NORTHSTAR
ASSET MANAGEMENT

Drinking From An Empty Cup

An Investor Toolkit for Addressing AI's Growing Water Demands

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"The world faces a growing water disaster. For the first time in human history, the hydrological (water) cycle is out of balance, undermining an equitable and sustainable future for all."

The OECD

Where we are TODAY

AI'S THIRSTY APPETITE

NorthStar Asset Management, Inc. ("NorthStar") is a socially responsible investment firm based in Boston, guided by our deeply held belief that the financial system is broken, people are suffering, and investors can use their resources to create social change.

Beginning in the early 1970's the United Nations ("UN") General Assembly began adopting multiple resolutions to highlight the need for access to safe water and sanitation. In early 2008, NorthStar became aware that the UN was in the process of considering access to safe, clean, accessible and affordable water as a human rights issue. Understanding the critical intersection between access to safe, clean, accessible, affordable water and human rights NorthStar decided to actively engage with companies on responsible water. We filed a shareholder proposal urging PepsiCo to adopt a Human Right to Water policy. In a landmark move, PepsiCo became the first publicly traded multinational corporation to adopt such a policy in May 2009. This set a powerful precedent, and in 2010, the UN General Assembly and the Human Rights Council formally recognized the Human Right to Water, establishing it as binding international law. In the years that followed, many companies worldwide adopted similar human right to water policies, modeled after PepsiCo's approach. Since then, the world's water challenges have only intensified, exacerbated by climate change and the rapid expansion of artificial intelligence ("AI") and tech infrastructure. Freshwater scarcity is now one of the most critical global issues. The Organisation for Economic Co-operation and Development ("OECD") warns:

> "The world faces a growing water disaster. For the first time in human history, the hydrological (water) cycle is out of balance, undermining an equitable and sustainable future for all."[1]

Additionally, since 2015, the World Economic Forum has ranked the water crisis among top five global risks annually. To put it in perspective, only 1% of the earth's water is available for human consumption, yet one in ten people struggle to access it.[2]

As these challenges grow, the water crisis no longer concerns only food and beverage or consumer goods companies, but all companies that rely on earth's most precious resource. The responsibility for addressing long-term societal impacts is shifting from government to companies themselves. While public policy remains vital, it often struggles to keep pace with rapid innovation, emerging as a reactive force rather than a proactive one. We at NorthStar, believe that water scarcity and resource concerns are not just government concerns, but issues that must be addressed by the very corporations vying for water resources within the communities in which they operate and serve.

In recent years, we've seen an unprecedented boom in artificial intelligence as it becomes embedded in nearly every aspect of our lives. Generative AI (gen AI) and its ability to produce human-like content across various media is fundamentally reshaping how we perceive, interact with, and leverage information across numerous domains. Despite being hailed as a silver bullet for tackling some of society's toughest challenges—from accelerating drug development to improving natural disaster prediction—artificial intelligence carries a significant hidden cost: its extensive water consumption. Generating sophisticated responses requires greater computational power which in turn intensifies the amount of energy used to run a prompt and deliver an output. Additionally, due to the intense processing involved, significant heat is produced, which requires effective cooling to protect hardware performance and ensure operational continuity in data centers. This heightened energy consumption directly translates to increased water usage, as the data centers powering these AI models rely on vast amounts of water for essential cooling, making AI development an increasingly water-intensive process. As AI adoption accelerates, water demands are projected to skyrocket, with estimates suggesting that by 2027, AI-related water withdrawals could reach 4.2–6.6 billion cubic meters annually—equivalent to California's total annual water use.[3]

Data centers are the tenth largest consumer of water in the US, consuming over 1 billion liters of water daily for cooling and energy generation which is enough to meet the daily water needs of 3.3 million people, according to Bluefield Research. Training AI models is especially water-intensive — Microsoft used approximately 700,000 liters of water to train GPT-3 alone.[3] Even seemingly small AI tasks add up — generating a 100-word AI-written email can use as much water as a 16.9-ounce bottle. Beyond cooling the data centers, water is also used in off-site electricity generation. For example, Meta reported that in 2023, approximately 55,475 megaliters of water were embedded in the electricity it purchased to power its data centers. This indirect water consumption underscores how AI's water footprint extends beyond cooling data centers, but also its use in the energy infrastructure that supports it.

