

AI data center revolution sucks up world's energy, water, materials

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and Amazon.

- *As large AI data centers proliferate, they are competing for water, energy and materials with already stressed tropical communities. National governments frequently welcome Big Tech and AI, offering tax breaks and other incentives to build AI complexes, while often not taking community needs into consideration.*
- *Aware that fossil fuels and renewables by themselves likely can't handle the astronomical energy demands posed by AI mega-data centers, Internet companies are reactivating the once moribund nuclear industry, despite intractable problems with radioactive waste disposal.*
- *Voices in the Global South say that AI computing (whose producers remain principally in the Global North) is evolving as a new form of extractive colonialism. Some Indigenous people say it is time to question limitless technological innovation with its heavy environmental and social costs.*

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In 2024, the state of Querétaro in north-central Mexico [suffered its worst drought in a century](#), impacting crops and communities. [Seventeen of the state's 18 municipalities](#) were affected, putting drinking water access at risk for thousands of families, according to CONAGUA, Mexico's National Water Commission.

With freshwater already diminished due to worsening climate change, Querétaro residents now fear a more calamitous future, with the announcement that [32 new data centers](#) — the physical facilities needed to satisfy humanity's insatiable desire for Internet-sourced data — planned for the state.

Most recently, on Sept. 25, U.S. tech firm CloudHQ [announced](#) plans to spend \$4.8 billion building Mexico's biggest ever "[hyperscale](#)" data center campus in Querétaro, most likely for cloud and artificial intelligence (AI) computing. It appears likely the state will emerge as [Mexico's data center capital](#), with a strong emphasis on AI capabilities.

The Querétaro growth spurt has angered some local activists, who argue authorities have their priorities wrong, elevating the needs of transnational corporate tech giants like Microsoft and Amazon, above those of local communities. "Water is what's needed for the people, not for these industries," campaigner Teresa Roldán [says](#).

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Environmentalism Teresa Roldán Soria (left), is aiding local residents in an area known as Los Sabinos in the municipality of Pedro Escobedo in Querétaro state, Mexico. Here she joins with local people to defend a spring and age-old *ahuehuate* (*Taxodium mucronatum*) trees against development. The *ahuehuate*, also known as the Montezuma cypress, is Mexico's national tree. Image courtesy of Teresa Roldán Soria, July 2022.

A Querétaro government spokesperson [responds](#): “We have always said and reiterated that the water is for citizen consumption, not for the industry.” But the spokesperson also notes limits to local regulatory power, stating that neither “the state, nor the municipality can [allocate water] to any industry or the primary sector. That’s a job for the National Water Commission,” which is under federal jurisdiction.

Data center growth in Querétaro may not only stress the region’s water supply. [According to the Mexican Institute for Competitiveness](#), the nation faces a massive electricity deficit of 48,000 megawatt-hours by 2030, more than half the country’s output in 2023. That yawning gap could grow wider as Big Tech firms rush to build AI data centers there.

Residents of Esperanza, a small Querétaro village, have already complained of energy and water outages, due, they say, to a nearby Microsoft data center. “We looked deeply and found no indication that our data centers have contributed to blackouts or water shortages in the region,” a Microsoft representative [responds](#). “We will always prioritize the basic needs of the community.”

Data center development is likely to continue causing conflict in poorer nations (of the world’s largest 1,244 such facilities nearly 60% are already [located](#) outside the U.S.). Experts especially expect conflicts

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In November, 2016, people [took to the streets](#) in Dublin, Ireland to protest the government's decision to allow Apple to build a data center in County Galway. The protesters, members of the group People Before Profit, carried a poster that had its own version of the old saying, "An apple a day keeps the doctor away." Image courtesy of Data Center Dynamics.

Artificial intelligence: Data centers on steroids?

Internet users, able with a few keystrokes to get instant answers to any question, have begun embracing AI. Others point to the transformation AI is bringing to health care, with algorithms now [detecting patterns in medical images](#) that even seasoned radiologists might miss. AI is also benefiting environmental scientists, as [its algorithms track deforestation](#), monitor air and water quality and assess natural disaster damage.

