative Impacts:

Wildlife Mortality:
Wind turbines can be a threat to birds and bats, causing collisions and fatalities. While mortality rates vary among facilities and regions, and studies indicate that modern wind energy developments have relatively low raptor fatality rates, some locations still experience significant impacts. 

Land Use:
Wind farms require land, and the installation of turbines can impact existing habitats, potentially displacing plants and animals. 

Noise and Visual Impact:
Turbines can be noisy, and their presence can be a visual impact, especially in certain areas. 

Shadow Flicker:
Turbines can cause shadow flicker, which may disturb wildlife and other people. 

Environmental Concerns During Construction and Manufacturing:
The manufacturing, transportation, and installation of wind turbines do release some pollution, although it is significantly lower than burning fossil fuels. 

Benefits and Positive Impacts:

Renewable and Clean Energy:
Wind energy is a renewable and clean source of electricity, meaning it doesn't rely on burning fossil fuels. 

Reduced Greenhouse Gas Emissions:
Wind turbines help reduce greenhouse gas emissions by displacing electricity generation from fossil fuels, contributing to efforts to mitigate climate change. 

Learn more

Wind Turbines: Not Green, Not Reliable | The Heritage Foundation Aug 2, 2024 — As a result, the United States is projected to have about one-fifth of the world's... 
The Heritage Foundation

Environmental Impacts of Wind Power | Union of Concerned Scientists Mar 5, 2013 — Harnessing power from the wind is one of the cleanest and most sustainable... 
Union of Concerned Scientists

Wind explained: Wind energy and the environment - EIA Wind turbines do not release emissions that can pollute the air or water (with rare exceptions)... 
U.S. Energy Information Administration (EIA)

Show all



Wind Turbines

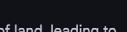
Google Why are wind turbines so bad for the environment? X | Microphone | Camera | Search

All Images Forums Short videos News Videos Shopping More Tools AI Overview

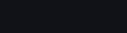
Wind turbines have several environmental drawbacks, including potential harm to wildlife (especially birds and bats), noise pollution, habitat loss, and the environmental impact of their production and disposal. While they offer a clean energy alternative, these negative impacts are a significant consideration. 

Here's a more detailed look at the environmental drawbacks:

Wildlife Impacts:
Wind turbines can kill birds and bats that fly into their spinning blades. Additionally, noise and shadow flicker can disrupt habitats and affect animal behavior. 

Noise Pollution:
Wind turbines generate noise, which can be a nuisance to nearby residents and potentially affect wildlife. 

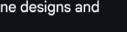
Habitat Loss:
The construction and operation of wind farms require large areas of land, leading to habitat loss and fragmentation. 

Production and Disposal:
The manufacturing of wind turbine components requires significant resources and energy, and the materials used, including rare earth metals, can have environmental impacts. Additionally, turbine blades are not easily recyclable, and some landfill operators require them to be crushed before landfilling. 

Offshore Wind Impacts:
Offshore wind farms can also have environmental impacts, including noise pollution for marine life, the potential for collision with seabirds, and the physical alteration of the seabed. 

Carbon Footprint:
While wind energy is a low-carbon source of electricity, the production, installation, and eventual decommissioning of wind farms can have a carbon footprint. 

Mitigation and Research:

- The wind energy industry and governments are researching ways to reduce the impact of wind turbines on wildlife, such as using different turbine designs and location strategies. 
- Researchers are also exploring ways to make turbine blades recyclable. 

Wind Turbines: Not Green, Not Reliable | The Heritage Foundation Aug 2, 2024 — Onshore wind farms require eight times the amount of critical minerals as...  The Heritage Foundation

Can wind turbines harm wildlife? | U.S. Geological Survey - USGS.gov A key challenge facing the wind industry is the potential for turbines to adversely affect wild...  USGS.gov

Wind explained: Wind energy and the environment - EIA Wind turbines have some negative effects on the environment ... Wind turbine blades make...  EIA

Show all



Solar panels

Google Why is solar so bad for the environment? X | Microphone | Lock | Search

All Images Forums Short videos Videos News Shopping More Tools AI Overview

While solar panels offer many environmental benefits by generating clean electricity, their manufacturing and disposal also have environmental impacts. These include **habitat loss from clearing land for solar farms, the release of hazardous materials during manufacturing and disposal, and the energy and water used in production processes**. Additionally, the long-term effects of large solar farms on ecosystems and wildlife are still being studied.

Here's a more detailed look at the environmental concerns associated with solar energy:

Habitat Loss and Ecosystem Disruption:
Clearing land for solar panel installations, especially large-scale solar farms, can lead to habitat loss and disruption of ecosystems. Roads and transmission lines needed for these facilities can also fragment habitats and impact wildlife.

Hazardous Materials:
Solar panels contain materials like cadmium, lead, and silver, which can be harmful if not handled properly during manufacturing, use, and disposal. Proper recycling and waste management are crucial to prevent these materials from leaching into the environment.

Manufacturing and Energy Consumption:
The manufacturing of solar panels requires significant energy and materials, including silicon, glass, and other metals. These processes can also involve the use of hazardous chemicals and potentially lead to air and water pollution.

Water Use:
Some solar technologies, like concentrated solar power plants, require significant amounts of water for cooling and cleaning. This can put a strain on water resources, especially in arid regions.

Carbon Footprint:
While solar panels don't produce emissions while generating electricity, their production and transportation do contribute to the carbon footprint of the entire system. The time it takes for solar panels to offset the emissions from their production is a factor to consider.

Waste Disposal:
As solar panels become more widespread, the issue of end-of-life disposal and recycling becomes more critical. Proper handling of hazardous waste and development of efficient recycling infrastructure are essential.

The Dark Side of Solar Power - Harvard Business Review
Jun 18, 2021 — See more HBR charts in Data & Visuals. If early replacements occur as predict...
Harvard Business Review

End-of-Life Solar Panels: Regulations and Management | US EPA
Hazardous waste testing on solar panels in the marketplace has indicated that different variet...
Environmental Protection Agency

The Environmental Impact of Solar Energy: Is It Truly Worth It?
Feb 11, 2022 — Habitat Loss. Solar energy systems require land for the installation of sola...
GreenFi

Show all



Shell Oil

Google How is Shell working to protect the environment? Sign in

All Images Short videos Forums News Videos Shopping More Tools

AI Overview

Shell is working to protect the environment by focusing on various strategies, including transitioning to low-carbon energy sources, reducing emissions, and supporting nature-based solutions. They are also implementing measures to improve energy efficiency, utilize renewable energy, and develop carbon capture and storage technologies. Additionally, Shell is actively involved in biodiversity and ecosystem protection, aiming to achieve net-zero deforestation and increase the use of recycled plastics in their packaging.

Specific Actions:

Transitioning to Low-Carbon Energy:
Shell is investing in low-carbon intensity projects, decommissioning older plants, and divesting assets to gradually shift away from fossil fuels.

Reducing Emissions:
They are improving energy efficiency in their operations, using more renewable electricity, and developing carbon capture and storage (CCS) for some of their facilities.

Supporting Nature-Based Solutions:
Shell is investing in nature-based solutions, such as reforestation and mangrove regeneration, to help offset emissions and restore ecosystems.

Biodiversity and Ecosystem Protection:
Shell has a commitment to net-zero deforestation and is working to protect biodiversity in areas where they operate.

Circular Economy and Waste Reduction:
Shell is aiming to increase the use of recycled plastics in their packaging and use packaging that is reusable or recyclable.

Collaborating with Stakeholders:
Shell engages with local communities and other stakeholders to address environmental concerns and ensure their activities are sustainable.

Embracing Renewable Energy:
Shell is using solar energy to power some of their service stations and is exploring other renewable energy options.

Nature-based solutions | Shell Global
Regenerating mangroves in Senegal. We have invested directly in the Sine-Saloum project in... Learn more

Biodiversity and ecosystems - Shell Global
Net-zero deforestation. We have set a new commitment that we will replant forests,...

The Greenwashing Files - Shell - ClientEarth
Shell says its ambition is to invest \$100 million per year in 'nature-based projects' theoretical...

Show all

AI responses may include mistakes.



Clean Coal

Google is clean coal real

All Videos Images News Short videos Forums Shopping More Tools

AI Overview Learn more :

No, the term "clean coal" is inaccurate, as coal combustion inevitably produces harmful pollutants. While technologies like carbon capture and storage (CCS) can mitigate some emissions, the inherent pollution associated with coal mining and combustion, including greenhouse gas emissions and air pollution, makes "clean coal" an oxymoron.

Elaboration:

Coal's inherent pollutants:
Coal burning releases particulate matter, sulfur dioxide, nitrogen oxides, and greenhouse gases like carbon dioxide, all contributing to air pollution and climate change.

Myth of "clean coal":
The term "clean coal" is often used to suggest that technologies can make coal a pollution-free energy source. However, while some technologies can reduce emissions, they don't eliminate them completely, according to Green America and National Geographic.

