The Sustainability Gap in AI

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Abstract

The rapid expansion of artificial intelligence (AI) infrastructure has created many environmental problems for companies. These challenges have made corporate sustainability claims increasingly questionable, such as goals of net zero or water positive by 2030. This paper examines these claims from 3 companies that have expanded their AI significantly in the past 6 years: Google, Microsoft, and Meta, by comparing their greenhouse gas emissions, water consumption, and energy usage to their stated environmental goals. The findings show that even with their commitments to net-zero emissions by 2030 or water-positive by 2030, all 3 companies have seen substantial growth in their environmental footprint. This increase is largely from the companies' data center expansion. The research also identifies common misconceptions and weaknesses in ESG ratings, and current Federal Trade Commission regulations that enable these companies' misleading claims. Furthermore, the expansion of AI infrastructure damages local communities and ecosystems through increased electricity costs, water depletion, and air pollution. This paper recommends multiple policies that would help prevent these issues. It recommends mandatory Scope 3 emission reports, more frequent emission tracking, and stronger environmental oversight. These policies would make companies' claims more trustworthy and make sure that the future of AI doesn't come at the cost of sustainability.

Introduction

The rapid improvement of AI in recent decades has caused a major expansion of data centers and energy grids in the US. This expansion over the past decade has made some sustainability commitments harder to meet, but it has also shown the importance of enforcing these sustainability promises.

Sustainability has been one of the most defining issues of the 21st century, trying to meet our current needs without hurting future generations. Being sustainable for companies means reducing their negative impact on the environment and society. The three most important “pillars” of sustainability are environmental impact, social impact, and economic impact; they are measured in ESG metrics, which stand for E, environmental, how the company impacts the environment; S, social, how the company treats people and communities; and G, governance, how a company is led and managed. ESG is important because it helps investors decide which companies to invest in, and having a high ESG rating helps companies be trusted.

This rapid growth of AI, as it becomes more efficient, leads to more and more environmental problems. Google, Microsoft, and Meta are the three biggest publicly traded AI companies and, in the past couple of years, have focused heavily on expanding AI to all parts of their company, from fridges to supercomputers. This has severely affected the environment and many sustainability plans, lowering these companies' ESG scores and affecting their stocks. Each has also announced climate goals, including net-zero emissions, carbon removal, and 24/7 carbon-free energy.

This paper analyzes corporate sustainability disclosures against reported emissions data to see if the current regulatory framework shows the environmental impact of rapid AI infrastructure growth.

The Water Usage

Environmental problems with AI: its water use and its energy usage; these two problems cause a cascade of environmental issues. First, the water usage of AI: a single data center for AI can consume up to five million gallons of water per day for its evaporative cooling, which is the same amount of water daily that 15,000 homes use (American Rivers). This water is pulled from local watersheds or from groundwater aquifers, usually depleting the local water supplies. This is even more impactful in water-stressed regions where communities and ecosystems already compete for limited water resources (Center for Law, Energy & the Environment). The water consumption from these data centers using groundwater is an important part of streamflow; intense groundwater usage can reduce the streamflow or even cause streams to stop flowing(Leake and Barlow). This reduction in water can negatively affect the aquatic ecosystem and habitats that depend on it (Winter). When water isn't pulled from the watersheds,

it's mostly pulled from the local aquifers. These are large stores of water under the ground that recharge about five mm per year.

When data centers excessively pull more water from the aquifers faster than they can recharge, this results in local streams, springs, and lakes that rely on groundwater flow drying up and having lower water pressure. This causes land subsidence, where underground rock and clay permanently collapse, causing the ground above to sink, making the buildings and roads above sink or collapse. Draining aquifers also has effects on local communities, making them have to drill deeper to get water, which costs much more (U.S. Geological Survey).

The Energy Usage

This brings up the second environmental problem of AI: the energy use of its data centers. Data centers need huge amounts of electricity to operate their servers, networking equipment, and cooling systems. According to Lawrence Berkeley National Laboratory, U.S. data centers consumed approximately 76 terawatt-hours of electricity in 2018, representing 1.9% of total U.S. electricity consumption. By 2023, this had increased to 176 terawatt-hours, or 4.4% of total U.S. electricity consumption. This report even predicts that their consumption could increase even more to approx. 325 and 580 terawatt-hours by 2028, representing 6.7% to 12% of projected U.S. electricity consumption (Shehabi et al. 5–6). They use this enormous amount of energy to run the processors and networking hardware that compute 24/7. They must also power AI GPUs, which in the past couple of years have improved exponentially, being able to do trillions more calculations than a standard computer, but costing significantly more wattage.

Data centers usually get their electricity from the local utility, so depending on the region they are in, the greater environmental impact can be, since different regions use different types of energy sources: fossil fuels, nuclear energy, or renewable energy (Shehabi et al. 56–57). These different energy sources have different amounts of emissions, with fossil fuels having the biggest impact. This is because fossil fuels are one of the key drivers of climate change and global warming, since burning them releases CO2 into the atmosphere. Furthermore, fossil fuels are non-renewable, meaning they cannot be replaced; mining them can also cause erosion, which hurts landscapes and forests.

This increase in AI energy use also has many negative effects on the public, but one reported effect is higher electricity costs. These costs rise first from the electrical power used to run these data centers, which adds load to local power grids, raises electricity bills, and

increases the risk of blackouts (Lindwall and Shallant). Also, because of this huge increase in power demand, utility companies pay for the expensive transmission and distribution upgrades by raising costs on everyday residential customers. This cost is estimated by the Congressional Research Service and federal energy labs estimated to be around 6-8% by 2030 on average (RFF), but in areas with massive concentrations of data centers it is estimated to be as high as 25-70%. These percentages can differ depending on the region and the assumptions used in the study.

