Data centers draining resources in water-stressed communities

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A single data center can consume up to 5 million gallons of drinking water a day, enough to supply thousands of households or farms.

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The rapid growth of the technology industry and the increasing reliance on cloud computing and artificial intelligence have led to a boom in the construction of data centers across the United States. Electric vehicles, wind and solar energy, and the smart grid are particularly reliant on data centers to optimize energy utilization. These facilities house thousands of servers that require constant cooling to prevent overheating and ensure optimal performance.

Unfortunately, many data centers rely on water-intensive cooling systems that consume millions of gallons of potable (drinking) water annually. A single data center can consume up to 5 million gallons of drinking water per day (https://www.washingtonpost.com/climate-environment/2023/04/25/data-centers-drought-water-use/), enough to supply thousands of households or farms.

The increasing use and training of AI models has further exacerbated the water consumption challenges faced by data centers.

Machine learning, particularly deep learning models, requires significant computational power, which generates a lot of heat. As a result, data centers housing these machine learning servers need even more cooling to maintain optimal performance and prevent overheating. Graphics processing units (https://arxiv.org/abs/2304.03271), which are commonly used to accelerate machine learning workloads, are known for their high energy consumption and heat generation.

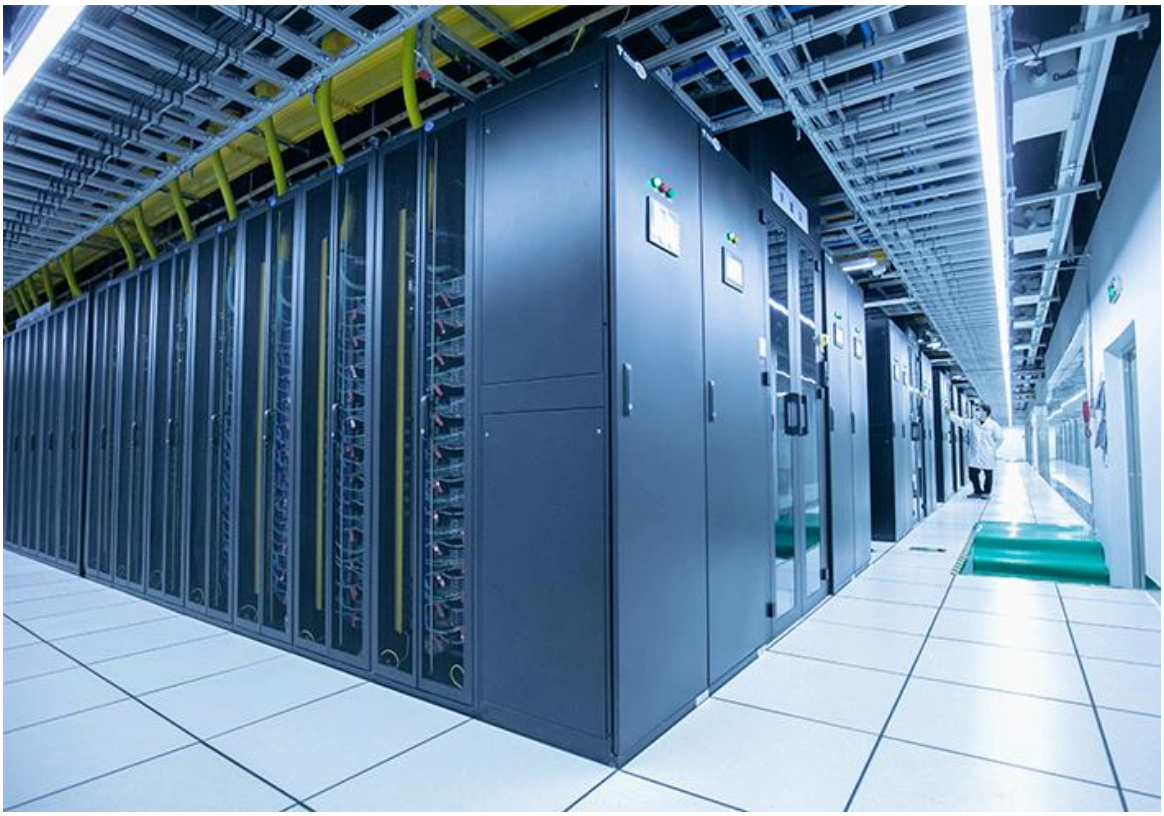
As the demand for machine learning applications grows across various industries, the need for data centers equipped to handle these workloads will continue to rise, putting additional pressure on local water resources. According to a report by McKinsey & Company (https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/investing-in-the-rising-data-center-economy), data center electricity consumption in the United States is expected to increase from 17 gigawatts in 2022 to 35 GW by 2030, a 100% increase.