Carbon Capture and Storage (CCS):
CCS technology captures carbon dioxide emissions from coal-fired power plants and either stores them underground or uses them for other purposes. While CCS can reduce greenhouse gas emissions, it doesn't address the other pollutants released

Clean Coal? Are there different types of coal that give off different emissions? : r...
Oct 31, 2020
Reddit · r/askscience :

Everything You Need to Know About Clean Coal
May 19, 2022 — Ideal spots for this include old oil and gas fields, which have already dug into...
Popular Mechanics :

Coal pollution mitigation - Wikipedia
Mitigation includes precombustion approaches, such as cleaning coal, and post combustion...
Wikipedia :

Show all



Clean Coal

Google Is clean coal good for the environment? X | 🔍 | 📸 | ⚡

All Short videos Images Forums Shopping News Videos More Tools

AI Overview Learn more :

While clean coal technologies can reduce some harmful emissions from coal-fired power plants, **they don't make coal completely environmentally friendly**. Burning coal inherently releases greenhouse gases and pollutants, and even with capture and storage technologies, the legacy of coal mining and processing remains. [🔗](#)

Here's a more detailed look:

What "clean coal" technologies do:

Carbon Capture and Storage (CCS):
This technology aims to capture CO₂ released during combustion and store it underground, preventing it from entering the atmosphere and contributing to climate change. [🔗](#)

Pollution Controls:
Newer coal plants often incorporate technologies like scrubbers to reduce emissions of sulfur dioxide, nitrogen oxides, and particulate matter. [🔗](#)

Why "clean coal" is not fully clean:

Greenhouse Gas Emissions:
Even with CCS, burning coal still releases significant amounts of CO₂, a major greenhouse gas. [🔗](#)

Column: What does 'clean coal' mean and can it save the planet?
Jun 15, 2017 — Clean coal technologies that capture and store the CO₂ generated from co... 

PBS :

Clean Coal Is Crucial for American Jobs, Energy Security, and ...
Jun 26, 2020 — Coal-fired electricity generation is cleaner than ever. NETL's research shows... 

Department of Energy :

Everything You Need to Know About Clean Coal
May 19, 2022 — "Clean coal" usually means capturing carbon emissions from burning coal... 

Popular Mechanics :

Show all



Clean Coal

What is clean coal? X Microphone Camera Search Gears More Sign in

All Images Videos Short videos News Forums Shopping More Tools

AI Overview Learn more More

"Clean coal" refers to technologies that mitigate or reduce the pollutants and carbon dioxide emissions associated with burning coal to generate electricity. It's not about a specific type of coal, but rather about the processes used to power coal-fired plants. These technologies aim to make coal a cleaner energy source by reducing emissions of sulfur dioxide, nitrogen oxides, and carbon dioxide. More

Here's a more detailed breakdown:

What "Clean Coal" Involves:

Pollutant Control:
Technologies like scrubbers, which remove sulfur dioxide, and selective catalytic reduction (SCR), which reduces nitrogen oxides, are used to clean the emissions from coal-fired power plants. More

Carbon Capture and Storage (CCS):
This technology captures carbon dioxide from power plant emissions and either stores it underground or uses it for other purposes, according to HowStuffWorks. More

'Clean Coal' Technologies, Carbon Capture & Sequestration
Nov 16, 2021 — The term 'clean coal' is increasingly being used for supercritical co... World Nuclear Association More

Everything You Need to Know About Clean Coal
May 19, 2022 — For decades now, clean coal has been a... Popular Mechanics More

Clean Coal Technology
The clean coal technology program has resulted in mor... National Mining Assoc... More

Show all



Does AI reduce emissions in the Oil and Gas industry?

Google

How is AI helping reduce emissions in industries such as oil and gas?

All News Images Short videos Videos Forums Shopping More Tools

AI Overview Learn more :

AI is playing an increasingly vital role in helping the oil and gas industry reduce its emissions and environmental impact. [Read more](#)

Here's how AI is contributing to emissions reduction:

1. Methane Emissions Reduction:

- Detection and Quantification: AI analyzes data from various sources like satellite imagery and sensor readings to accurately detect and quantify methane leaks from oil and gas infrastructure. This helps in pinpointing the sources of methane emissions, a potent greenhouse gas.
- Predictive Maintenance: AI-powered predictive maintenance systems continuously monitor equipment health, predicting potential failures and leaks before they happen. This allows for timely repairs and prevents methane releases, according to Appinventiv.
- Optimized Operations: AI optimizes operational parameters in oil and gas production, such as wellhead pressure and flow rates, to minimize methane leaks. [Read more](#)

2. Energy Efficiency and Optimization:

- Smart Grid Management: AI enhances energy distribution by analyzing real-time data to optimize power flow and reduce transmission losses in smart grids. This minimizes energy waste and associated emissions.
- Predictive Analytics for Energy Consumption: AI analyzes historical data and environmental factors to predict energy consumption patterns and optimize energy use in oil and gas operations.
- Renewable Energy Integration: AI facilitates the integration of renewable energy sources into oil and gas operations, reducing reliance on fossil fuels and associated emissions. [Read more](#)

3. Carbon Capture and Storage (CCS) Optimization:

Artificial Intelligence in Oil and Gas: Benefit, Use Cases ...
Apr 29, 2025 — Unleashing the Potential of Artificial Intelligence in the Oil and Gas Industry – 10 Use Cases...
[Appinventiv](#) :

How AI can help mitigate climate change and drive business efficiency
Dec 9, 2024 — What can AI do for climate mitigation? AI helps mitigate climate change by leveraging data, predictive...
[Carbon Direct](#) :

Envana Paints a Bigger Methane Picture by Combining Existing ...
Jan 28, 2025 — \$4.2 DOE Grant * Envana Software Solutions doesn't require new equipment to detect methane emissions...
[Envana](#) :

Show all



Does AI reduce emissions in the Oil and Gas industry?

Google How is AI helping oil companies produce cleaner oil? X | Microphone Camera Search

All Short videos Images News Videos Forums Shopping More Tools

AI Overview

AI helps oil companies produce cleaner oil by [optimizing various processes, including drilling, production, and supply chain management, to reduce environmental impact and emissions](#). It also plays a crucial role in reducing flaring, optimizing energy use, and improving safety protocols. [Read more](#)

Here's how AI contributes to cleaner oil production:

Drilling Optimization:
AI analyzes geological data to identify the most efficient drilling techniques, minimizing environmental impact during extraction. It also helps optimize drilling speed, accuracy, and safety by processing real-time data. [Read more](#)

Production Optimization:
AI algorithms can optimize production rates, reduce flaring, and detect and reduce methane emissions, a major environmental concern in the industry. [Read more](#)

Supply Chain Management:
AI optimizes supply chain operations by providing insights into demand forecasting, inventory management, and logistics planning. [Read more](#)

Energy Efficiency:
AI optimizes energy use during exploration and production, reducing carbon footprints. [Read more](#)

Emissions Tracking and Reduction:
AI helps monitor and reduce emissions by analyzing data from various sources, including sensors and machinery. [Read more](#)

Safety and Incident Response:
AI-powered simulations enable operators to practice safety procedures and respond to incidents like toxic leaks, fires, and equipment failures. [Read more](#)

Predictive Maintenance:
AI helps predict and prevent maintenance issues, reducing downtime and maximizing asset utilization. [Read more](#)

Learn more : Artificial Intelligence in Oil and Gas: Benefit, Use Cases, Examples

AI in the oil and gas industry optimizes supply chain management by providing insights into...

Appinventiv : AI in the Oil & Gas Industry: From drilling optimization to ...

Apr 22, 2024 — For production, AI systems optimize drilling operations and manage...

HCLTech : Artificial Intelligence in the Oil and Gas Industry: Benefits & Uses

Oct 25, 2024 — Drilling Optimization. AI is used to optimize drilling operations by processing...

Ksolves : Show all



Does AI reduce emissions in the Oil and Gas industry?

Google is the use of AI by oil companies good for the environment? X | Microphone | Camera | Search

All News Short videos Forums Images Videos Shopping More Tools

AI Overview Learn more :

The impact of AI adoption by oil companies on the environment is a complex issue with both potential benefits and drawbacks.

Potential Benefits:

- Improved Efficiency & Reduced Emissions: AI can optimize various processes within the oil and gas industry, such as drilling, production, and refining. This can lead to reduced energy consumption, lower greenhouse gas emissions, and a smaller carbon footprint.
- Enhanced Safety and Leak Detection: AI-powered systems can detect and predict potential hazards like equipment malfunctions, oil spills, and gas leaks, enabling quicker responses and minimizing environmental damage.
- Resource Optimization: AI can help identify and manage resources more effectively, potentially reducing waste and minimizing the environmental impact of operations.
- Better Environmental Monitoring: AI can be used for real-time monitoring of emissions, pollution levels, and other environmental parameters, helping companies track and manage their impact. ♂

Potential Drawbacks:

- Increased Fossil Fuel Production: AI can optimize exploration and production processes, potentially leading to increased extraction and consumption of fossil fuels, which contributes to climate change.
- Data Center Energy Consumption: AI models require significant computing power and data storage, leading to increased energy consumption by data centers, which may rely on fossil fuels.
- Resource Depletion: The development and deployment of AI hardware require the extraction of minerals like cobalt, which can have negative environmental impacts.
- Ethical Concerns: There are ethical concerns around AI decision-making, particularly in high-stakes situations where environmental or social impacts may be a factor. ♂