The expansion of AI infrastructure also uses massive amounts of semiconductors and memory chips, the same ones that are used in phones and computers, causing their prices to rise. Computer and PC prices are projected to rise 20% by the end of 2026 (Schisgall), and phone prices are projected to rise 12-13% (Kharpal). Lastly, companies like Google, which have started implementing AI into all their services, need to raise the cost of those services because of the high costs of running new advanced AI.

Companies Benefit

To avoid public backlash and maintain high ESG ratings, companies have many methods of presenting their environmental performance. The most prominent method is greenwashing, which is when companies make false or misleading claims about the environmental benefits of their product, usually using words like “natural”, “green,” or “eco-friendly”. While this is effective in avoiding public backlash, it doesn't help their ESG, so companies try to raise their ESG rating by making ambitious long-term commitments like being Net-Zero/carbon neutral across operations by 2030, which means the amount of greenhouse gases emitted equals the amount of greenhouse gases removed from the atmosphere, or other goals like water positive, which means replenishing more clean water to the environment or community than the company takes out.

MSCI, a prominent ESG rater, bases its ratings on long-term commitments, not penalizing spikes in energy consumption or infrastructure growth. Also, MSCI compares the companies in their own sphere, so Microsoft's data center footprint is normal when compared to Google and Meta, which may understate its absolute scale. MSCI does this since its ratings are designed strictly to measure financial risk resilience relative to industry peers (MSCI). This difference makes MSCI’s rating widely misunderstood by investors and media not understanding

its relative to industry peers and that is not about if a company is actively helping the planet or operating ethically. The other ESG rating is S&P, which doesn't give scores but gives a description based on questionnaires filled out by the companies (S&P Global). These questionnaires are subject to self-reporting bias, and similar to MSCI, it is based more on policies than real-life footprint. The other way companies' emissions can be obscured is through REC's. They purchase RECs to claim zero emissions for the electricity they pull from local power grids; then, for the carbon emissions, they buy carbon offsets to balance them out. Since current accounting methods allow considerable flexibility in how emissions are reported and ESG is measured (Shriimali G), companies can have a large footprint yet receive favorable ESG ratings, avoiding public backlash and keeping investment ratings high.

Greenwashing is often used by companies to maintain favorable ESG and consumer trust during periods of operational expansion. These green claims also have an effect on people's everyday shopping choices since people want to support companies that are sustainable (Li), so these goals persuade people into thinking they are on track to being sustainable while keeping public support.

Companies can also mislead customers into paying a premium for their "eco-friendly" product or service. This way, firms making less-verified claims may gain an advantage over more conservative reporters. Transparent companies' true promises start looking less strong than deceptive companies' exaggerated promises. This creates a competitive pressure to make stronger claims in the market, where companies have to be making stronger claims to be successful. Stronger enforcement or new legislation would help address this, such as laws from the Federal Trade Commission (FTC) or new laws preventing this.

Current Regulations

Right now, at the federal level, the FTC still uses its 2012 Guides for the Use of Environmental Marketing Claims, commonly known as the Green Guides (the official guidelines from the FTC designed to help businesses avoid making false, deceptive, or misleading environmental claims about their products and services). In 2022, they reviewed the guidelines to see whether they needed to update them to regulate more modern greenwashing problems like "carbon neutral" and "sustainable". However, the 2026 version of the Code of Federal

Regulations still identifies the 2012 guidelines as the current version (Federal Trade Commission, “FTC Seeks Public Comment”; Guides for the Use)

Since federal action has slowed, state governments have taken it into their own hands; for example, California enacted Senate Bill 343 in 2021, which banned the recycling symbol on products unless it passes the rigorous state-verified recycling benchmarks. However, a federal court issued a preliminary injunction in July 2026 that temporarily stopped enforcement of Senate Bill 343 (California Department of Resources Recycling and Recovery). In Oklahoma, they introduced HB 4068 in 2026, a law banning unverified use of terms like net-zero, eco-friendly, sustainable, and non-toxic. However, the bill was referred to committees and wasn't enacted (Oklahoma Legislature). These state-level actions demonstrate how governments are attempting to address misleading environmental marketing while federal guidance remains under review.

Courts have also begun addressing disputes over corporate environmental claims. One example is Berrin vs. Delta Air Lines, a proposed class action lawsuit against Delta Air Lines over carbon-neutral claims that rely on questionable carbon offsets. In July 2026, a federal court allowed the consumers' claims for damages under California law to proceed because a dispute remained over whether Delta's carbon-neutral claims influenced the consumers' decision to purchase flights. In the end, the court did not rule that Delta had committed fraud and denied the request for an injunction (Barry and Tigre). Now the courts are increasingly evaluating whether broad corporate greenwashing constitutes actionable fraud.

While some states have passed significant laws on greenwashing, we still need the federal government to enforce standards for big consumer companies' environmental marketing claims. This research paper goes over these big consumer companies' emissions and compares them against their claims of “net-zero” or “carbon neutral” to assess whether federal action may be warranted to give equal protection to all citizens and have consistency to reduce compliance confusion.