But this AI surge, with its on-screen ease and convenience, could come with an astronomical environmental toll.

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searches and graphics; these advanced facilities necessitate specialized infrastructure to manage the high power, speed and heat requirements for AI workloads.

These requirements have likewise supercharged AI data center energy, water and material consumption. So much so, in fact, that [critics](#) fear AI implementation could hamstring the [world's hopes of slashing carbon emissions](#), even as technology promoters promise breakthrough [AI-derived climate solutions](#).



A data center owned by Amazon Web Services, front right, is under construction next to the Susquehanna nuclear power plant in Berwick, Pa., on Tuesday, Jan. 14, 2025. Image by Ted Shaffrey/AP.

AI energy consumption

An AI-capable data center operated today by Amazon Web Services, Microsoft Azure, Google Cloud, Meta, IBM Cloud and other companies utilizes a far more powerful, and energy voracious, technology than pre-AI predecessors.

An AI-equipped public cloud [hyperscale data center](#) can cover millions of square feet, contain 5,000 or more servers (significantly upgraded from those used in pre-AI centers), with many miles of connection

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But unlike the world's small towns, AI is expected to drive a 165% increase in data center power demand globally by 2030, [according to Goldman Sachs Research](#). Water demand, material use and e-waste ([including PFAS forever chemicals](#)) are also going to increase, though forecasts vary widely due to tech industry lack of transparency.

The [OpenAI data center](#) in Abilene, Texas, for example, (the flagship for its Stargate Project), occupies about 370,000 square meters (4 million square feet), and is billed as the largest single building in the world — until an even bigger one is built, that is. Its natural gas power plant can [provide 360 MW of electricity](#), though this is planned to increase to [2 gigawatts of computing capacity](#). Suddenly, a midsize “city” is appearing in Texas, requiring major electrical infrastructure and massive quantities of water in a drought-stricken state.

“Just five years ago, a 20-50-megawatt data center was already considered large,” Shaolei Ren, associate professor at the University of California, Riverside, tells Mongabay. “Today, that’s small. We’re now seeing AI data centers being built and planned at the gigawatt scale. To put that in perspective, 1 GW is roughly enough to power 1 million homes.”

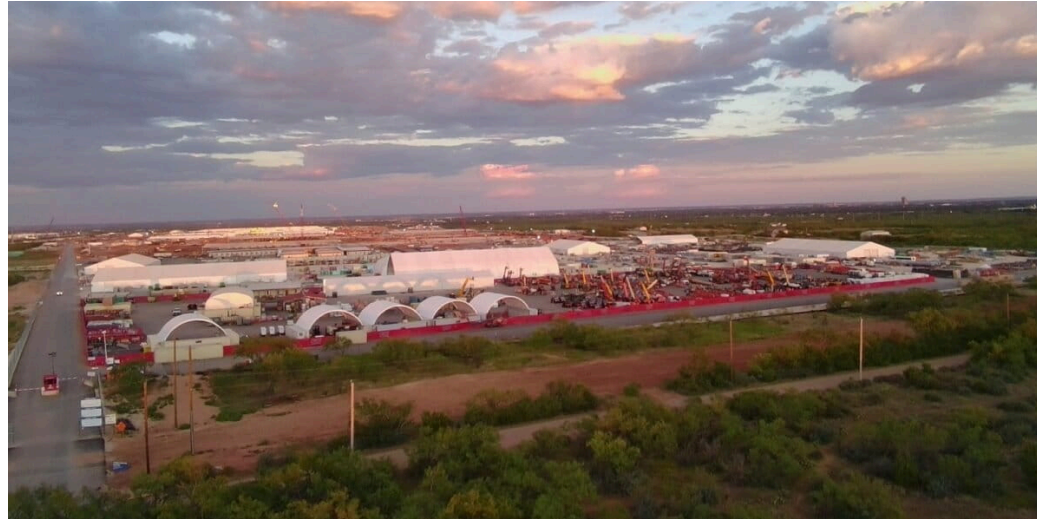
Worldwide, annual power consumption by data centers is projected at 536 terawatt-hours (TWh) for 2025, about 2% of global energy consumption. But as power-intensive generative AI grows, global electricity consumption could [double to 1,065 TWh by 2030](#), with much of that demand in the developing world.