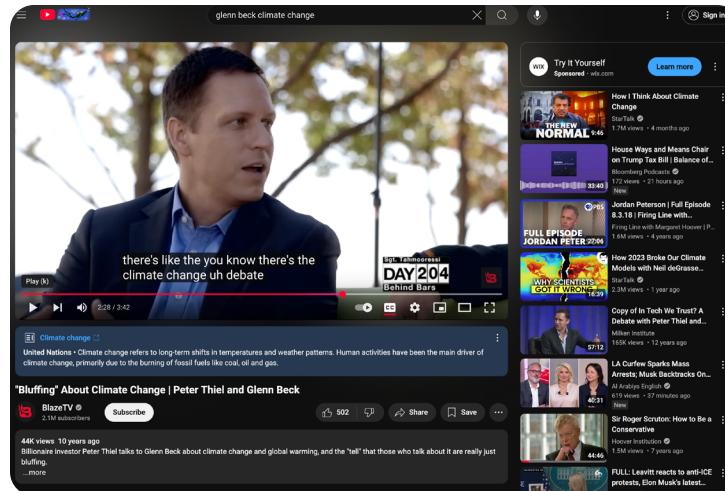
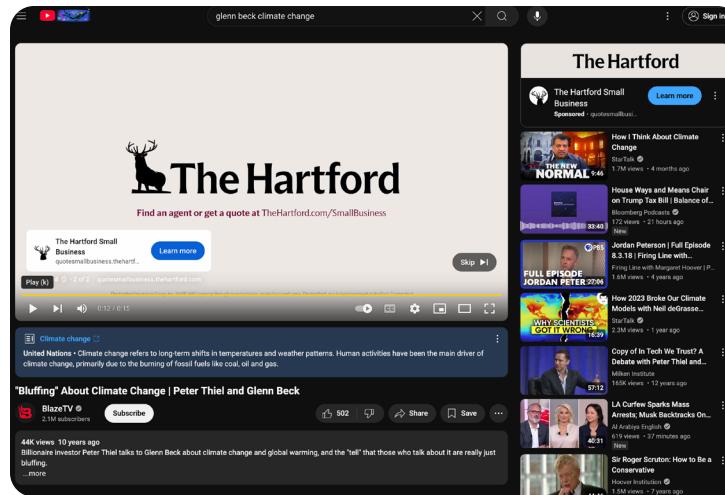
Environmental Impact of Crude Oil: Pros and Cons - BKV Energy Sep 15, 2024 — Environmental Impact of Crude Oil * 10 ways oil harms the environment. Local pollution and disease... BKV Energy :

Is AI Bad for the Environment? - Insights blog Is artificial intelligence bad for the environment? ... Insights > Sustainability > Is artificial intelligence bad for the... Taylor & Francis :

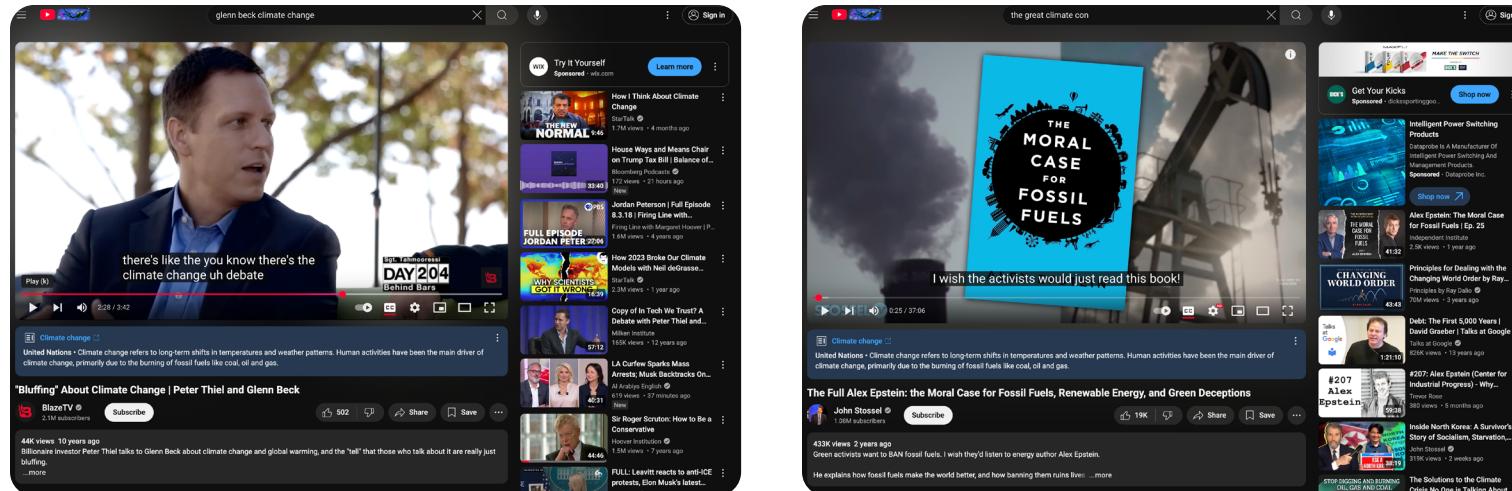
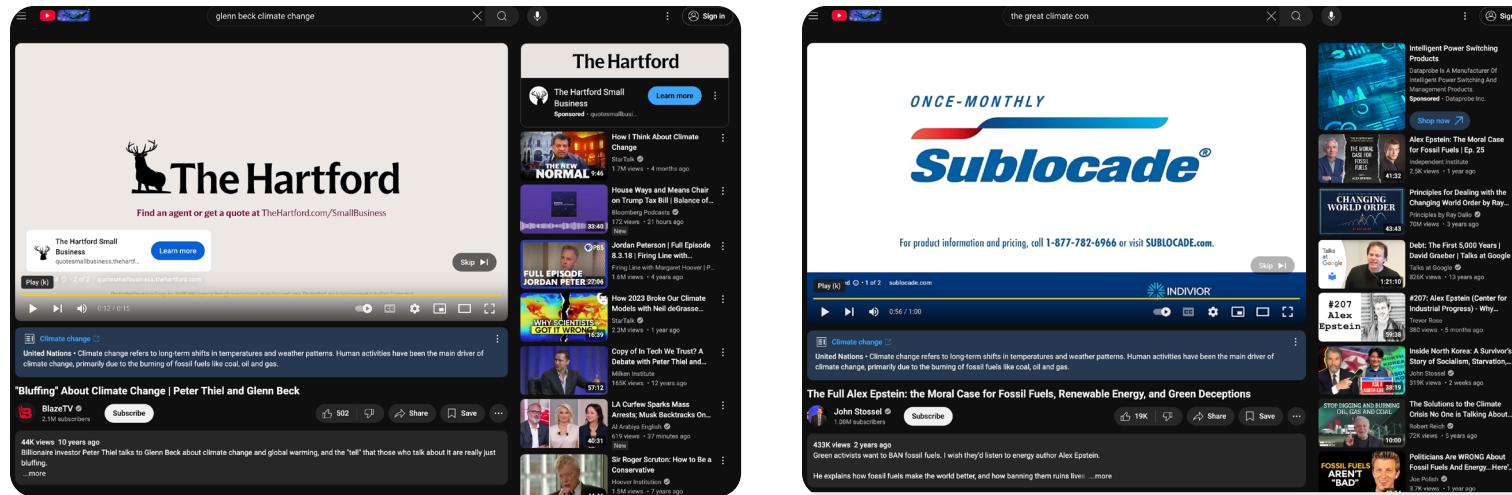
3 ways AI advances health, safety, and sustainability - SLB * Flaring Reduction. Carbon Capture, Utilization, and Sequestration (CCUS) Process, Compression, and Flow... SLB :

Show all

Appendix 3. YouTube Climate Disinformation and Monetization Screenshots



A video from John Stossel promoting “The Moral Case for Fossil Fuels” is monetized with three ads, including one from Dick’s Sporting Goods.



A video from PragerU promoting false claims about climate science being unreliable is monetized with two ads, one (shown) for Sublocade, which treats opioid addiction, and one from smartphone maker Motorola US.



The video player interface for Wix. The main video frame shows a man in a suit speaking. Below the video, there is a caption: "Although CO2 causes some warming, it's much less significant than we've been told." The video has 6,828,663 views and was uploaded on Jul 29, 2019. The channel has 3,574 subscribers. The video is sponsored by Planet Fitness.

WIX

wix.com Try it out

Play (k) 0:44 / 0:48

Climate change United Nations • Climate change refers to long-term shifts in temperatures and weather patterns. Human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil and gas.

What's the Deal with the Green New Deal? | 5 Minute Video

PragerU 6,828,663 subscribers

Subscribe 24K Share Save

6,828,663 views Jul 29, 2019 5 Minute Videos

There's been a lot of talk about The Green New Deal. Beyond the headlines, what is it really? Given our energy needs, is it practical? Can we have an abundance of energy and a clean planet? Alex Epstein, the author of The Moral Case for Fossil Fuels, considers these questions and has thought-provoking answers.

wix.com

The YouTube channel page for "PragerU". The channel has 4.9M views and 3.8M views. The page features a sidebar with categories like Home, Shorts, Subscriptions, You, History, Explore, Trending, Shopping, Music, Movies & TV, Live, Gaming, News, Sports, Courses, Fashion & Beauty, Podcasts, and Playables. The main feed displays several videos, including:

- "I'LL NEVER BE THE SAME" by CHARLIE BENTLEY-ASTOR (4.9K views)
- "Doctors Were Wrong: My Trans Mistake is Permanent - Charlie Bentley Astor (4.9K views)
- "The Psychology Behind Why the WOKE Left Have Meltdowns - Rafe Heydel-..." (3.8M views)
- "Mexican American Has a Brutal Message for ICE Protesters That's Going Viral Now" (513K views)
- "New BUILDERS Reduced Sugar Crispy bars with 16g of protein and 5g of sugar..." (360K views)
- "Joe Rogan | The Long Term Effects of Climate Change" (303K views)
- "10 BRUTAL Thomas Sowell Facts Liberals Hope You NEVER See | Thoma..." (295K views)
- "PRONOUNS AND" (404K views)
- "We're all in this together" (404K views)
- "Diversity is our strength" (404K views)

Transphobic disinformation videos are shown next to an ad for Clif bar.

The video player interface for PragerU. The main video frame shows a man in a suit speaking. Below the video, there is a caption: "Although CO2 causes some warming, it's much less significant than we've been told." The video has 6,828,663 views and was uploaded on Jul 29, 2019. The channel has 3,574 subscribers. The video is sponsored by Planet Fitness.