Types of emissions

One of the most important differentiations you need to know about emissions is how they are split up and reported. First, there are the scope 1 and 2 emissions, which companies usually focus on, with scope 1 being the direct greenhouse gas emissions from sources that an

organization controls or owns, like the burning of natural gas in their factories, the fuel burned by company-owned cars, or the emissions from the manufacturing process. Scope 2 emissions are the indirect greenhouse gas emissions generated off-site to produce the energy the company buys and consumes, like electricity used to light and run an office building or purchased heating and cooling for factories. Lastly, there are Scope 3 emissions, usually less reported by the company, while being the biggest %age of the company's greenhouse gas emissions. Scope 3 emissions are usually split into two parts: upstream and downstream emissions, or the manufacturing emissions and end-use emissions. The energy-intensive production of these chips, which uses huge amounts of electricity and pollutes large amounts of toxic chemicals into the environment, is classified under Scope 3 emissions and not under their reported Scope 1 and 2 emissions. These chips and other specialized hardware also have very short lifetimes since companies trying to keep a competitive advantage replace them every two or four years. This short lifecycle creates continuous supply chain emissions from the mining of raw rare materials and the manufacturing that is required to be able to replace the parts frequently, and all of these emissions occur before a single query.

The other scope 3 emissions, downstream scope 3 emissions, “enabled emissions,” come from what their AI is used for. Microsoft and Google, with Meta less directly involved, partner with major oil companies to streamline fossil fuel exploration and maximize extraction efficiency. Research indicates that productivity gains from AI applications in the fossil fuel sector increase net global emissions by 0.47 to 1.8 gigatonnes of CO2 annually (Alpine). This boost in fossil fuel extraction can generate emissions up to 13 times greater than the direct energy footprint of the data centers running those AI models.

Results

Google, Microsoft, and Meta are the three biggest AI companies in the U.S. right now that are publicly traded, and all three of them have made net-zero promises by 2030, whether it be water positive or carbon neutral. Some of these goals are on the way to being achieved; other goals seem to be slowing down in reaching for a multitude of reasons. The stats in this section, if not cited, were pulled from the companies' own environmental reports.

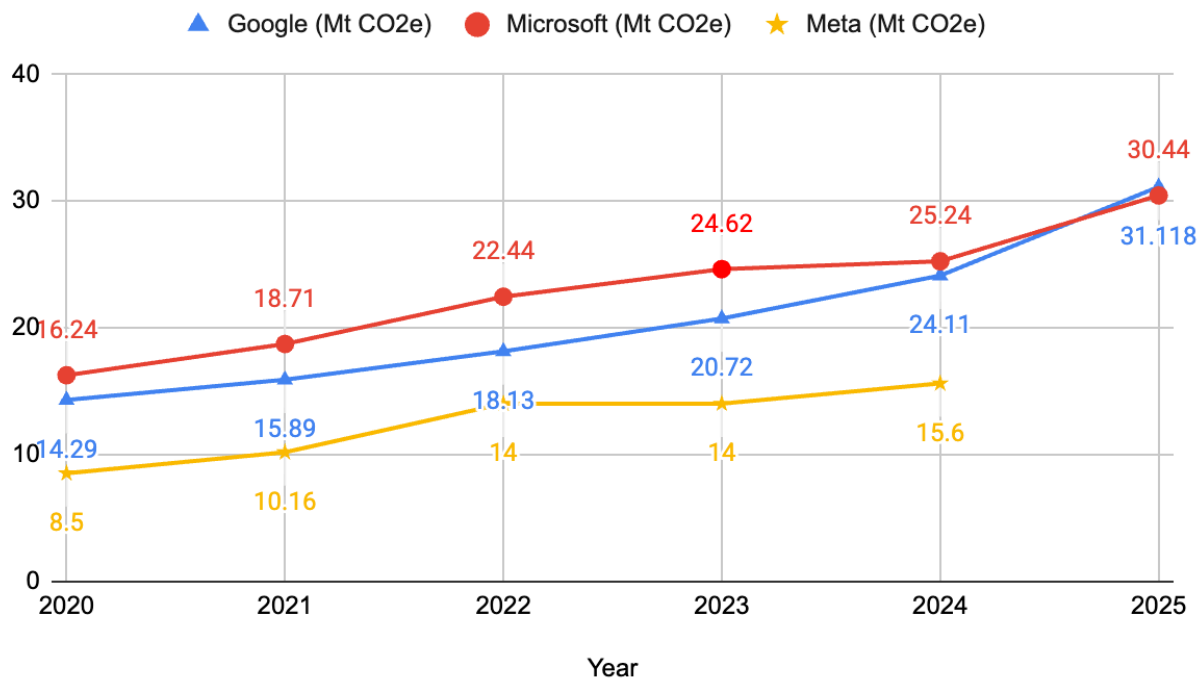


Fig 1: Total GHG Emissions Growth Across Tech Hyperscalers, 2020-2025

This figure compares the total gross location-based greenhouse gas emissions of Meta, Microsoft, and Google. Data were drawn from each company's respective yearly sustainability reports from 2026 going back to 2021. Meta's 2026 environmental report hasn't been released yet. (Google Environmental Report; Microsoft Sustainability; Meta Platforms, Inc.)

Google

First, let's start with Google, one of the biggest companies in the world, which has pledged net-zero by 2030, 24/7 carbon-free energy, and replenishing 120% of fresh water consumption by 2030. These goals are very ambitious, but they claim to be on track, reporting significant progress in clean energy and water replenishment, with 12 gigawatts of net new

clean energy and replenishing 78% of water (Johnson). Due to the rapid expansion of AI, however, they have noted that their 2030 goal of net zero is getting more ambitious (Google Sustainability). For Google, their Scope 3 emissions make up about 80% of their greenhouse gas footprint. Google's Scope 3 emissions have doubled since 2019 because of their AI expansion. This expansion of AI also increases supply chain hardware manufacturing (Scope 3), resulting in massive increases year over year in Scope 3 emissions.

