



TECHNOLOGY FEATURE Research Communication / Green Computing / Sustainable Technology

The Hidden Cost of a Google Search: Green Computing and the Energy Crisis Behind Artificial Intelligence

Each ChatGPT query utilizes almost 10 times the electricity of a conventional web search. Artificial intelligence is developing faster than ever, and the world's data centres are unwittingly in the middle of the largest energy crisis to date, and the need to resolve this is more urgent than ever.

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Introduction

Recall the last time you asked an AI chatbot a question. It was instantaneous, clean, easy — it was just a blinking cursor, then an answer. What you didn't notice was the lighting up of the building that was the size of a warehouse somewhere in the world, using thousands of watts of electricity in the fraction of a second it took to respond to your request. Then times that by hundreds of millions of people doing it all day, every day. The situation is very different when it comes to the picture.

AI is said to be an invisible, weightless and clean phenomenon, purely digital. In fact, it's one of the most physically intensive sectors ever created. AI servers require vast amounts of electricity to train and operate AI models, emit significant heat, and use water to cool off. With AI moving beyond a mere novelty and into the very core of the global economy, its environmental footprint is emerging as one of the most pressing technology issues of the day. Green computing, the quest for environment-friendly and energy-efficient computing, has evolved from wish to must.

“One AI query requires almost 10 times as much electricity as a typical web search, and when multiplied by the billions of people using it each day, the impact becomes almost incomprehensible.”

How Big Is the Problem, Really?

The amount of energy required for artificial intelligence is truly astonishing, and it is increasing at a speed that many people do not know. The International Energy Agency (IEA) estimates that data centres consumed around 415 terawatt-hours (TWh) of electricity in 2024, which represents about 1.5% of world's electricity use. This is expected to grow to approximately 945 TWh by 2030 under the IEA's central scenario, and AI workloads are highlighted as the biggest contributor to this increase.



In comparison, 945 TWh matches the total electricity use of the entire Japanese economy, the world's third largest. Data centres accounted for 4% of the electrical power used in the United States in 2023, and this use is projected to increase to 7% to 12% of U.S. electricity by 2028, according to analysis by Lawrence Berkeley National Laboratory. In Ireland, where tech infrastructure is a growing priority for the country, data centres already use approximately 21% of the national electricity supply and the IEA predicts that by 2026, they could absorb as much as 32%.

The power required to train and run AI is doubling approximately every 100 days. Using a creative AI tool consumes almost ten times more electricity than a typical search on the internet. During the past year, the demand for artificial intelligence computing power for major tech companies like Google, Meta, and Microsoft has more than doubled, which is directly equivalent to an increase in electricity usage. All three have made public commitments to being "net zero," but each has seen absolute emissions increase over the past few years as a result of growth in their data centres.



Figure 1: A large-scale AI data centre facility showing server racks consuming vast amounts of electricity. Global data centre demand is projected to reach 945 TWh by 2030 — equivalent to Japan's entire annual electricity consumption. Credit: Hanwha Data Centers / Google Images

What Is Green Computing?

Green computing is basically the idea that the way we make, use, and dispose of computers and devices should not harm the planet. The idea spans everything from developing more energy-efficient chips and processors, to using renewable energy to power data centres, to reworking AI algorithms to achieve the same results without needing as much computational effort.

The environmental impact of the computing industry as a whole is already estimated at 5%-9% of the global electricity consumption, and over 2% of all GHG emissions, equivalent to the aviation industry.



Whereas in aviation, the impact of computing is very much seen by the average user, in computing it is much less visible. No one is exposed to the smoke of a data centre. No one can detect its exhaust. The effects of climate change are, however, real, measurable, and accelerating much faster than can be envisioned by the aviation industry.

“Data centres already emit more than 2% of global greenhouse gas emissions, which is similar to the amount emitted by the aviation sector, and unlike planes, there is no visible smoke in centers.”

The Water Problem Nobody Talks About

But electricity is not the only thing. Data centres produce huge amounts of heat as a by-product of computing and the most common way of controlling the heat is to use water cooling. Data centres are thus not only consuming vast amounts of electricity, but also fresh water, which is already in short supply in many regions of the world, including South Asia.

It is a challenge that is showing some promise for research, however. In 2025, Diaz-Marin and Berquist published their study in *Energy and Environmental Science*, showing how data centres can become water and carbon negative, capture carbon and creating clean water as a by-product thanks to innovations in advanced cooling and smart heat management. With their suggested structure, they would also be able to pull down half a kilogram of carbon dioxide and produce half a kilogram of useful water for every kilowatt-hour of computing energy consumed. This is an experimental project, but it shows the scope of creative ambition that's coming into the picture.