The [International Energy Agency](#) says that by the end of 2035 renewables will be providing 60% of the energy needed by data centers, but this claim seems highly questionable. According to the latest report from the [International Energy Agency](#), earlier this year, fossil fuels were still providing nearly 60% of all data center energy, with renewables meeting 27% of demand and nuclear 15%. With data centers’ use of [gas, oil and coal surging](#), critics worry rapid AI data center expansion could prolong fossil fuel use.

“Google and Microsoft are now questioning if they can hit their own climate and energy targets, while Amazon and Meta engage in efforts to enable them to continue to burn fossil fuels while claiming to be 100% renewable,” according to a [joint statement from civil society for the AI Action Summit](#). It goes on: “Without addressing the escalating energy demands of AI and their contribution to the climate crisis, the promise of AI as a ‘climate solution’ is pure fiction.”

Escalating AI energy demand is even [making coal great again](#), with new Google and Meta data centers [prolonging the lives of coal plants](#). In 2025, Google praised the Trump administration when it [described coal as “incredibly clean.”](#) In July of this year, Google, seeing [a nearly 50% rise in CO2 emissions](#) since 2019, tried to quietly delete its net-zero pledge from its sustainability website, [according](#) to Canada’s *National Observer*. Meanwhile, Microsoft co-founder Bill Gates has reversed his previous view that [climate change poses an existential threat](#), while [arguing](#) that future AI-powered climate solutions will outweigh the massive energy consumption of data centers.

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An entrance to the Stargate artificial intelligence data center complex in Abilene, Texas on Monday, Sept. 22, 2025. Image by Matt O'Brien/AP.

AI water use

Today's AI facilities are sprawling, hunched, windowless warehouses, crammed with hundreds of thousands of Nvidia accelerators and servers, packed closely in server cabinets and racks to maximize latency and thus processing efficiency.

Before the 2020s, a standard server rack might consume about 5,000 watts. By 2025, individual AI server racks could be using 50,000 watts or more. All this power is for a reason: to do vastly more processing than traditional servers, and it's needed especially for AI videos, where, as video length doubles, processing demand quadruples.

All this computing throws off intense quantities of heat, which must be ejected from these super-compressed spaces to prevent overheating and fires. Air was often used to cool pre-AI data centers. But water and other liquids are much better conductors of heat, so liquids are becoming the more viable, cost-efficient way of whisking heat away from AI servers.

Which is why AI has such a ravenous thirst. With the world facing a [freshwater crisis](#), AI data centers may demand as much as 6.4 trillion liters ([1.7 trillion gallons](#)), or nearly 2.8 million Olympic swimming pools, annually by 2027 — 4-6 times Denmark's total yearly water consumption. The advent of AI “represents a fundamental shift in data center water consumption patterns,” Dashveenjit Kaur writes in [Cloud Computing](#).

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[Google said](#) 15% of its water consumption was in areas with “high water scarcity.”

However, Big Tech continues locating data centers in arid areas, with good reason. The facilities need to be in regions with low humidity to prevent the risk of metal corrosion. That's one reason the Querétaro, Mexico, data center hub provides a perfect location — that, along with its proximity to U.S. Internet data consumers.



Farmers struggle to keep farms going in Querétaro state, Mexico, which is periodically ravaged by climate change-intensified drought. The state is on its way to becoming Mexico's data center hub. Photo first published by [Agencia Quadratín](#) in 2023. Image courtesy of Marittza Navarro.

AI material use

AI infrastructure buildout involves [intense demands](#) for materials, including mega-miles of plumbing, driving [a surge in demand for metals such as copper](#) — a mined metal with [a notoriously bad environmental record](#).

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meet demand.