Google's goal of 120% water replenishment seems to be on track right now at 78% (using 10 billion gallons and replenishing seven billion) in 2026, but if we take into account that the increase in water consumption every year is 34%, and if it stays the same, being generous, they need to have 43.2 billion gallons replenished. Currently, their goal is 19 billion gallons replenished annually by the end of the decade. This is more than 120% of current water consumption, but in the future it may not even be enough if AI expansion continues as it has. In short, Google's claims of being on track for 120% water replenishment rely on fixed targets, while consumption is tied to exponential growth. This is an issue many companies face: they report being on track for net-zero goals while consumption keeps rising faster than replenishment; even so, many companies still claim they are on track to reach their goals.

The second issue Google has addressed is its net-zero claims. While they have reduced the carbon footprint of their prompts by 33x-44x (Elsworth), this has led Google to put AI into everything, resulting in not a reduced carbon footprint but instead an 81% increase from the 2019 baseline. Google has made significant progress in clean energy by signing agreements for 12 gigawatts of clean energy, more than their last two years combined, but their electricity consumption has increased 37 % because of data center and AI expansion. So while their Scope 1 and Scope 2 operational emissions have decreased slightly because of clean energy purchases, the reduction was small relative to growth in Scope 3 because of how rapidly AI infrastructure is expanding, being faster than local energy grids can decarbonize.

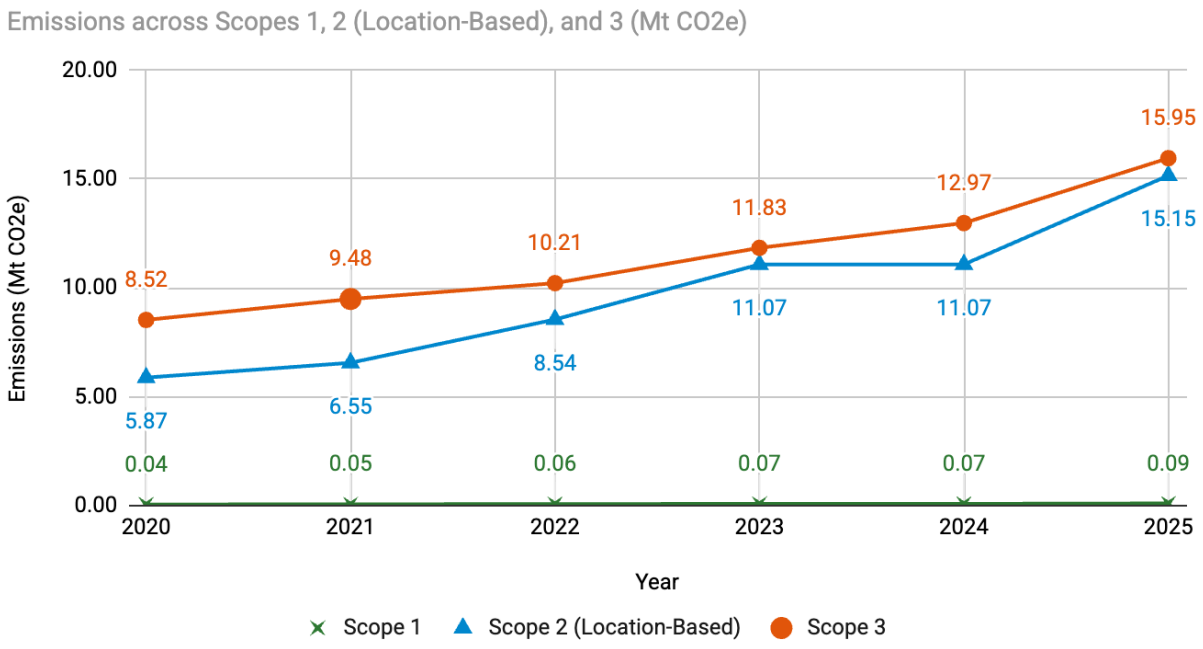


Fig 2: Emissions across Scopes 1, 2 (location-based), and 3 (Mt CO2e) for Google. This figure compares Google's net location-based GHG emissions across Scope 1, 2, and 3. This data was sourced from Google's Environmental Report 2026 (Google Environmental Report)

Meta

Meta has also claimed goals of being net-zero by 2030, being water positive, and reducing emissions by 2030. While their impact is much less than Google's, Meta claims the best PUE and the lowest emissions. Though their emissions may look great, in recent years, their emissions have actually gone up 145% from 2020 to 2023 and 23% from 2023 to 2024 (Clancy), which is the largest jump of any of these three companies. Their Scope 3 emissions make up 99% of their greenhouse gas footprint, with 62% of that being from capital goods. This 62% comes mostly from the massive construction costs of building the Hyperion, a massive artificial intelligence data center campus being built in Richland Parish, Louisiana. This data center is already generating huge amounts of Scope 3 emissions, even before it has been

turned on. This jump in emissions is because of Meta trying to catch up to Google and Microsoft in AI. Meta, because of their investments in massive gas plants to power their huge AI data centers like the Hyperion campus, had to withdraw from their claim of 100% renewable energy.