Play (k) 2:44 / 5:56

Climate change United Nations • Climate change refers to long-term shifts in temperatures and weather patterns. Human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil and gas.

What's the Deal with the Green New Deal? | 5 Minute Video

PragerU 6,828,663 subscribers

Subscribe 24K Share Save

6,828,663 views Jul 29, 2019 5 Minute Videos

There's been a lot of talk about The Green New Deal. Beyond the headlines, what is it really? Given our energy needs, is it practical? Can we have an abundance of energy and a clean planet? Alex Epstein, the author of The Moral Case for Fossil Fuels, considers these questions and has thought-provoking answers.

wix.com

Another video from PragerU promotes climate misinformation while being monetized by two ads: website builder Wix (shown) and one from Planet Fitness.



Appendix 4.

Recommendations: How Google can clean up its act

We recommend that Google adopt the following policies.

Prioritize honesty and transparency in environmental disclosure.

- Set aggressive, realistic goals for reducing emissions and achieving other top environmental goals.
- Track and disclose environmental impacts for the entire AI lifecycle, including energy and water usage.
- Provide AI resource use reports in all future environmental impact reporting, and regulate Google's AI products using the same energy targets as other Google technologies.
- Provide information about the development, resource consumption, and impacts of data centers to government, regulators, utilities, grid operators, and communities before they are planned and built.

Scale compute and data center expansion to planetary limits.²²⁸

- Rather than complacently acknowledge that Google's global energy consumption, emissions, and water consumption are increasing due to data center expansion for AI development, Google must take a proactive stance to leverage its market, political, and cultural influence to develop products in line with planetary constraints.
- Set a moonshot goal to develop AI in line with climate science in partnership with civil society, communities, Big Tech, governments, regulatory agencies, and investors.
- Ensure any new data centers do not deplete water and land needed for people or extend fossil fuel use.

Address energy use: prioritize the scale-up of renewables and rapidly decrease the use of fossil fuels.

- Prioritize investment in climate solutions that will work within the 5-year timeframe we have to mitigate climate change.
 - Change the criteria for carbon-free energy to only include solar, wind, geothermal, and hydropower; remove nuclear, biomass, and carbon capture and storage (CCS).
 - Immediately stop advocating for nuclear, natural gas with CCS, development of CCS infrastructure, and any policy statements²²⁹ or lobbying that expedites infrastructure development for AI without appropriate oversight.
 - Exit all carbon market initiatives and refocus industry, nonprofit, and higher education collaboration on renewable energy projects.
 - Reinvest money currently spent on carbon capture, carbon offsets, and other unproven technologies into building renewable energy at scale and funding frontline organizations working to end fossil fuel use.
- Cut actual greenhouse gas emissions.
 - Prioritize absolute emission reductions over carbon intensity.
 - Prioritize grid-aware computing; run heavy computation when demand is low and renewable energy is available.²³⁰
 - Do not purchase or plan to use new or additional fossil fuel energy.
 - Phase out diesel backup generators for data centers, including "renewable" diesel, and prioritize non-fossil fuel backup systems.²³¹
 - Provide detailed reporting for renewable energy credit (REC) use, ensure they provide additionality, and integrate best practices.²³²
 - Update Google's 2030 net-zero commitment to incorporate these standards and chart a course to achieve this commitment amid its generative AI growth plans.



Address unsustainable water use.²³³

- Halt development or expansion of data centers in water-scarce regions.
- Increase transparency and reporting of water use, including adding water consumption metrics to generative AI model cards²³⁴ / technical information about gen AI models; report Scope 2 (e.g., for electricity generation) and Scope 3 (e.g., for chip fabrication) water consumption.
- Establish policies for when and where water is used for AI training and inference to minimize water consumption.

Enforce and strengthen measures to end climate disinformation on all Google platforms.²³⁵

- Implement robust measures to end greenwashing, disinformation, and climate denial on all Google-owned platforms, especially with the advent of Google AI products that can be used to spread dis- and misinformation (e.g., Vero 3).
- Produce, publicize, and resource plans to stop the spread of climate disinformation, with yearly benchmarks detailing progress.
- Report on the prevalence of climate disinformation in Google's products and services.
- Allow researchers access to all data needed to conduct research that contributes to the detection, identification, and understanding of systemic climate disinformation risks, as well as to the assessment of adequacy, efficiency, and impacts of risk mitigation measures taken.

Address the impact of enabled emissions.

- End the Google Cloud partnership with the world's largest fossil fuel company, Aramco, and cancel all cloud partnerships that use Google technology to aid fossil fuel extraction.
- Publicly commit to and do not start any new cloud partnerships with fossil fuel companies.

Prioritize human rights in policy decisions.

- Immediately cancel and publicly commit to never enter into partnerships with governments, militaries, private companies, and law enforcement agencies that violate human rights, including, but not limited to, AI use for weapons and mass surveillance.
- Secure free, prior, and informed consent (FPIC) for any activities throughout Google's supply chain that affect Indigenous Peoples' land, resources, and communities, including any capital expenditures to develop its generative AI segments (e.g., data centers, chip fabrication, mineral extraction).²³⁶
- Include communities along the supply chain in any decision-making, activities, and practices that affect them.²³⁷
- Respect Google workers' right to organize without fear of intimidation or retaliation.²³⁸

Support climate-positive policy and regulation.

- Support federal and strong state legislation and regulations to ensure generative AI development is monitored and regulated. For example, Google could lobby for Congress to pass the Artificial Intelligence Environmental Impacts Act of 2024.²³⁹
- Oppose legislative efforts to delay or stop regulation of the development of generative AI, like Republican efforts to enact a nationwide, 10-year moratorium on state AI laws and regulations.²⁴⁰
- Leave the U.S. Chamber of Commerce²⁴¹ and do not support any trade associations that promote unchecked generative AI development, fossil fuel development, and/or lobbying against science-based action on climate change.



Appendix 5. Carbon capture and carbon removal: additional false solutions

Carbon Capture and Storage (CCS)

What it is

Carbon capture and storage (CCS) refers to a range of experimental efforts to pull carbon, one of the most common greenhouse gasses that causes climate change, out of the air. Carbon capture efforts include pumping carbon into deep underground geologic reservoirs, using trees or marshlands to supposedly keep it bound up in the soil, or store it in other ways. Ironically, carbon pumped underground is often used to extract more oil, which ends up emitting more carbon instead of less, but companies still claim it as a "carbon removal" process.²⁴²

Why it won't work

- CCS is more than 50 years old, yet there are only around 50 operational CCS facilities worldwide with a reported capture capacity of 51 million metric tons per year (Mtpa) CO₂.²⁴³ There are 44 additional facilities in construction and 534 facilities in various phases of development; if all 628 CCS facilities that currently exist, are currently being built, or are in the pipeline to be built were all working, the combined capture capacity would be only 416 Mtpa CO₂.²⁴⁴ To get a sense of scale, 416 million metric tons is just 1.1% of the estimated 37.4 billion metric tons of global fossil fuel CO₂ emitted in 2024.²⁴⁵ There is no way to make this technology scalable within the timeframe we need.
- Moreover, many existing CCS projects use the captured carbon to extract more oil and gas.²⁴⁶



Nature-based carbon removal

What it is

Nature-based carbon removal is essentially a rebrand of conservation, oceanic, or agricultural-based carbon capture, carbon trading, and carbon offset programs that seek to store carbon in land-based processes and then let polluters buy "credits" for their emissions.²⁴⁷

Meeting 2050 goals

In order to keep warming to 1.5°C, IPCC scenario forecasting implies we need to scale up to 3.8 billion tons by 2050. To put that into scale...

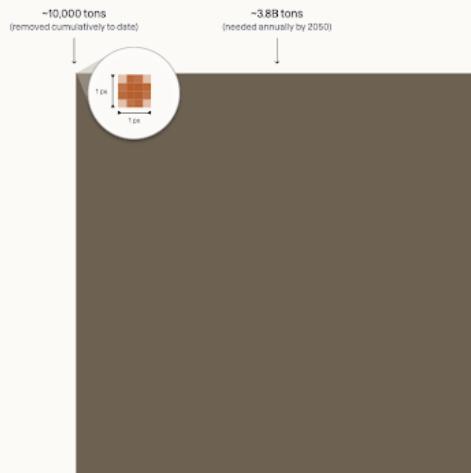


Image Source: [Frontier Climate](#)

Why it won't work

- The carbon offset industry—and the very similar new "carbon removal" rebrand—has significant, systemic problems, including its voluntary basis and its reliance on false equivalences to make GHG emissions a tradable commodity.²⁴⁸ In comparing nature-based carbon removal to carbon offsets, Wijnand Stoefs at nonprofit watchdog Carbon Market Watch says: "It's exactly the same thing. It's the same animal; I don't think [carbon offsets] can ever work."²⁴⁹
- Even the industry admits there are questions about durability (e.g., how long the carbon is stored),²⁵⁰ and scientists have raised multiple concerns about their efficacy.²⁵¹
- Nature-based carbon removal projects are devastating to Indigenous Peoples worldwide. In September 2023, Carbon Brief reviewed media coverage and a comprehensive global environmental conflicts database published over the prior five years.²⁵² The review found 72% of the 61 reports they described harm to Indigenous people and local communities.²⁵³ Indigenous Peoples were forcibly removed from their lands in the Republic of the Congo and Democratic Republic of the Congo (DRC), the Brazilian, Colombian, and Peruvian Amazon, Kenya, Malaysia, and Indonesia.²⁵⁴
- Frontier Climate, the carbon offsets market co-founded by Google,²⁵⁵ demonstrates how little carbon has been cumulatively removed and the enormity of the scale required annually to achieve the 2050 goals of the Intergovernmental Panel on Climate Change (IPCC).²⁵⁶