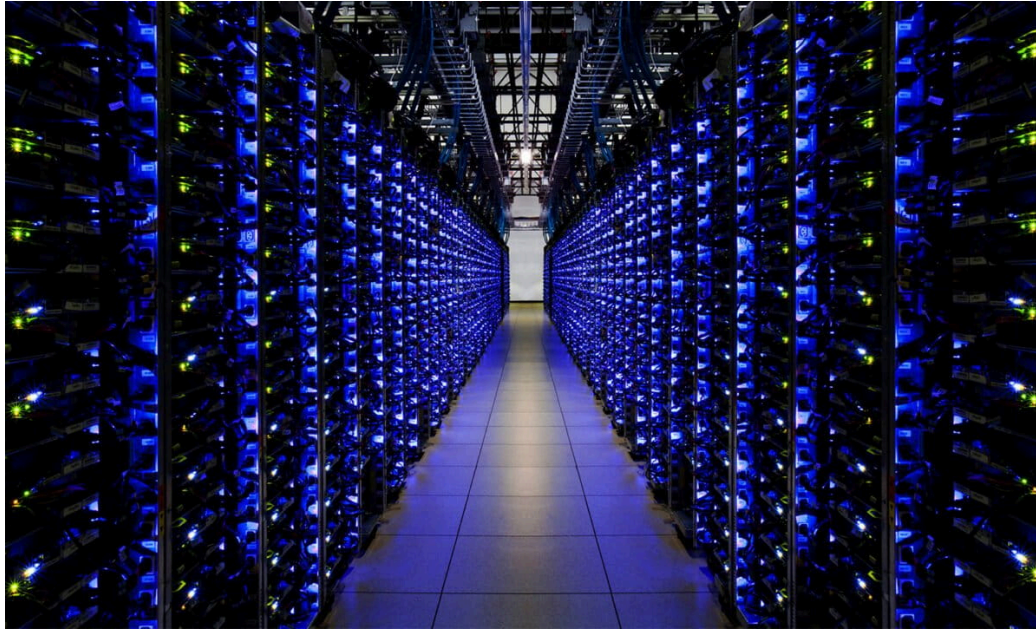
AI is also driving a [surge in e-waste](#), the fastest-growing — and among the most toxic — waste streams in the world. AI servers are expected to have useful lives, on average, of no more than a few years before becoming e-waste. Globally, less than 25% of all e-waste is collected and recycled properly, [according to the U.N.](#)

And because each AI computer chip contains more than a hundred microscopic layers — laced with heavy metals like lead, mercury, arsenic and hazardous chemicals like flame retardants — it isn't currently cost-feasible to recycle the chips when they wear out or go obsolete in [3-5 years](#). The industry has proposed solutions, but there is no global data center-specific data on waste recycling.

To keep up with unpredictable peak energy demands, many data centers are now installing dirty diesel backup generators, contributing to climate change and polluting local air and lungs. In addition, the water that cools AI computers must have bromine-containing compounds added to it to kill bacteria and algae, presenting a water pollution risk. These compounds can be [carcinogenic](#).

On top of public health concerns, electricity charges to ordinary consumers are surging, as data centers pass on operating costs to the public. [Forbes reports](#) that U.S. “households have seen their electricity bills rise 30% since 2021 ... At the center of these price hikes is the AI revolution.” The Global South can expect the same sorts of impacts as data centers pop up there.

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Data centers, like this Google center in Georgia, use huge amounts of energy and require regular hardware updates. Servers need constant cooling to protect data. Operations and energy consumption are largely opaque to the public. Image courtesy of Google.

The tropical AI data center buildout

The Big Tech industry is so powerful and profitable, governments in the Global North and South have made mostly weak efforts to regulate data center growth, with facilities often sited in regions without the cushioning wealth, infrastructure, legal mechanisms and resources to sustainably support them. Most governments embrace AI, because in a time of anemic economic growth, AI has become a supercharger of GDP.

Querétaro isn't the only tropical locale whose energy and water supply is threatened by this short-term emphasis on economics. The IT consultancy Gartner estimates [\\$475 billion](#) will be spent on data centers this year, up 42% over 2024. And even this expenditure may not be enough to keep up with global buildout. McKinsey [predicts](#) \$5.2 trillion in data center investment by 2030, with much of that to support AI computing facilities.