This Hyperion data center and the seven new natural gas plants built to power it faced immense pushback, with the Union of Concerned Scientists documenting $90 billion in projected health and environmental damage from data center development in the state (Green America). Meta's new gas plants to power the Hyperion and Prometheus data centers could result in 4-10 million tons of CO_2 emissions per year (Smith), which may be inconsistent with the stated target to reduce scope 1 and scope 2 emissions by 42% in 2031. This Hyperion data center not only uses a massive amount of energy and emits tons of pollution; The projected baseline water consumption is 1.5 million gallons per day, with a peak water consumption of 23 million gallons predicted by the company with their water permit (Hawkins and Marcano). This is the same amount of daily consumption as 17,000 people, while the nearby town of Holly Ridge only has around 2,000 people. The massive scale of the Hyperion has raised local questions about stress on groundwater and the lack of strict state-level tracking. These statistics are only on the direct footprint of the data center; the indirect footprint is thought to be many times higher when factoring in the water consumption required to generate the electricity powering the campus.

To sum up Meta's AI footprint, while they might have lower emissions than Google and Microsoft, their environmental footprint is growing the fastest out of the three with the construction of new massive data centers like the Hyperion. Recently, they have withdrawn from their goal of 100% renewable energy and reported rising greenhouse gas emissions coming mainly from data center expansion.

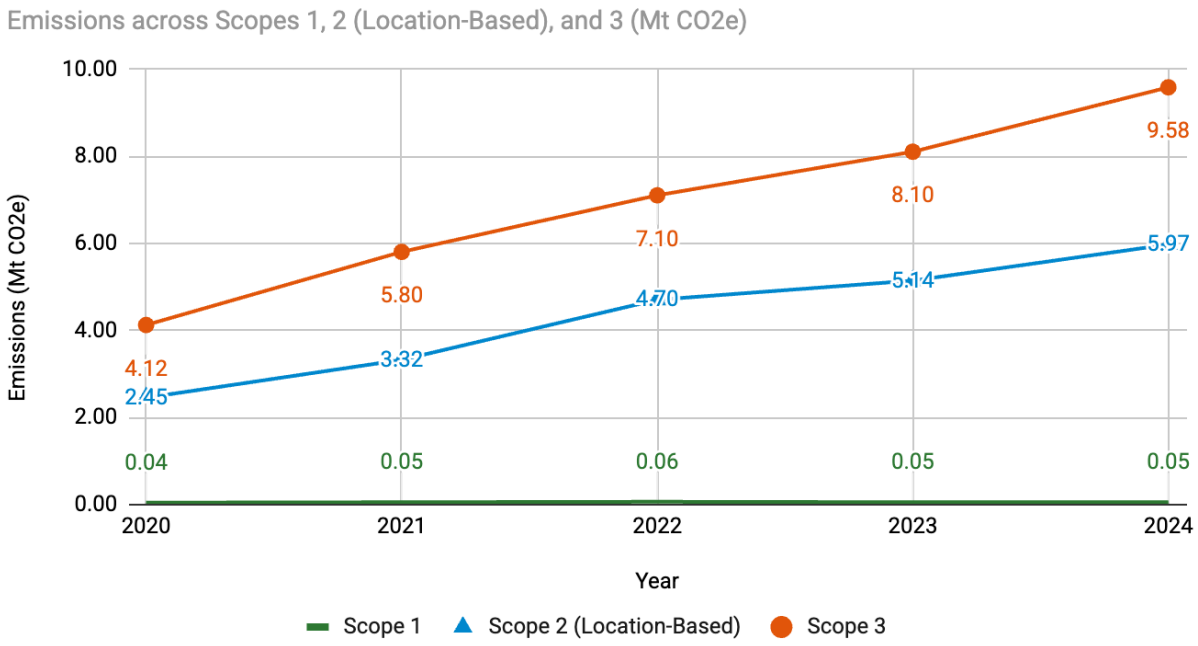


Fig 3: Emissions across Scopes 1, 2 (location-based), and 3 (Mt CO2e) for Meta. This figure shows Meta's location-based net GHG emissions in Mt CO2e across scopes 1, 2, and 3. This data was sourced from Meta's sustainability report from 2025. (Meta Platforms, Inc., 2025)

Microsoft

Microsoft's emissions are the highest of the three companies and have the highest PUE of 1.17, with Scope 3 emissions making up 85.5% of Microsoft's total greenhouse gas footprint. They have even said that it is their "Number one obstacle to net zero"; their goals are very similar to Meta's and Google's, wanting to be carbon negative by 2030 and water positive. Like Meta and Google, their emissions have surged due to AI expansion, with Microsoft's greenhouse gas emissions going up 25% in 2025 (Segal). This increase, they claim, partly comes from Microsoft ending its use of short-term renewable energy certificates and focusing more on long-term direct clean energy procurement. While Microsoft used to be the largest financier of contracted engineered carbon removal, it has cut back 80% of its purchases in the

first half of the year compared to previous years, which Bloomberg links to AI-related spending priorities (Bloomberg). In addition to Microsoft reducing its financing of carbon removal, the U.S. Department of Energy terminated clean-energy and carbon-management funding worth $3.7 billion.

Despite Microsoft's rising emissions, they still claim to remain dedicated to being carbon negative and water positive by 2030. Though their emissions may be rising, they are still on track to meet their water-positive goal. They reached a milestone in 2025 when they replenished 3.7 billion gallons more water than the 3.5 billion gallons they consumed. Microsoft's emissions may be the highest, but they are the most on track to meet at least one of their goals out of these three companies.