Endnotes

- 1 "Google Environmental Report: 2016," p. 1, Google, July 2016.
- 2 "Google Environmental Report 2024," p. 70, Google, July 2024.
- 3 "Google's Kate Brandt: Harnessing the Digital Revolution for Sustainability," Stanford Leadership for Sustainability Program, Nov. 2nd, 2017; "Google teams up with UN for verified climate information," United Nations, Oct. 5, 2021.
- 4 "Why tech's titans are moving right," The Hill, Oct. 30th, 2024; "Google fired people for protesting. Is that legal?" Fast Company, Apr. 26, 2024.
- 5 See [Glossary](#) for definitions of Scopes and other technical terms.
- 6 "Google Environmental Report 2025," p. 98, Google, June 2025.
- 7 This includes Scope 2 (location-based), Scope 3, Total Emissions (All Scopes), Global Energy Consumption, Water Withdrawal, and Water Consumption. See "Google 2025 Environmental Report," p. 105-110, Google, June 2025; "Google Environmental Report 2024," p. 76-78, Google, July 2024.
- 8 According to [Google Environmental Reports](#) for years 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, and 2025 which list emissions back to 2011. And CDP reports for 2010.
- 9 "Greenhouse Gas Emissions from a Typical Passenger Vehicle," United States Environmental Protection Agency, accessed June 27, 2025; "Vehicles registered by County," California DMV, modified April 2025; "Only 50 U.S. Counties Had Populations Over a Million in 2024," US Census Bureau, 2024.
- 10 "YouTube Loosens Video Content Moderation Rules," The New York Times, June 9, 2025.
- 11 According to [Google Environmental Reports](#) for years 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, and 2025.
- 12 "Showerheads," US EPA, Apr. 11th, 2025; "List of the largest U.S. cities by population," Britannica, June 21, 2025; "U.S. Census Bureau QuickFacts: United States," US Census Bureau, 2023.
- 13 "1 MILLION Square Feet," Upstate Business Journal, Oct. 27, 2016; "Is Google a bad neighbor? A fight over water use at a huge data center is exposing deeper issues in an Oregon town," Fortune, June 6, 2023.
- 14 "Explained: Generative AI," MIT News, Nov. 9, 2023.
- 15 "Societal Impact," Google AI (permalink, June 11, 2025).
- 16 "Carbon Capture and Storage Is a False Solution for the Climate and Our Communities," Center for Biological Diversity, accessed June 18, 2025; "Biofuels Policy, a Mainstay of American Agriculture, Has Been a Failure for the Climate, a New Report Claims," Inside Climate News, June 13, 2025.
- 17 "The Cloud Is Material: On the Environmental Impacts of Computation and Data Storage," MIT Press, Jan. 27, 2022.
- 18 "How Walmart, Delta, Chevron and Starbucks are using AI to monitor employee messages," CNBC, Feb 9, 2025; "How Israel Uses AI in Gaza—And What It Might Mean for the Future of Warfare," Time, Dec. 18, 2024; "The Digital Drill: How big oil is using AI to speed up fossil fuel extraction," Global Witness, Sep. 21, 2023.
- 19 "On conflating different kinds of AI in the climate context," Chris Adams ([mrchrisadams](#)), May. 21, 2025.
- 20 "We did the math on AI's energy footprint. Here's the story you haven't heard," MIT Technology Review, May 20, 2025. ([permalink](#)).
- 21 "Explained: Generative AI," MIT News, Nov. 9, 2023.
- 22 "AI, Data Centers, and the Next Big Correction: Will Growth Outpace Market Reality?" Data Center Frontier, Feb. 28, 2025.
- 23 "The AI revolution is likely to drive up your electricity bill. Here's why," CBS News, June 16, 2025; "Big Tech's data center boom poses new risk to US grid operators," Reuters, Mar. 19, 2025.
- 24 See: "Google Environmental Report 2025," p. 6, Google, June 2025
- 25 "AI slop is suffocating the web, says a new study," Fast Company, Mar. 10, 2025; "ChatGPT's Impact On Our Brains According to an MIT Study," TIME, June 23, 2025.
- 26 Google Environmental Reports from "2022," "2023," "2024," Google.
- 27 "Google Environmental Report 2024," p. 81, Google, July 2024.
- 28 "Google Environmental Report 2025," p. 80, p. 105, Google, June 2025.
- 29 "A New Meaning of 'Moonshot,'" Merriam Webster, Jan. 2020.
- 30 "Google Environmental Report 2025," p. 80; p. 105, Google, June 2025.
- 31 "Google Environmental Report 2025," p. 107, Google, June 2025; "Google Environmental Report 2024," p. 76, Google, July 2024; Scope 2 location-based and Scope 3 non-ambition-based emissions were used for this calculation.
- 32 "Google Is No Longer Claiming to Be Carbon Neutral," Bloomberg, July. 8th, 2024 ([permalink](#))
- 33 "Microsoft Wanted to be Carbon Negative. Then It Went Big on AI," Bloomberg, May 23, 2024 ([permalink](#))
- 34 "Google Is No Longer Claiming to Be Carbon Neutral," Bloomberg, July. 8th, 2024 ([permalink](#)).
- 35 "Google Is No Longer Claiming to Be Carbon Neutral," Bloomberg, July. 8th, 2024 ([permalink](#)). Bloomberg used Google's market-based emissions, which are lower than its location-based emissions. Regardless, Google's market- and location-based emissions are increasing year-over-year.
- 36 "Reducing global energy demand is key to cutting emissions," World Economic Forum, Nov. 10th, 2022; CLIMATE CHANGE 2023, p. 22, Intergovernmental Panel on Climate Change, 2023.
- 37 While Google's Scope 3 emissions are higher than Scopes 1 or 2, Scope 3 emissions are harder to reduce since there are so many additional vendors and users involved. Data center energy falls under Google's "operational control" as they define it on p. 70 of "Google Environmental Report 2024," Google, July 2024.
- 38 "Google Environmental Report 2024," p. 28, Google, July 2024
- 39 Google Environmental Reports: "2019," "2020," "2021," "2022," "2023," "2024," Google..
- 40 "Google Environmental Report 2024," p. 30, Google, July 2024.
- 41 "Google Environmental Report 2025," p. 19, Google, June 2025
- 42 See [Glossary](#) for definitions of Scopes and other technical terms.
- 43 According to [Google Environmental Reports](#) for years 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, and 2025 which list emissions back to 2011. And CDP reports for 2010
- 44 "Greenhouse gas emission [World]," Our World in Data, accessed June 20th, 2025. Between 2010 and 2023 global emissions grew 8%, Google's grew 1,289% in the same period.
- 45 "Google Environmental Report 2019" p. 63, Google Footnote 58, July 2019
- 46 "Google Environmental Report 2025," p. 21, and p. 65, mistakenly labeled 21, Google, June 2025 ([permalink](#)).
- 47 Google can be seen promoting its Scope 2 market-based emissions, with no location-based emissions, on page 32 of its "Environmental Report 2024"; For Scope 2 definition, see "Google Environmental Report 2024," p. 71, Google, July 2024.
- 48 For Scope 2 definition, see "Google Environmental Report 2024," p. 71, Google, July 2024.
- 49 Google Environmental Reports from: "2020," "2021," "2022," "2023," "2024," Google.
- 50 "Big Tech's bid to rewrite the rules on net zero," Financial Times, Aug. 14, 2024. ([permalink](#)).
- 51 "Data center emissions probably 662% higher than big tech claims. Can it keep up the ruse?" The Guardian, Sep. 15, 2024; "GHG Protocol Scope 2 Guidance," p. 8, World Resources Institute, Mar. 2023.
- 52 "Why Do Environmental Justice Advocates Oppose Carbon Markets? Look at California, They Say," Inside Climate News, Feb. 25, 2022; "Disparities in the Impact of Air Pollution," American Lung Association, Nov. 2, 2023.
- 53 Google emissions data from "Google Climate Change 2010 CDP Response" and Google Environmental Reports 2016 through 2025. (While Google's first Environmental Report was published in 2016, this report gives historical data as far back as 2011.)
- 54 "We did the math on AI's energy footprint. Here's the story you haven't heard," MIT Technology Review, May 20, 2025 ([permalink](#)); "Everything Google's Ever Revealed about LaMDA AI Chatbot," CNET Highlights, June 21, 2022 (video); "An important next step on our AI journey," Google, Feb. 6, 2023; "Supercharging Search with generative AI," Google, May 10, 2023; "Generative AI in Search: Let Google do the searching for you," Google, May 14, 2024.
- 55 "Google Environmental Report 2025," p. 21, and p. 65, mistakenly labeled 21, Google, June 2025 ([permalink](#)).
- 56 "What is Power Usage Effectiveness (PUE)?", Digital Realty, accessed June 18, 2025; "Power Usage Effectiveness (PUE) Definition," TechTarget, June 12, 2025.
- 57 "In 2025 for the first time since publishing environmental data, Google released aggregated data center electricity figures. We used this to calculate an estimated percentage of emissions from IT Equipment using the following methodology: Data Center Electricity Use / PUE = Electricity from IT Equipment (EIT); EIT / Total Electricity Consumption = EIT Percent of Total Electricity; since Google's Scope 2 primarily represents emissions from purchased electricity, and EIT Percent of Total Electricity represents the percent of total electricity purchased to power IT Equipment, we use this percentage to show IT Equipment's share of Scope 2 emissions. Using this calculation we can also figure an estimate of IT Equipment's share of All Scopes (Scope 2 location-based) emissions. In summary: By calculating IT Equipment's share of data center electricity consumption using the Power Usage Effectiveness ratio, we were able to produce an estimate of its share of Scope 2 location-based emissions and All Scopes (Scope 2 location-based) emissions.
- 58 "Google Environmental Report 2025," p. 29, Google, June 2025
- 59 As an example, see "Google Environmental Report 2024," p. 74-79, Google, July 2024; We used Global Energy Consumption as the base for these calculations and not Data Center Electricity Consumption as Google does not provide data center figures past 2020.
- 60 Energy from IT Equipment is estimated by dividing Google's Global Energy Consumption ("GEC") by Google's 12-month trailing PUE for the given year ("PUE") [i.e. GEC / PUE = Estimated IT Energy]. Energy from Non-IT Equipment is estimated by subtracting Google's Global Energy Consumption ("GEC") by Google's GEC, divided by Google's 12-month trailing PUE for the given year [i.e. GEC - (GEC / PUE) = Estimated Non-IT Energy]; We used Global Energy Consumption as the base for these calculations and not Data Center Electricity Consumption as Google does not provide data center figures past 2020.
- 61 Google's Global Energy Consumption for 2010 was found in its 2011 CDP response, 2,367 TWh in 2010 to 32,727 TWh in 2024; We used Global Energy Consumption and not Data Center Electricity Consumption as Google does not provide data center figures past 2020.