In the short-term, Latin America is well placed to meet data center needs, despite energy and water limitations. But [according to Callaway Climate Insights](#), AI energy demand “could cripple Latin America’s already weakened energy grid within the next 10 years.” Mexico, [Costa Rica](#) and Brazil are on the data

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Growth is soaring in Asia. Singapore, Malaysia, India and Indonesia have emerged as AI data center hub targets (though in September, Malaysia moved to [slow development](#) due to [strain on the nation's energy grid and water resources](#)). [Thailand and Vietnam](#) are also entering the data center race. AI data center construction in Africa is [quickenning](#) as well, especially in South Africa, Nigeria, Uganda, Kenya and Algeria.

According to [ABI Research](#), there will be 6,111 [public data centers](#) globally by the end of 2025, with 567 counting as “hyperscale” sites. That overall total number could shoot to 8,378 public data facilities by 2030. ABI notes, “The use of Artificial Intelligence (AI) is a key catalyst for data center expansion,” as large and mega-sized data centers increase from 28% of all facilities in 2025, to 43% by 2030.



This MDXi data center, located in Lekki city in Lagos state, Nigeria, is owned by MainOne, which is part of Equinix, an American multinational and a leader in the global data center industry. As of 2025, it operates 260 data centers in 33 countries across five continents. Image courtesy of datacenterlocations.

The rush to embrace nuclear power

Fearful of being slowed by energy shortages, Big Tech companies are turning to the once moribund nuclear power industry for AI power solutions.

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Rights in the Green Economy Coalition, tells Mongabay. "AI is insatiable and it seems that the only way to feed it fast and quick is to build additional nuclear reactors."

That raises regulatory concerns, since much AI-supporting nuclear development will likely not be done by government, but be in private hands. The [first privately owned facility](#) in the U.S. to enrich uranium will be built in Kentucky. Peter Thiel, one of the key architects of Big Tech, is an investor in this project. But hanging over nuclear power efforts is the enduring specter of radioactive accidents and waste.

Until recently, the risk of nuclear disasters, like 1979's [Three Mile Island accident](#), deterred investors. But Ren of UC Riverside tells Mongabay, "While no technology is entirely risk-free, nuclear safety has advanced significantly over the past few decades, making a recurrence of the Three Mile Island accident highly unlikely."

One improvement, according to proponents, would be to equip each major AI data center with a [modular nuclear reactor](#), said [to be safer](#). But, Edwin Lyman, a nuclear tech expert, [warns](#) such reactors have been insufficiently tested, with boasted benefits of tech progress potentially accompanied by hidden environmental and social costs. "Advanced' isn't always better," he [cautions](#). One [study](#), for example, found modular reactors will significantly increase nuclear waste, for which there is currently no safe disposal method.

Despite these concerns, the transition back to nuclear power, partly spawned by AI needs, has already begun in the United States. This year, the Pinyon Plain uranium mine in Arizona, not far from Grand Canyon National Park, was reopened, and uranium-laden trucks are rolling across Navajo Indigenous lands again.

There are more than 500 abandoned [uranium mines](#) in the region, which in 1979 endured the largest radioactive spill on U.S. soil when a dam burst at the Church Rock uranium mill, imperiling a vital water source to the Navajo Nation. The accident contaminated the Puerco River with [94 million gallons of radioactive waste](#).

The reopening of the Pinyon Plain mine has touched a nerve with the Navajo because of the troubled environmental legacy left by the spill, along with the health risks posed by other abandoned local nuclear waste dumps. Families still link ongoing health issues to the mine disaster — high rates of kidney disease, cancer and reproductive disorders.

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From 1944 to 1986, nearly 30 million tons of uranium ore were extracted from Navajo lands. Possible health impacts of the mining project include lung and bone cancer and impaired kidney function from drinking polluted water. Navajo medical interns have been working with the U.S. Environmental Protection Agency to assess continued contamination. Image from March 2016 courtesy of the U.S. EPA.