Microsoft's 2022 Sustainability Report (https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RW15mgm)showed that its total water consumption increased 34% from fiscal year 2021 to fiscal year 2022. In 2022, Google's water consumption was 5.6 billion gallons (https://www.businessinsider.com/google-water-use-soaring-ai-make-it-worse-data-centers-2023-7) and projected to increase due to the generative AI revolution. Likewise, Meta's water withdrawal (https://sustainability.fb.com/wp-content/uploads/2023/07/Meta_2022_Volumetric_Water_Benefit_Report_2023.pdf) was approximately 1.29 billion gallons in 2022. However, the contractual price of the water used for each data center is not reported for any of the above-listed companies.

The drinking water used in data centers is often treated with chemicals to prevent corrosion and bacterial growth, rendering it unsuitable for human consumption or agricultural use. This means that not only are data centers consuming large quantities of drinking water, but they are also effectively removing it from the local water cycle.

Dry air reduces the risk of corrosion and electrical issues in the sensitive equipment in the data centers. The lack of humidity in water-stressed regions, such as the southwest United States, makes it an attractive location for data centers. This means that the regions in which it is "best" to locate a data center due to its arid environment has the highest marginal cost in terms of water consumption.

In the Phoenix area alone, there are more than 58 data centers (https://www.datacentermap.com/usa/arizona/phoenix/). If each data center uses 3 million gallons of water per day for cooling, that equates to more than 170 million gallons of drinking water used per day for cooling data centers. This massive consumption of drinking water for data center cooling puts a strain on the already fragile water supply and raises ethical questions about prioritizing the needs of tech giants over the basic needs of residents and agriculture.



The regulated nature of water pricing often creates a situation where tech companies, such as those operating data centers, pay the same amount for water regardless of their consumption levels. This is because water rates are often set by public authorities based on factors like the cost of water treatment, distribution, and infrastructure maintenance, rather than being determined by supply and demand in a competitive market.

As a result, tech companies may be able to negotiate favorable water rates or take advantage of pricing structures that do not fully reflect the marginal cost of their water consumption. This can lead to a lack of incentives for these companies to conserve water or invest in more efficient cooling technologies, as they may not face the full economic cost of their water use.

Companies are often able to negotiate better rates for water than local residents. In recent years, Google faced criticism for its plans to build a massive data center in Mesa, Arizona (https://www.bloomberg.com/news/features/2020-04-01/how-much-water-do-google-data-centers-use-billions-of-gallons?sref=7mwUMHq1&leadSource=uverify%20wall), after it was revealed that the company would pay a lower water rate than most residents. The deal, negotiated with the city, allowed Google to pay $6.08 per 1,000 gallons of water, while residents paid $10.80 per 1,000 gallons. The arrangement sparked outrage among some residents who felt that the tech giant was receiving preferential treatment at the expense of the community.

Data centers are not a renewable resource. The average lifespan of a data center is approximately 10-15 years and needs continuous maintenance just like a gas-powered vehicle. While the initial construction of a data center generates jobs, after its completion, the number of employees needed at the center drops by approximately 90% (https://www.uschamber.com/assets/archived/images/ctec_datacenterrpt_lowres.pdf).

Optimizing renewable power with AI and data centers at the expense of increasing water consumption is not a sustainable solution. Prioritizing one aspect of sustainability, such as reducing carbon emissions, while neglecting another crucial resource like water, creates an illusion of sustainability. In reality, this can lead to unsustainable practices that can have severe unintended consequences for individuals and farmers, especially in water-stressed regions.

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