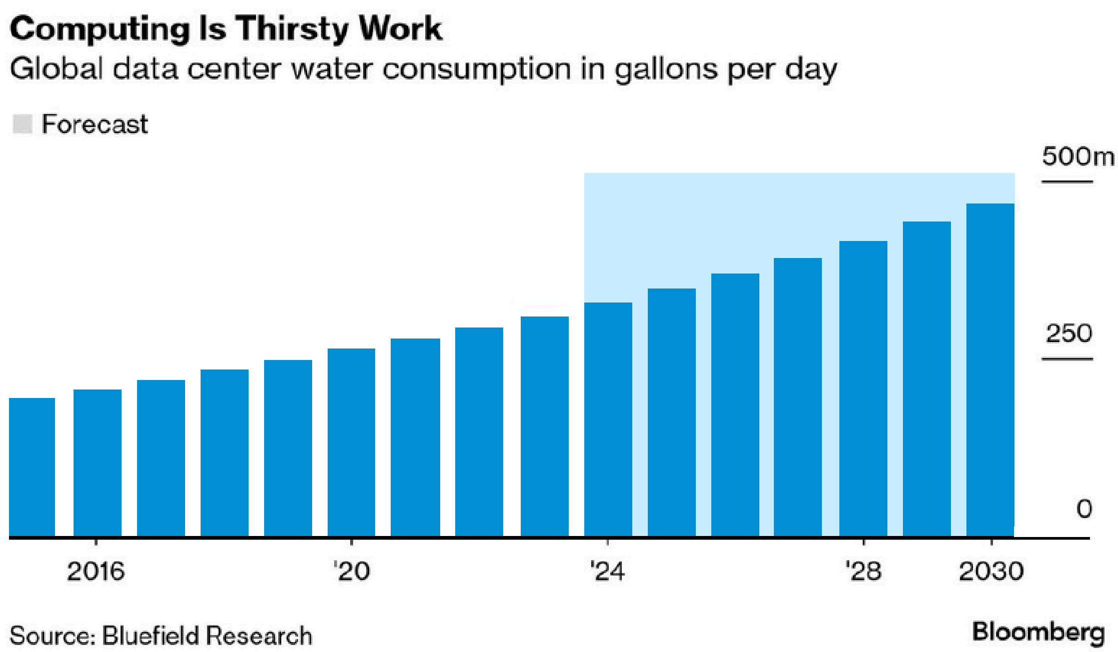
With 20% of U.S. data centers located in drought-prone regions, the rapid expansion of AI is exacerbating local water shortages in already vulnerable communities.[4] This raises the importance of engaging with tech companies on their responsible water use to safeguard community water supplies and assess water risk impacts in response to AI demand.

Water Based Cooling

Requiring significant computing power to process each query causes the AI powered data center servers to heat up. The larger and more complex the AI model, the more computational energy is required, resulting in even more heat production. To prevent overheating, the servers must be cooled down. Not all data centers operate equally – the cooling technology applied to a data center plays an integral role in its energy and water use. Despite the variety of cooling systems available, many tech companies use water-based or what is known as water evaporative cooling as it is less carbon-intensive relative to air-based cooling. Water evaporative cooling works by running water through cooling towers, where it evaporates and absorbs heat, effectively lowering the temperature of the servers. According to researchers, "ChatGPT needs to 'drink' a water bottle's worth of fresh water for every 20 to 50 questions you ask."[3]