Navajo activist, writer and artist, Klee Benally, who died in 2023 at age 48, wrote about the impacts of uranium mining on his childhood in his memoir, *No Spiritual Surrender*. When his uncles, who worked the mine, arrived at his home, it was not a time for celebration, he explains:

We'd face the occasional scares when my dad's brothers would stop by in the evening. ... My Mom would scream at them to stay away due to the white dust on their clothes. I later learned this was uranium dust from their work at the nearby Canyon [now Pinyon Plain] mine.

In May 2025, U.S. President Donald Trump issued an [executive order](#) "to implement a program to enhance the global competitiveness of American nuclear companies ... to power and operate critical defense

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Protesters voice opposition to uranium mining at the Pinyon Plain Mine, Aug. 4, 2024. Despite Navajo Nation concerns, this mine, once called the Canyon Mine, is being reopened as the U.S. once again moves to develop nuclear energy, in part to supply the surge in AI data centers supported by the Trump administration. Image courtesy of Blake McCord via Grand Canyon Trust.

AI data colonialism?

One place already feeling the simultaneous pressures of data center growth and intensifying global warming is the drought-stricken [Silicon Valley](#) of California, where summer temperatures now regularly exceed 37.8° Celsius (100° Fahrenheit), and where AI data center campuses demand an ever-increasing share of dwindling water supplies.

In response, Silicon Valley appears to be reaching for a past solution — outsourcing as it did with [heavily polluting semiconductor production](#) in the 1970s. Back then, having turned the valley into the country's No. 1 toxic waste dump, Big Tech moved its semiconductor fabrication to nations with less restrictive environmental regulations, particularly in the Global South. Now, it is locating many AI data centers in the tropics.

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According to [many sociological studies](#), Europe for centuries exploited the Global South's people and resources as a necessary externality of capitalism — a source of cheap labor, land and materials, and a place to dump waste.

Four centuries ago, John Evelyn, the diarist, feared deforestation due to rising capitalism in his native England. According to Carolyn Merchant in her book, *The Death of Nature*, Evelyn recommended: “the removal of most iron mills to New England, lest they ‘ruin Old England.’ ... Conservation at home was thus to be purchased at the expense of frontier expansion abroad.”

Today, it's Big Tech that appears to be exporting environmental harm, not only to the Global South but also onto Indigenous lands. In Canada, the Sturgeon Lake Cree Nation says they first heard of an AI data center planned for their land on social media. “It seems like it was all worked on well before us, and then we're an afterthought,” Chief Sheldon Sunshine [says](#).

The tech industry continues courting Global North governments ([including the U.S.](#)) along with [Global South officials](#), urging them to recognize data centers as critical infrastructure that demands tax incentives and fast-tracking that bypasses climate and other environmental regulation.

Laís Martins, a reporter at *The Intercept Brasil*, an investigative journalism website, tells Mongabay “the Brazilian Environment Ministry has been completely sidelined from discussions” about the country's data center policy under President Luiz Inácio Lula da Silva. “More than 80 meetings were held in Brasília on the topic but the Environment Ministry was not present at even one,” she says.

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Sturgeon Lake Cree Nation Chief Sheldon Sunshine says their Indigenous group wasn't consulted before plans were announced to build the "world's largest" artificial intelligence data center within its traditional territory. He notes that, "Our people have traplines in this area; we rely on the water from the Smoky River; and it is one of the few areas accessible to exercise our way of life, which has been systemically eroded by unmitigated cumulative effects resulting from the provincial government's authorizations of industrial development in our territory." Image courtesy of *Alberta Native News*.

AI meets the limits to growth

Big Tech has achieved a marriage of sorts between data center development and some renewable energy advocates. Early on, a key argument in favor of renewable energy use by data centers was that the new facilities would spur the transition away from fossil fuels. So far, this transition hasn't happened — instead, there's mostly energy additions. Coal, oil, gas, nuclear, hydro, solar, wind — [all are being harnessed](#) to feed AI's hunger.