- 62 Google's 2011 PUE data seems to conflict with itself! In the two (2016 & 2017) environmental reports we reviewed where 2011's PUE data was present the number was reported as 1.14. However, Google's PUE chart seems to suggest 2011's PUE was somewhere around 1.16 as seen in the "Energy efficiency (PUE) in Google data centers" PUE chart from Google's 2025 Environmental Report. Unlike what it seems Google has done with its PUE chart, we used the data from its publicly available environmental reports.
- 63 378,056 MWh - 351,701 MWh [2010 Estimated Non-IT Energy - 2011 Estimated Non-IT Energy = Estimated reduction in Non-IT Energy Consumption]. Estimated Non-IT Energy Consumption is calculated in the same way as the chart above [i.e. GEC - (GEC / PUE) = Estimated Non-IT Energy].
- 64 Flight Data from Tracking Google's Globe-Spanning Flights, Tech Transparency Project, July 9, 2025, gallons fuel per hour ("GPH") data for each plane type (B752, B762, GLF550 [Google flew two of these planes during the period], GV), jet fuel to MWh conversion from United States Bureau of Transportation Statistics, calculation used for each trip: [(flight_hours * GPH [by plane type]) * 0.0395 = total trip MWh].
- 65 "NEW REPORT: Record Year for U.S. Clean Power Installations in 2023," American Clean Power, Mar. 7, 2024.
- 66 "Google Environmental Report 2025," p. 5, Google, June 2025.
- 67 "Google Environmental Report 2018," Google, Sep. 2018.
- 68 "Our third decade of climate action: Realizing a carbon-free future," Google, Sep. 14, 2020; "Google Environmental Report 2019," p. 2, Google, Sep. 2019; "Google Environmental Report 2024," p. 35, Google, July 2024.
- 69 "Google Environmental Report 2024," p. 82, footnote 112, Google, July 2024.
- 70 "The path to cost-effective decarbonization solutions," p.3, McKinsey, June 16, 2025.
- 71 "Google Cloud & McKinsey," McKinsey, accessed June 29, 2025.
- 72 "The History of Nuclear Energy," U.S. Department of Energy, accessed June 23, 2025.
- 73 "Evacuation after a nuclear accident: Critical reviews of past nuclear accidents and proposal for future planning," ScienceDirect, Mar. 2021.
- 74 "A second new nuclear reactor is completed in Georgia. The carbon-free power comes at a high price," AP News, Apr. 29, 2024; "The True Cost of Nuclear Power in the United States," Nuclear Watch South, May 2024.
- 75 "The True Cost of Nuclear Power in the United States," Nuclear Watch South, May 2024.
- 76 "Small Modular Reactor (SMR) Global Tracker," World Nuclear Association, updated May 23, 2025.
- 77 "Small Modular Reactors (SMRs): Why The Delay," Energy Monitor, Aug. 2022.
- 78 "A Closer Look at Two Operational Small Modular Reactor Designs," Power, Mar. 1, 2024.
- 79 "Where can the U.S. put 88,000 tons of nuclear waste?" WHYY, June 26, 2024.
- 80 "Nuclear waste from small modular reactors," PNAS, May 31, 202
- 81 "Potential Human Health Effects of Uranium Mining, Processing, and Reclamation," Committee on Uranium Mining in Virginia; Committee on Earth Resources; National Research Council, Dec. 19, 2011.
- 82 "Tribes Meeting With Inter-American Commission on Human Rights Describe Harms Uranium Mining Has Had on Them, and the Threats New Mines Pose," Inside Climate News, Mar. 10, 2024.
- 83 "Small Modular Reactors (SMRs): Why The Delay," Energy Monitor, Aug. 2022.
- 84 "Everything You Wanted to Know About Biodiesel and Renewable Diesel. Charts and Graphs Included," Union of Concerned Scientists, Jan. 10, 2024.
- 85 "Google Environmental Report 2024," p. 32, Google, July 2024.
- 86 "Everything You Wanted to Know About Biodiesel and Renewable Diesel. Charts and Graphs Included," Union of Concerned Scientists, Jan. 10, 2024.
- 87 "Google Environmental Report 2025," p. 25, Google, June 2025.
- 88 Ibid., p. 41.
- 89 Ibid., p. 43.
- 90 Ibid., p. 19.
- 91 Ibid., p. 46.
- 92 "Google remains committed to investing \$75 billion in AI despite macroeconomic uncertainties," Business Insider, Apr. 24, 2025.
- 93 "Alphabet Form 10K 2024," p. 42, Alphabet, Feb. 4, 2025.
- 94 "Capital Expenditure (CapEx) Definition, Formula, and Examples," Investopedia, June 18, 2024.
- 95 "Google Environmental Report 2024," p. 35, Google, July 2024; Estimated spend calculated as \$16 billion/30 years = \$533 million.
- 96 "Google data center list," Data Center Map (permalink June 17, 2025); "Microsoft data center list," Data Center Map (permalink June 17, 2025).
- 97 "Google Environmental Report 2025," p. 109, Google, June 2025; "2024 Environmental Sustainability Report," p. 14, Microsoft, May 2024. (Microsoft's 2024 report is the latest available with PUE figures)
- 98 "Amazon and Microsoft Stay Ahead in Global Cloud Market," Statista, Feb. 27, 2025.
- 99 "2025 Environmental Sustainability Report Data Fact Sheet," p. 6, Microsoft, May. 2025; "Google Environmental Report 2024," p. 76, Google, July 2024; "10,500 kWh average U.S. home electricity consumption," U.S. Energy Information Administration (EIA) (permalink June 13, 2025).
- 100 "US Electricity Profile 2023," EIA, permalink accessed June 2, 2025; "Google Environmental Report 2025," p. 109, Google, June 2025; Google publishes two different energy consumption metrics: "Total energy consumption" and "Total electricity consumption". They differ slightly: with Energy being 32.72 TWh and Electricity being 32.17 TWh. This is due to Energy's inclusion of "non-electric" sources of energy such as Fuel, Purchased heat, Purchased steam, and Purchased cooling. This chart uses the more complete "Energy" metric.
- 101 "What Gemini is," Google, permalink accessed June 17, 2025.
- 102 Question asked in Google "Will Google achieve its 2030 climate goals?" AI Overview response given as seen in screenshot. The same question was also asked to Gemini in chat at [gemini.google.com](#) with a similar response given (see Google Gemini Chat Screenshots in Appendix 3), May 26, 2025.
- 103 "Google I/O 2025 keynote in 32 minutes," 2m23s, The Verge, May 20, 2025.
- 104 "Google's Water Risk Framework," p. 3, Google, Dec. 2023.
- 105 Withdrawal is the total freshwater taken from a source; Google does not report seawater withdrawals. Google uses the following formula to report its water use: Water Consumption = Water Withdrawal - Water Discharge. See detailed definitions in the Glossary. "Google Environmental Report 2024," p. 73, Google, July 2024.
- 106 "Google Environmental Report 2024," p. 78, Google, July 2024.
- 107 "Your Water System," MWRA, accessed June 30, 2025.
- 108 "Google Environmental Report 2024," p. 44, Google, July 2024.
- 109 "Revealed: Big tech's new datacentres will take water from the world's driest areas," The Guardian, Apr. 9, 2025.
- 110 "Water and Climate Change," United Nations, permalink accessed June 17, 2025.
- 111 "Revealed: Big tech's new datacentres will take water from the world's driest areas," The Guardian, Apr. 9, 2025.
- 112 Ibid.
- 113 "Is Google a bad neighbor? A fight over water use at a huge data center is exposing deeper issues in an Oregon town," Fortune, June 6, 2023.
- 114 "Google Environmental Report 2024," p. 79, Google, July 2024.
- 115 "2025 Google Water Stewardship Project Portfolio," Google, Mar. 2025.
- 116 "Google Environmental Report 2025," p. 86, Google, June 2025.
- 117 "Amazon says it's going 'water positive' – but there's a problem," Grist, Aug. 29, 2024.
- 118 "Labor Unions and Environmental Justice: Paving the Way for a Greener Future," Union-coded, Apr. 22, 2024; "Do employees' voices matter? Unionization and corporate environmental responsibility," International Review of Economics & Finance, Nov. 2021.
- 119 "Google's Shadow Work Force: Temps Who Outnumber Full-Time Employees," The New York Times, May 28, 2019.
- 120 "GlobalLogic Pay Parity Letter," Alphabet Workers Union, accessed 26 Jun, 2025; "The Human Workforce Behind AI Wants a Union," The Nation, May 28, 2025.
- 121 "Precarious Conditions of 'ghost workers' revealed by Google termination of Appen contract, union says," The Guardian, Jan. 23, 2024.
- 122 "Google Help Workers Ratify Collective Contract with Accenture, First In Alphabet Workers Union-CWA History," Alphabet Workers Union, press release, Dec. 18, 2024; Statement on Googlers for Job Security Win, Alphabet Workers Union, June 10, 2025.
- 123 "Why Microsoft Has Accepted Unions, Unlike Its Rivals," The New York Times, Feb. 28, 2024.
- 124 "Google plans to stop making A.I. tools for oil and gas firms," CNBC, May 20, 2020.
- 125 "Google Cloud & McKinsey," McKinsey, accessed June 24, 2025.
- 126 "ENABLED EMISSIONS CAMPAIGN," Enabled Emissions, accessed June 24, 2025.
- 127 "Despite climate pledge, Google partners with world's largest oil company for Saudi cloud region," Data Center Dynamics, Dec. 22, 2020.
- 128 "2025 Environmental Report," p. 116-117, Google, June 2025.
- 129 Ibid.
- 130 See Section of the report: "Google's climate failings are intensified by its acceleration of militarism."
- 131 "Google Cloud CEO on Momentum, Sustainability Strategy," Bloomberg, May 26, 2022.
- 132 "Oil & gas field profile: Dammam Redevelopment Conventional Oil Field, Saudi Arabia," Offshore Technology (permalink June 17, 2025).
- 133 "Oil & gas field profile: Dammam Redevelopment Conventional Oil Field, Saudi Arabia," Offshore Technology (permalink June 17, 2025).
- 134 "Google Cloud and PIF Advance AI Hub in Saudi Arabia," Google Cloud, May 13, 2025.
- 135 "Energy giant Saudi Aramco is betting on AI to thrive after the 'peak oil' era," Fortune, June 26, 2024. (permalink June 17, 2025).
- 136 "The Digital Drill: How big oil is using AI to speed up fossil fuel extraction," Global Witness, Sep. 21, 2023.
- 137 "The Digital Drill: How big oil is using AI to speed up fossil fuel extraction," Global Witness, Sep. 21, 2023
- 138 "How Chevron is using AutoML Vision to find information," Google Cloud, Sep. 10, 2018.
- 139 "Total to Develop Artificial Intelligence Solutions with Google Cloud," TotalEnergy, Apr. 24, 2018.
- 140 "Repsol and Google Cloud to launch a project that will use big data and artificial intelligence to optimize refinery management," Repsol, Apr. 6, 2018.
- 141 "Repsol to use Google technology to improve refinery efficiency," The Chemical Engineer, June 4, 2018.
- 142 "Schlumberger Selects Google Cloud as a Preferred Cloud Provider," Schlumberger, May 13, 2019.
- 143 "Google 2024 Environmental Report," p. 21, Google, July 2024.
- 144 "Top Websites Ranking," Similarweb, June 1, 2025.
- 145 "Browser Market Share Worldwide," StatCounter, May 2025.
- 146 "Mobile Operating System Market Share Worldwide," StatCounter, May 2025; "Google's Android Sourcecode," Google Git, accessed June 18, 2025.
- 147 "US v. Google redux: all the news from the ad tech trial," The Verge, May 6, 2025.
- 148 "How decades of disinformation about fossil fuels halted U.S. climate policy," NPR, Oct. 27, 2021.
- 149 "YouTube Loosens Video Content Moderation Rules," The New York Times (permalink), June 9, 2025.