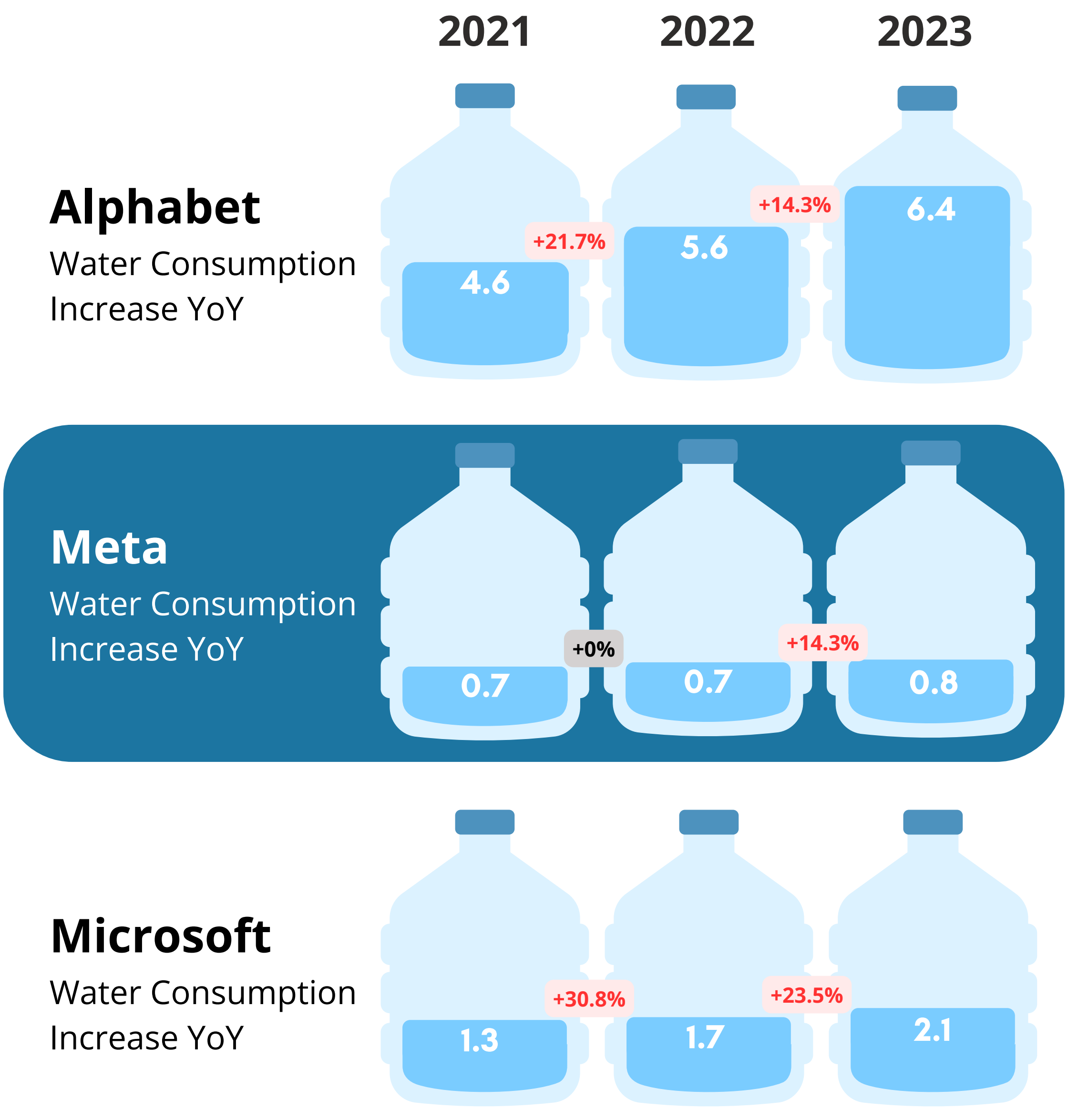
Considering that as of February 2025, ChatGPT has surpassed 400 million weekly active users, ChatGPT is "drinking" over 60 million bottles of water a day.[5]

Additionally, these data centers require potable (drinking) water because the cooling towers need high-quality, impurity-free water to avoid contaminating and corroding the sensitive equipment. Impurities such as minerals, metals, or microbial blooms can build up over time and cause damage to the cooling system and other vital components, leading to system failure or reduced efficiency. Potable water is carefully filtered and treated to ensure it's free of contaminants, making it ideal for maintaining the integrity of the cooling systems. The amount of water used varies by location and depends on outdoor temperatures. Some data centers adopt a "once-through" cooling system while others recirculate formerly used, purified water multiple times. However, multiple re-circulations will raise the conductivity of the water and may risk scale formation; thus, new water will have to be introduced.[6]