There are even examples of data center hubs deliberately established near renewable energy projects to consume energy before communities can tap into it. "The Northeast of Brazil is a big producer of renewable energy, mostly wind but also solar power," Martins tells Mongabay. "The problem is that, although there is considerable renewable energy generation, there is a distribution bottleneck."

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homes and traditional Brazilian businesses now flows to Internet demand. “It is [also] important to remember that ... clean, renewable energy plants are not free of impacts, and have already seriously impacted communities and biomes in the Northeast of Brazil,” Martins says — without those communities benefiting from those sources of power.

Big Tech continues gaining priority government treatment, locating data centers in regions with energy and water shortages, so as to tap into existing global data distribution networks. One example comes from the city of Caucaia, in northeast Brazil, bordering the Atlantic Ocean in Ceará state.

Even though close to the sea, Caucaia suffers from regular drought emergencies, but tech companies still decided to build there. The reason: Caucaia is strategically located near major international undersea data cables, making it easy to process the data requests of Global North customers.



The city of Caucaia, in Ceará state in northeast Brazil, has beautiful beaches. But it is not what's attracting tech companies, who plan to build a large data center here because it is strategically located near major international undersea data cables, making it easy to store and process data from customers in the Global North. Image by Elissonm via [Wikimedia Commons \(CC BY-SA 3.0\)](#).

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policy does not benefit [Brazil's] national tech sector, and it also does not advance Brazil's digital sovereignty agenda, which would reduce our dependence on Big Tech actors. We are handing over our natural resources — water, land and energy, and financial resources, in the form of tax breaks — to foreign tech companies. It repeats a colonial legacy of resource extractivism.”

Ironically, critics say, undersea internet data cables often [follow the same trade routes as the slave ships](#) that plied the oceans centuries earlier.

Indigenous organizations have begun asking how long this spiral of tech development and demand for resources can continue. “We really need to talk about what is an appropriate level of technological progress,” Bryan Bixcul, global coordinator at the SIRGE Coalition, tells Mongabay. And then say “stop” before the world's resources are all consumed.

Bixcul, a Maya Indigenous man and part of the Tz'utujil people of Guatemala, says he's heard lots about how AI will save the climate if only we move fast enough to embrace it. “We've seen this over and over again throughout history,” he tells Mongabay, “and we know that it's just the same extractive system.”



Bryan Bixcul belongs to the Tz'utujil Indigenous people, one of the 22 Maya ethnic groups that live in Guatemala. He is a member of the Indigenous Advisory Group to the Banks and Biodiversity Initiative, an organization that aims to hold banks accountable for their impacts on biodiversity and critical ecosystems. Bixcul is particularly interested in

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driven by demand for transition minerals like lithium, copper, cobalt, nickel and large-scale renewable energy projects, is increasingly encroaching on Indigenous peoples' lands without consent. This threatens not only the rights, livelihoods and cultures of Indigenous peoples but also the integrity of the ecosystems they have protected since time immemorial." Image courtesy of IISD.

Banner image: Producing an AI chip requires 10-15 times more energy than making a standard chip. As AI data centers spread globally they're putting increased pressure on local and regional energy grids. Image by analogicus via [Pixabay](#) (Public domain).

Citations:

Krall, L. M., Macfarlane, A. M., & Ewing, R. C. (2022). Nuclear waste from small modular reactors. *PNAS*. doi:[10.1073/pnas.2111833119](https://doi.org/10.1073/pnas.2111833119)

Al Kez, D., Foley, A. M., Hasan Wong, F. W., Dolfi, A., & Srinivasan, G. (2025). AI-driven cooling technologies for high-performance data centres: State-of-the-art review and future directions. *Sustainable Energy Technologies and Assessments*, 82, 104511. doi:[10.1016/j.seta.2025.104511](https://doi.org/10.1016/j.seta.2025.104511)

Hemphill, T. A. (2024). US AI data centers and deployment challenges for small modular reactors: Proposed regulatory policy recommendations. *Science and Public Policy*, 51(5), 999-1003. doi:[10.1093/scipol/scae040](https://doi.org/10.1093/scipol/scae040)

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