Figure 4

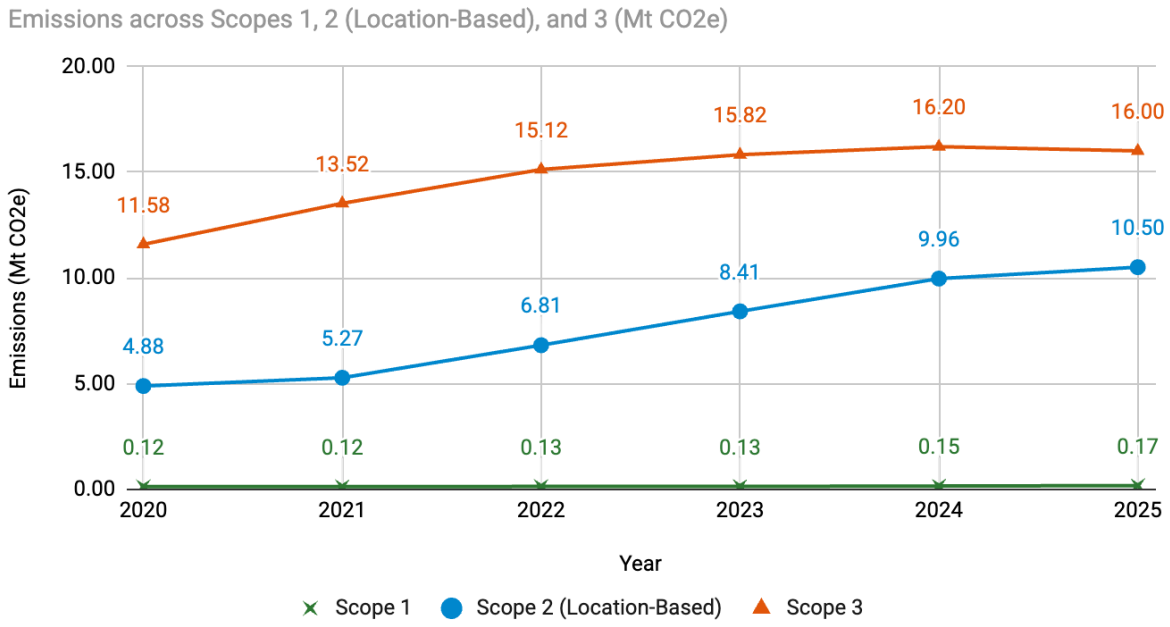


Fig 4: Emissions across Scopes 1, 2 (location-based), and 3 (Mt CO2e) for Microsoft. This figure compares Microsoft's net location-based GHG emissions across scopes 1, 2, and 3. This data was sourced from Microsoft's 2026 sustainability report. (Microsoft Sustainability, 2026)

AI's Potential Benefits

In addition to the natural resources required to build out the physical infrastructure for AI, the advanced machine learning applications can aid in environmental monitoring, energy grid optimization, and scientific discovery.

In the power grid and solar panel space, AI can predict weather patterns, solar panel output, and even wind speeds to aid in the integration of renewable energy into the power grid, thereby reducing the use of fossil fuels (Utility Dive). In hyperscale data centers and other industrial applications, AI can aid in the optimization of the facility to draw power from the grid when renewable energy is abundant, further reducing the use of fossil fuels (Dizikes). AI can also aid in the optimization of the facility to increase efficiency in the cooling loops in real time, increasing the PUE and decreasing total energy use.

All of the examples above describe enabled handprints (or the software's ability to save energy) and are compared to the direct physical footprint (or energy used to run servers) to determine whether the benefits of AI to reduce greenhouse gas emissions outweigh the negative environmental impacts.

This balance is challenging, though, because of how they are connected: more efficiency gains come with an increased expansion of AI.

Historical evidence suggests efficiency gains can restrain data center energy growth; Masanet et al. estimated that global data center energy use rose only about 6% between 2010 and 2018 while compute output grew several hundredfold. Whether this pattern will continue under future AI workloads is contested. Some analysts expect rebound effects, as described by the Jevons paradox, to outpace efficiency gains, while others argue that hardware and software improvements will continue to moderate growth.

The reported benefits of optimizing AI support many different parties. Cooling optimization lowers operating costs for the operator, better renewable forecasting benefits grid managers and ratepayers, and climate and materials research may benefit the public broadly. Efficiency gains that lower a company's costs do not necessarily reduce the water, electricity, or air quality burdens on nearby communities.

Whether AI-enabled benefits outweigh its direct footprint remains uncertain. Estimates depend on how many companies incorporate it and whether the efficiency gains are made insignificant by increased demand.

Analysis/Discussion

The Accounting

All these companies account for their emissions in different ways. Google claims to have reduced its AI prompt footprint by 33-44x, claiming a huge reduction in emissions. While they claim this huge reduction in emissions, they are implementing this new efficient AI into all parts of their company, making this efficiency increase less helpful and also increasing energy usage and water consumption. Jevons paradox predicts that as efficiency increases, so does demand, which offsets the benefits of the efficiency gains. This paradox shows how we cannot depend only on efficiency improvements to solve our environmental problems.