Exacerbating Community Supplies

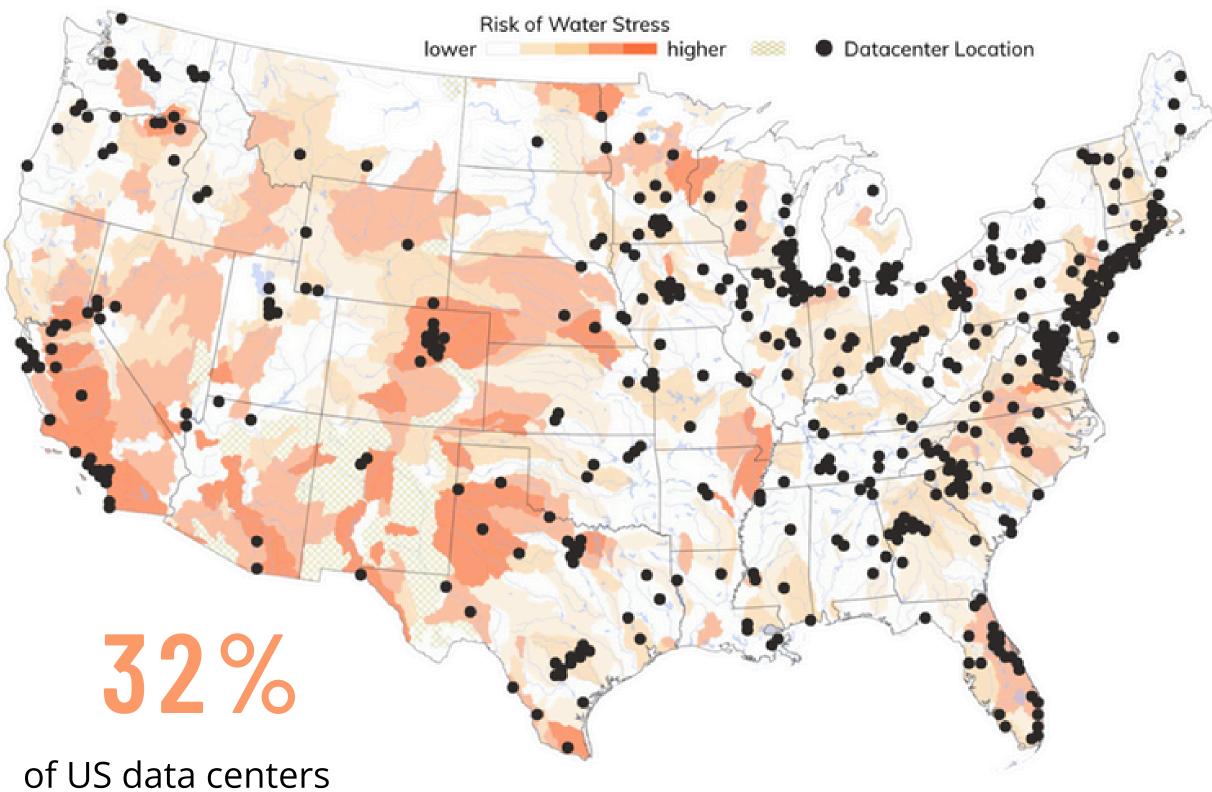
Freshwater scarcity is worsening daily with demand expected to exceed supply by 40% by 2030 according to the UN. Approximately 60% of the world's aquifers are beyond their tipping point of irreversible damage due to the rising sea levels—leading to long term freshwater shortages. As sea levels rise, saltwater seeps into freshwater aquifers which causes the water to be unsuitable for human consumption and agriculture use. As a result, risk of water scarcity and water stress are now becoming material risks. Annually, more areas are transitioning into deserts with land about the size of Poland.[7] Data centers are amongst the industries with the largest water usage and will continue to if changes aren't made as demand for generative AI and the transition to the cloud will further accelerate data center demand. It was found that "Google, Microsoft, and Meta Platforms used more than two billion cubic meters of fresh water to cool servers and produce electricity last year, more than twice Denmark's annual use."[8]