What Researchers and Companies Are Doing About It

Energy crisis solutions are moving forward quickly in research institutions and industry. In March 2026, research at Carnegie Mellon University (CMU) announced a new chip architecture that could cut the power consumption of data centers drastically. The project, funded by the first seed grant in the AI and Energy initiative sponsored by the Scott Institute for Energy Innovation at CMU, aims to make general purpose computing chips significantly more energy efficient without compromising performance. The CMU team's efforts are part of a growing trend in academic research on hardware efficiency: optimizing the physical hardware of an AI system from the transistor to the top.

In the software realm, researchers at Harvard University and Boston University released a multidisciplinary approach to sustainable AI for 2025, stating that for any AI to be truly green, it needs to be supported by all four aspects of hardware design, algorithm efficiency, energy sourcing, and policy regulation. Their framework, which was published in the journal *Environment and Sustainability*, highlights the need to strategically position data centres close to renewable energy sources to have an impact on carbon intensity.

In 2025 and 2026, liquid cooling (direct liquid contact, instead of air) is also quickly becoming popular, as AI accelerators are becoming more powerful than air cooling can economically support. Liquid immersion and direct-to-chip cooling systems can save 70-90 percent of the direct water use and dramatically increase power usage efficiency, but they don't address the need for electricity. In the



meantime, new-generation GPU and TPU designs from the top chipmakers are aiming for significant strides in performance-per-watt over their ancestors.

“Now Researchers think it is possible to convert a data centre from a carbon producer to a carbon captor, capturing CO₂ and producing clean water as by-product of computing.”

The Algorithmic Dimension: Making AI Itself More Efficient

In addition to hardware, there is a movement in the AI research community that is raising the question: why does the model have to be so big and energy-intensive in the first place? One of the dominant themes in the development of AI over the last decade has been the increasing size of the models: more parameters, more data, more compute. This has worked well and has come at an ever-increasing energy price. Now, scientists are looking to find out if a smaller and more carefully designed version can perform the same feat using less energy.

Model distillation (training smaller models to learn the same meaning), quantisation (using approximate numbers for model parameters), and sparse activation (using only relevant parts of a model to process a specific input) are all proving to be very promising techniques. The objective, which has become more widely expressed in the research community, is to separate out the capacity of AI from energy usage – to create systems that are smarter but not necessarily bigger or more energy-intensive.

What's Next: A Greener Intelligence

AI's energy consumption doesn't have to keep going in this direction. It is a result of choices: choices made by the designers of the chips, software engineers, corporate executives and policy makers. Green computing provides a blueprint to do those decisions differently. These new and efficient hardware, renewable power in data centres, algorithmically more efficient AI models and novel cooling technologies offer a real opportunity to separate AI from environmental impact.

Green computing isn't a side issue or a checkbox to be checked in a sustainability report for students and researchers entering the technology profession in 2026. One of the most pressing engineering and ethical dilemmas of the 21st century. Whether AI will keep on growing is the question, but it will. The question here is whether humanity can develop the intelligence it desires without destroying the planet on which it lives. That answer will be decided in laboratories, lecture halls and boardrooms over the next few years by people who are just entering the field now.

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References

- [1] International Energy Agency (2025) Energy and AI. *IEA Report*. Available at: <https://www.iea.org/reports/energy-and-ai>
- [2] Huang, J. and Gopal, S. (2025) Green AI – A multidisciplinary approach to sustainability. *Environment and Sustainability*, 100536. DOI: 10.1016/j.es.2025.100536. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11850145/>
- [3] Diaz-Marin, C.D. and Berquist, Z.J. (2025) Flipping the switch: carbon-negative and water-positive data centers through waste heat utilization. *Energy and Environmental Science*, 18, pp. 8403–8413. Available at: https://environment.ec.europa.eu/news/ai-data-centre-waste-heat-could-be-used-water-purification-and-carbon-capture-2026-03-30_en
- [4] Carnegie Mellon University (2026) How CMU is curbing energy demands from AI data centers. *CMU News*, 16 March 2026. Available at: <https://www.cmu.edu/news/stories/archives/2026/march/how-cmu-is-curbing-energy-demands-from-ai-data-centers>
- [5] Ramanath (2026) AI data center energy consumption statistics 2026. *Presenc AI Research Report*, May 2026. Available at: <https://presenc.ai/research/ai-data-center-energy-consumption-2026>
- [6] Carbon Brief (2025) AI: Five charts that put data-centre energy use and emissions into context. *Carbon Brief*, 17 September 2025. Available at: <https://www.carbonbrief.org/ai-five-charts-that-put-data-centre-energy-use-and-emissions-into-context/>
- [7] Wikipedia (2025) Green computing. *Wikimedia Foundation*. Available at: https://en.wikipedia.org/wiki/Green_computing
- [8] TTMS (2026) Growing energy demand of AI: data centers 2024–2026. *TTMS Technology Report*. Available at: <https://ttms.com/growing-energy-demand-of-ai-data-centers-2024-2026/>