These companies also all buy renewable energy certificates (RECs) to claim their market-based Scope 2 emissions are “net zero”. What we see right now, though, is that their physical data centers are burning fossil fuels to keep their data center powered 24/7. Lastly, we see that companies account for their energy usage or water replenishment. In Google's case, with static replenishment goals, they report they are on track to reach water-positive goals when, in reality, these goals are increasing exponentially. While they might be on track to meet this year's, current data suggests the 2030 targets may not be met. All three of these big companies talk about their carbon removal plans and all the money they put into it, but all three of these companies rely on offsets with varying levels of third-party verification instead of putting money into real direct air capture or permanent carbon removal. Microsoft has even cut down on its spending on carbon removal when computer hardware costs increased. This explains how companies can report “progress” while their footprint slowly worsens.

Gaps in Regulation

Greenwashing can continue because of the lack of regulation or lack of enforcement from the government and the FTC. ESG raters even enable this greenwashing by basing their ratings not on the actual impact of companies but on the long-term goals they claim. These ESG ratings also don't even take into account Scope 3 emissions, which usually make up 99% of Meta's emissions and 80% of Google's and Microsoft's. These Scope 3 emissions are usually less reported by the companies, as they highlight their Scope 1 and 2 emissions while their Scope 3

might be skyrocketing. If you take into account the Scope 3 emissions of these companies, like indirect water consumption, such as the water consumed by cooling towers (Scope 1 and 2), which is a fraction of their total water footprint. There are also billions of gallons being used for steam and cooling. This makes it hard for a lot of these companies to be on track for their water consumption goals. This is one example of companies not highlighting their Scope 3, claiming "operational net zero", which is net zero not including Scope 3 emissions.

The delay in updating the Green Guides means newer terms are not addressed. This delay has caused some states to make their own laws, leading to confusion and loopholes. This delay has also allowed companies to still claim "operational net zero," or claim net zero off of offsets with varying levels of third-party verification.

Local Impacts

The expansion of AI data centers can have many different effects on local communities since they require large amounts of water and electricity. For example, Meta's Hyperion data center in Holy Ridge, Arizona is projected by the company to draw 23 million gallons of water every day once it is built. This is more water than a town of approximately 17,000 people uses every day, even though Holly Ridge has fewer than 2,000 residents (Hawkins and Marcano).

Data centers can also affect nearby ecosystems and local infrastructure. A 2025 report from Washington State's Data Center Workgroup found some potential impacts from data centers' water withdrawals, wastewater discharges, and heated water released into rivers. These effects can all shrink aquatic habitats. This impact is even stronger in areas where water supplies are already limited. (Washington State Department of Revenue). The report also mentions how building multiple facilities in the same area has cumulative effects on water and air quality. These concerns are stronger in the Pacific Northwest as the local rivers and fisheries are a big part of local communities and tribal heritage.

The energy demand from these data centers can also put additional burdens on the local communities. A 2026 study found that data center expansion can spread the energy burden unevenly across rural and urban communities. The study found that rural communities experienced an increase in energy burden 76% greater than urban communities, while the lowest-income households can face even worse energy burdens of approximately 28% more(Feng and You). This study shows that the cost of expanding AI infrastructure is not shared

equally between owners of data centers and the communities where they are built, and within the communities they effect the burden is also disproportionately spread out.
Local air pollution is another concern. Data centers often have backup diesel generators, which are used in power shortages or when natural energy isn't enough. These diesel generators release fine particles and nitrogen dioxide. The Washington State Department of Ecology has these pollutants listed as potential health concerns, especially for people who are exposed often and/or have existing respiratory conditions. The agency has also required health-risk assessments for certain data centers in Washington to mitigate this problem. (Washington State Department of Ecology). In Meta's case, to power the massive Hyperion, they plan to use natural gas power plants (Union of Concerned Scientists), which emit large amounts of nitrogen oxides and sulfur oxides, degrading local air quality and creating serious health risks for the local community (Davis et al.).

These examples of the impact of data centers on local communities show why companies and government should do stronger evaluations of environmental conditions before being allowed to build large infrastructure. Data centers have some benefits for the community, as they can bring job opportunities and technological development to less developed areas. These benefits need to be weighed against the cost, as these data centers create massive demand on water, energy, and the local ecosystem. Greater transparency and careful planning can help make sure that the costs of AI expansion are not disproportionately carried by nearby residents.

Policy Recommendations

The results of my research highlight many areas of weakness within our regulatory framework and offer several recommendations for improvement. Mandatory Scope 3 reporting is one recommendation, as it would allow for significantly more information than what is currently provided through voluntary disclosure programs. Approximately 70% of total company emissions, or possibly up to 99%, are generated through Scope 3 activities. Therefore, when companies do not disclose their Scope 3 emissions, they do not provide a complete picture of the company’s overall climate impact (Tiley & Sin). Mandatory disclosure would also likely reduce financial risk by providing accurate reporting of the company’s total emissions versus relying on incomplete Scope 1 and 2 reports. Additionally, mandatory disclosure will encourage

companies to ensure that their operations are sustainable across the entire supply chain (Yale Program on Climate Change Communication).

Some individuals believe that it would be difficult for small businesses in the supply chain to track emissions due to limited resources (Sweep). However, others suggest that the head of the supply chain should be responsible for funding the tracking process down the line, either through discounts for the small businesses or by having the small businesses use low-tech tracking methods while the larger business utilizes high-tech tracking methods (Gaur & Ramdas).

Additionally, year-over-year reporting is not as precise as day-to-day reporting and is less accurate due to most reports relying on annualized industry averages. Only approximately 6% of companies utilize supplier-specific emission factors, according to research conducted by SBTi. Instead, most companies multiply annual financial expenditures by a broad industry average. As a result, averages are produced that do not accurately represent the day-to-day changes made, such as switching to renewable energy on one day or changes resulting from daily weather fluctuations. Instead, these types of changes are aggregated into a single inaccurate estimate (Devera & SBTi).