- 150 "Briefing Note: Programmatic Digital Advertisements and Climate Disinformation," Dewey Square Group, Sep. 30, 2022.
- 151 "CAAD Briefing Note: Tenet Media & Climate Disinformation," *Climate Action Against Disinformation*, Sep. 25, 2024.
- 152 "Google Environmental Report 2024," p. 17, Google, July 2024.
- 153 "Bizarre Falsehoods About Hurricanes Helene and Milton Disrupt Recovery Efforts," *The New York Times*, Oct. 10, 2024.
- 154 "2025 Environmental Report," p. 6, Google, June 2025; "Half of the top 10 online shows spread misinformation or false narratives about Hurricane Helene in 2024," Media Matters for America, June 26, 2025; "The Climate Denial Machine: How the Fossil Fuel Industry Blocks Climate Action," *The Climate Reality Project*, Sep. 5, 2019.
- 155 "Expanding AI Overviews and introducing AI Mode," Google, Mar. 5, 2025.
- 156 28 searches were done in total; all searches were conducted using Firefox inside a container tab alongside other plugins to prevent tracking (such as uBlock Origin and Privacy Badger). Between searches, all browsing history and cookies were cleared from the container. Some searches were performed after an original search; these "related searches" are always indicated as such. While this may prevent a certain degree of tracking-based bias in results, all searches did initially originate from California, which could skew some results. Later testing done on Gemini Chat used the same methods but added the use of a VPN and a change of location between each query.
- 157 "Heritage Foundation," DeSmog, accessed June 18, 2025.
- 158 "Wind Turbines: Not Green, Not Reliable," *The Heritage Foundation*, Aug. 2, 2024; "The Climate Denial Machine: How the Fossil Fuel Industry Blocks Climate Action," *The Climate Reality Project*, Sep. 5, 2019; "Heritage Foundation," DeSmog, accessed June 20, 2025.
- 159 "Do wind turbines kill birds?" MIT Climate Portal, Dec. 12, 2023.
- 160 "Beyond dark money: Information subsidies and complex networks of opposition to offshore wind on the U.S. East Coast," *The CDL*, Dec. 6, 2024.
- 161 "Environmental Impacts of Wind Power," Union of Concerned Scientists, Mar. 5, 2013.
- 162 "Google Fact Check Tool, search: wind turbines wildlife," Google Fact Check Tool, accessed June 23, 2025.
- 163 "Wind turbines can kill birds, but not as many as fossil fuels and other anthropogenic impacts," *Science Feedback*, Dec. 14, 2022.
- 164 "Google 2024 Environmental Report," p. 21, Google, July 2024.
- 165 "Google Publisher Policy on Unreliable and harmful claims," Google, permalink from May 14th, 2025; "Advertiser-friendly content guidelines," Google, permalink from May 17, 2025.
- 166 "The New Climate Denial," p. 6, *Center for Countering Digital Hate*, 2024.
- 167 Ibid., p. 27-32.
- 168 "I Traded My News Apps for Rumble, the Right-Wing YouTube. Here's What I Saw," *The New York Times*, Dec. 13, 2024.
- 169 "New Far-Right Conspiracy Claims Boeing's Accidents Are Intentional," *Wired*, Mar. 15, 2024; "Glenn Beck," *TheBlaze*, accessed June 18, 2025; "Peter Thiel," *Forbes*, accessed June 18, 2025; "The PayPal Mafia includes tech titans like Elon Musk, Peter Thiel, and Reid Hoffman. Here's where its members are now," *Business Insider*, Dec. 7, 2024.
- 170 See Appendix 3: *YouTube Climate Disinformation and Monetization*.
- 171 "John Stossel's Transformation from Skeptical Libertarian to Polluter Apologist," *Greenpeace*, Nov. 12, 2020; "US 'university' spreads climate lies and receives millions from rightwing donors," *The Guardian*, Sep. 6, 2023.
- 172 "The New Climate Denial," *Center for Countering Digital Hate*, 2024; "Google demonetized The Heartland Institute in June. Here are 4 more channels that violate its climate misinformation policy," Media Matters for America, July 31, 2024.
- 173 "Fossil Fuel Billionaires Are Bankrolling the Anti-Trans Movement," *Atmos*, June 10, 2025.
- 174 Videos were watched using a VPN, Firefox and a container tab that had been cleared of all cookies to ensure no prior YouTube history could skew results.
- 175 See Appendix 3: *YouTube Climate Disinformation and Monetization*.
- 176 "Transgender Health Program," *Mass General*, accessed June 23, 2025; "Largest Employers in Massachusetts," *Boston Business Journal*, Aug. 8, 2024.
- 177 "Google Announces Willingness to Develop AI for Weapons," *Human Rights Watch*, Feb. 6, 2025.
- 178 "Report: Estimating the military's global greenhouse gas emissions," *Conflict and Environment Observatory*, Nov. 2022.
- 179 "Google Lifts a Ban on Using Its AI for Weapons and Surveillance," *Wired*, Feb. 4, 2025.
- 180 "Google abandons AI ethics pledge as Trump pushes for military AI expansion," *Nation of Change*, Feb. 6, 2025.
- 181 "Surveillance giants: How the business model of Google and Facebook threatens human rights," p. 60, *Amnesty International*, Nov. 21, 2019.
- 182 "We are Google and Amazon workers. We condemn Project Nimbus," *The Guardian*, Oct. 12, 2021.
- 183 "Google Worried Israeli Contract Could Enable Human Rights Violations," *The New York Times*, Dec. 3, 2024.
- 184 "Google rushed to sell AI tools to Israel's military after Hamas attack," *The Washington Post*, Jan. 21, 2025.
- 185 "Is Israel Committing Genocide in Gaza? New Report from BU School of Law's International Human Rights Clinic Lays Out Case," *BU International Human Rights Clinic*, June 4, 2024.
- 186 "Google rushed to sell AI tools to Israel's military after Hamas attack," *The Washington Post*, Jan. 21, 2025; "Google Won't Say Anything About Israel Using Its Photo Software to Create Gaza 'Hit List,'" *The Intercept*, Apr. 5, 2024; "Google has fired 50 employees after protests over Israel cloud deal, organizers say," *CNN Business*, Apr. 23, 2024.
- 187 "Lockheed Martin and Google Cloud Collaborate to Advance Generative AI for National Security," *Lockheed Martin*, Mar. 27, 2025.
- 188 "The Deep Mind of Demis Hassabis," *Wired*, Jan. 16, 2015.
- 189 "Demis Hassabis Is Preparing for AI's Endgame," *Time*, Apr. 16, 2025.
- 190 "Demis Hassabis Is Preparing for AI's Endgame," *Time*, Apr. 16, 2025.
- 191 "As War Halts, the Environmental Devastation in Gaza Runs Deep," *Yale e360*, Feb. 6, 2025.
- 192 "Google rushed to sell AI tools to Israel's military after Hamas attack," *Washington Post*, Jan. 21, 2025.
- 193 "Sundar Pichai and Jeff Bezos head to Mar-a-Lago to schmooze with Trump," *The Verge*, Dec. 12, 2024.
- 194 "Trump, a populist president, is flanked by tech billionaires at his inauguration," *Associated Press*, Jan. 20, 2025.
- 195 "Google gives \$1 million to Trump inauguration," *Politico*, Jan. 9, 2025.
- 196 "Google donates \$1 million to Trump's inauguration, more than triple what it gave in 2017," *Business Insider*, Jan. 9, 2025.
- 197 "Tech CEOs' Donations to Donald Trump, Joe Biden Inaugurations Compared," *Newsweek*, Jan. 6, 2025.
- 198 "The Trump Administration's Environmental Impacts So Far, and How We're Fighting Back," League of Conservation Voters, Feb. 7th, 2025; "The Trump Administration Rolled Back More Than 100 Environmental Rules. Here's the Full List," *The New York Times*, Jan. 20, 2021.
- 199 "Trump's Attacks on Climate Policy Are Even Hitting Exxon," *The New Republic*, June 5, 2025.
- 200 "How Trump's assault on science is blinding America to climate change," *E&E News by Politico*, June 16, 2025; "Trump orders U.S. withdrawal from Paris Agreement, revokes Biden climate actions," *NPR*, Jan. 21, 2025.
- 201 "Special Report: Global Warming of 1.5 °C: Glossary," IPCC, IPCC, 2018; Annex I: Glossary.
- 202 "Base year recalculations methodologies for structural changes," World Resources Institute, Jan. 2005; "Google Environmental Report 2024," p. 7, Google, July 2024.
- 203 "Capital Expenditure (CapEx) Definition, Formula, and Examples," *Investopedia*, June 18, 2024.
- 204 "Google Environmental Report 2024," p. 82, Google, July 2024.
- 205 "Enabled Emissions Campaign," *Enabled Emissions Campaign*, permalink accessed June 18th, 2025.
- 206 "What Gemini is," Google, permalink accessed June 17, 2025; "Generative AI in Search: Let Google do the searching for you," Google, May 14, 2024.
- 207 "Explained: Generative AI," MIT News, Nov. 9, 2023.
- 208 "Google Environmental Report 2024," p. 76, Google, July 2024.
- 209 "Special Report: Global Warming of 1.5 °C: Glossary," IPCC, IPCC, 2018; Annex I: Glossary; "Sources of Greenhouse Gas Emissions," U.S. EPA, Mar. 31, 2025.
- 210 "IPCC," IPCC, accessed June 20, 2025.
- 211 "What is Power Usage Effectiveness (PUE)?," Digital Reality, accessed June 18, 2025; "Power Usage Effectiveness (PUE) Definition," TechTarget, June 12, 2025; "Google Environmental Report 2024," p. 78, Google, July 2024.
- 212 "Google Environmental Report 2024," p. 71; p. 84, Google, July 2024.
- 213 "YouTube channel monetization policies," YouTube, permalink accessed June 18, 2025; "YouTube Monetization: What It Is, Why It Happens, and How to Avoid It," Uscreen, Apr. 2, 2025.
- 214 "Special Report: Global Warming of 1.5 °C: Glossary," IPCC, IPCC, 2018; Annex I: Glossary; "Google Environmental Report 2024," p. 31, Google, July 2024.
- 215 "Explained: Generative AI," MIT News, Nov. 9, 2023; "What is machine learning?," IBM, Sep. 22, 2021.
- 216 "What is Power Usage Effectiveness (PUE)?," Digital Reality, accessed June 18, 2025; "Power Usage Effectiveness (PUE) Definition," TechTarget, June 12, 2025.
- 217 "What is renewable energy?," United Nations, accessed June 18, 2025.
- 218 "Google Environmental Report 2024," p. 75, Google, July 2024.
- 219 "Google Environmental Report 2024," p. 71, Google, July 2024.
- 220 "Google Environmental Report 2024," p. 71, Google, July 2024.
- 221 "Google Environmental Report 2024," p. 71, Google, July 2024.
- 222 "Google Environmental Report 2024," p. 73, Google, July 2024.
- 223 "GRI 303: Water and Effluents 2018," p. 25, GRI, June 2018.
- 224 "Google Environmental Report 2024," p. 73, Google, July 2024.
- 225 "GRI 303: Water and Effluents 2018," p. 25, GRI, June 2018.
- 226 "Google Environmental Report 2024," p. 73, Google, July 2024.
- 227 "GRI 303: Water and Effluents 2018," p. 25, GRI, June 2018.
- 228 See "Within Bounds" for a full suite of policy recommendations to limit gen AI's environmental impact.
- 229 See "Powering A New Era of American Innovation," Google, May 2025; see Google's "Public Policy, Responsible AI", "AI Policy" landing pages for other recent developments.
- 230 See "Within Bounds" for a full suite of policy recommendations to limit generative AI's environmental impact.
- 231 This includes concerns with hydrogen, see "Hydrogen Hype," Friends of the Earth, Feb. 2023; "Why data centers aren't a good use of green hydrogen," Latitude Media, accessed June 8, 2025.
- 232 Additionality refers to the principle that an activity or project's positive impact, like emissions reductions or social benefits, would not have occurred without external intervention or funding. It's essentially about determining if an intervention is genuinely "extra" compared to a baseline scenario, where no such intervention takes place. In essence, it ensures that investments truly lead to additional positive outcomes, rather than funding things that would have happened anyway; see "Improvements" on p. 32 in "Burns Trust: The Amazon Unsustainability Report," Amazon Employees for Climate Justice, June 2024.