Modern carbon accounting systems utilize business software to automatically track emissions throughout the supply chain (Neo & Chen). This allows companies to immediately identify spikes in emissions and make necessary adjustments based on real-time data collected from shipping ledgers or manufacturing lines. This method is much more efficient than waiting for a sustainability report 14 months after a carbon spike occurred (Fair Supply Co.).

Research on the impact of AI infrastructure on local communities suggests that conducting assessments of the potential impacts of infrastructure on both the local community and environment prior to construction could potentially prevent unintended negative consequences. Most AI infrastructure is not subject to pre-construction review, as comprehensive federal reviews under NEPA or the Clean Water Act are only initiated if a project utilizes federal land, receives federal funding, or requires specific federal permits. Many private AI data centers do not meet these criteria (Climate Law Blog).

Executive actions such as Executive Order 14318, commonly referred to as Accelerating Federal Permitting of Data Center Infrastructure, along with assistance from the EPA, can be utilized to attempt to expedite permitting processes and reduce public comment periods, which

typically last between 30 and 90 days. During this period, local citizens and environmental organizations can review plans, express concerns, and object to proposed projects. Pre-construction reviews are also completed during this time; they are a rigorous safety and environmental inspection performed prior to commencing construction, with a focus on specific components of the data center. The government has employed executive actions and expedited processes due to the rapid growth in AI and cloud computing, which has resulted in unprecedented demand for AI. Since the traditional environmental review process can take several years, the government has turned to executive actions to circumvent normal regulations so that the United States can maintain its position as a global leader in technology. Consequently, numerous states have implemented temporary construction moratoriums specifically designed to assess and evaluate the cumulative environmental and grid impacts of AI data centers (Brookings Institution).

Finally, these findings indicate that efficiency improvements alone will not resolve environmental issues; they will merely result in increased resource consumption. Thus, regulatory laws governing resource consumption must be established before further efficiency improvements. This concept is supported by researchers from entities including the United Nations, the World Economic Forum, and Oxford University, who determined that market logic and business incentives tend to prioritize efficiency in order to maximize production levels rather than conservation efforts (United Nations Environment Programme et al.).

Conclusion

In recent years, AI expansion has skyrocketed, with companies building more and more data centers to support their expansion, using millions of gallons of water each day and millions of kilowatts per day. This AI expansion has also come with breakthroughs in energy efficiency, which enable further AI expansion; however, some companies emphasize efficiency increases in their reporting rather than the impact it has on the environment.

This expansion has increased water usage, energy usage, and overall emissions, yet these companies still report that they are on track to meet their water replenishment, net-zero, and carbon-negative goals. Even though AI data centers affect rural communities with their pollution, companies that build them have not been the subject of FTC action under the current guidelines. Policy changes from the FTC to update its guidelines on greenwashing are needed

to keep companies' claims accurate. Also, new policies like Mandatory Scope 3 disclosure to ensure companies are sustainable throughout the supply chain, and day-to-day reports that show daily fluctuations in companies' emissions, would help them spot high-emission suppliers faster than year-to-year estimates based on industry averages.

Removing Executive Order 14318, increasing moratoriums, resuming the normal environmental standards, and strengthening regulatory laws on resource consumption would greatly reduce impacts on local communities and would make sure that AI's energy use or water consumption is regulated and can't grow out of control. While AI has the potential to improve energy efficiency and optimize renewable energy, these benefits come at an environmental cost, and we also need to ensure it is measured. Understanding this trade-off is essential to evaluating whether AI development can become more sustainable and ensuring that technological progress does not come at the expense of the ecosystems and communities on which it depends.

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Figure Legend

Figure 1:This figure compares the total gross location-based greenhouse gas emissions of Meta, Microsoft, and Google. Data were drawn from each company's respective yearly sustainability reports from 2026 back to 2021. Meta's 2026 environmental report hasn't been released yet. (Google Environmental Report, 2026; Microsoft Sustainability, 2026; Meta Platforms, Inc., 2025)

Figure 2:This figure compares Google's net location-based GHG emissions across Scope 1, 2, and 3. This data was sourced from Google's Environmental Report 2026 (Google Environmental Report, 2026)

Figure 3:This figure shows Meta's location-based net GHG emissions in Mt CO2e across scopes 1, 2, and 3. This data was sourced from Meta's sustainability report from 2025. (Meta Platforms, Inc., 2025)

Figure 4:This figure compares Microsoft's net location-based GHG emissions across scopes 1, 2, and 3. This data was sourced from Microsoft's 2026 sustainability report. (Microsoft Sustainability, 2026)

List of Abbreviations

AI: Artificial Intelligence

C.F.R.: Code of Federal Regulations

CO_2: Carbon Dioxide

CO_2e: Carbon Dioxide Equivalent

DOE: Department of Energy

ERP: Enterprise Resource Planning

ESG: Environmental, Social, and Governance

FTC: Federal Trade Commission

GHG: Greenhouse Gas

GPU: Graphics Processing Unit

MSCI: MSCI ESG Ratings (ESG ratings provider)

NEPA: National Environmental Policy Act

NRDC: Natural Resources Defense Council

PUE: Power Usage Effectiveness

REC: Renewable Energy Certificate

S&P: Standard & Poor's

SBTi: Science Based Targets initiative

SEC: Securities and Exchange Commission

SME: Small and Medium-Sized Enterprise

USGS: United States Geological Survey