- 233 See "Making AI Less 'Thirsty': Uncovering and Addressing the Secret Water Footprint of AI Models," ARXIV, Mar. 26, 2025, for further recommendations.
- 234 See "Model Cards Explained," Google, accessed June 8, 2025, for additional information.
- 235 See "Our Policy Asks" Climate Action Against Disinformation, for complete list.
- 236 See "Securing Indigenous Peoples' Right to Self-Determination: A Guide on Free, Prior and Informed Consent," Sirge Coalition, accessed June 8, 2025.
- 237 See "Within Bounds" for a full suite of policy recommendations to limit gen AI's environmental impact.
- 238 See "What's the Law?," NLRB; "Interfering with employee rights," NLRB, accessed June 8, 2025.
- 239 "Markey, Heinrich, Eshoo, Beyer Introduce Legislation to Investigate, Measure Environmental Impacts of Artificial Intelligence," Ed Markey, Feb. 1, 2024.
- 240 "House Republicans Push for 10-Year Moratorium on State AI Laws," Covington, May 14, 2025.
- 241 For more on Google's 2024 affiliations, see its "Trade Associations and Membership Organizations," hosted on Google's "GAPP Transparency Page," accessed June 8, 2025; "Escape the Chamber" ClimateVoice, accessed June 18, 2025.
- 242 "Big oil and gas firms deepen investment in carbon capture," Chemical and Engineering News, Apr. 10, 2024.
- 243 Mtpa stands for Million Tonnes Per Annum or Million Metric Tons Per Year. "Global Status of CCS 2024," p. 12, Global CCS Institute, Nov. 2024.
- 244 Mtpa stands for Million Tonnes Per Annum or Million Metric Tons Per Year. "Global Status of CCS 2024," p. 12, Global CCS Institute, Nov. 2024.
- 245 "Fossil fuel CO₂ emissions increase again in 2024," Global Carbon Budget, Nov. 13, 2024.
- 246 "Every Dollar Spent on This Climate Technology Is a Waste," The New York Times, Aug. 16, 2022. ([permalink](#)).
- 247 "Nature-based Solutions," Hoodwinked in the Hothouse, Nov. 2023.
- 248 "The offset industry, riddled with conflicts of interest, is not fixable," SOMO, Oct. 15, 2024.
- 249 "What is 'nature-based carbon removal' and is it any better than carbon offsets?", The Verge, June 7, 2024.
- 250 "Carbon removal, reduction, and avoidance credits explained," Carbon Direct, Oct. 13, 2023.
- 251 "What is 'nature-based carbon removal' and is it any better than carbon offsets?", The Verge, June 7, 2024.
- 252 "Global Atlas of Environmental Justice," accessed June 15, 2023.
- 253 "Mapped: The impacts of carbon-offset projects around the world," Carbon Brief, Sep. 25, 2023.
- 254 "Mapped: The impacts of carbon-offset projects around the world," Carbon Brief, Sep. 25, 2023.
- 255 "Inside Google's efforts to accelerate the next frontier of climate tech featuring Michelle Chang," Michael Terrell (Head of Advanced Energy at Google), Apr. 19, 2024.
- 256 "Frontier," Frontier Climate, May 28, 2025. ([permalink](#))