*All metrics are in billions of gallons

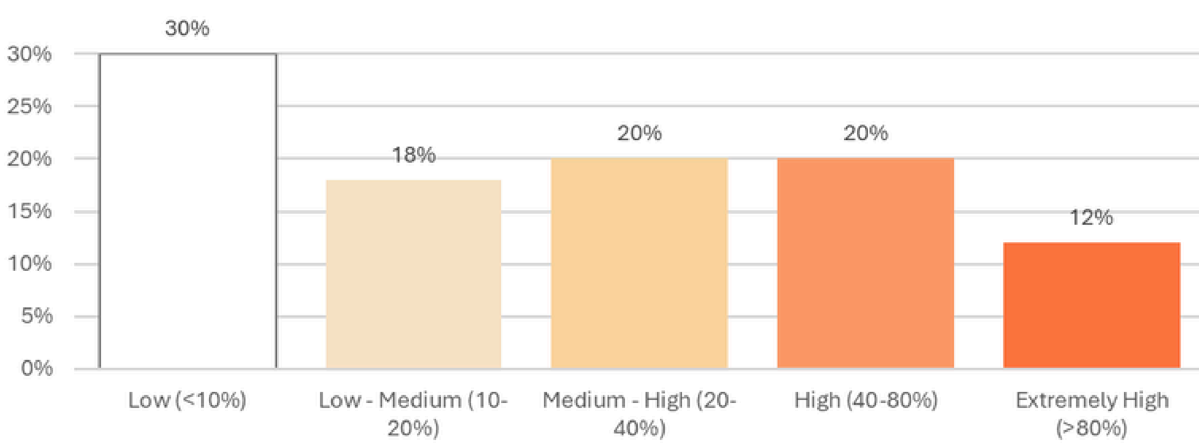
As data centers require potable water for cooling, they draw from the same drinking water supply as local communities—many of which are already experiencing active drought and water stress. It may seem ironic that these data centers, which require vast amounts of water for cooling, continue to be built in regions already struggling with water scarcity. These arid regions are attractive to data centers due to their low-cost water access and dry climates, which help protect computer systems from humidity-related damage. However, this demand puts tech companies in direct competition with local municipalities and agriculture, further straining limited water resources.

WRI Baseline Water Stress of US Data Centers



32%

of US data centers are located in high to extremely high water stress basin regions



Data center concentrations in the USA (ex. Alaska) mapped against regions of water stress

Sources: Washington Post, DataCentreMap, WRI and Planet Tracker

The stark reality of water insecurity was made painfully clear in September 2017 when Puerto Rico was hit by the strongest hurricane in almost a century, Hurricane Maria, just two weeks after Hurricane Irma. The devastation was staggering—over 3,000 lives lost, tens of thousands displaced, and 1 million people left without running water. At the height of the crisis, 95% of the island lacked access to drinking water, and 80% of the population—3 million people—were without power for nine months.[9] Yet amid this humanitarian disaster, Puerto Rico's data centers remained fully operational, with uninterrupted access to electricity and water. According to Stephen Gonzalez Monserrate, a postdoctoral researcher at the Fixing Futures Research Training Group at Goethe University, "This is not a bug. This is a feature of data center design. Data centers are designed to be the most resilient fortresses... even a hurricane of the magnitude of Maria was not able to take them down. This is really political. We have to think about the ways we are prioritizing computers over human beings. In Puerto Rico, while all these people were suffering, this data center was running.

It's a question that we have to ask ourselves: Where are our priorities as a civilization? We appear to be prioritizing computational needs over human rights."

In Dalles, Oregon, Alphabet used up 29% of the city's total water consumption in 2021—before ChatGPT.[10] These data centers in Dalles are likely being used for cloud computing which is much less demanding than AI workloads. Dalles, although located along the Columbia River, is in a dry region and amid a multiyear drought. Alphabet is supposedly planning to establish two more data centers along the river. John DeVoe, executive director of the nonprofit advocacy group WaterWatch, commented that "[i]f the data center water use doubles or triples over the next decade, it's going to have serious effects on fish and wildlife on source water streams, and it's potentially going to have serious effects for other water users in the area of The Dalles." Alphabet's water use in The Dalles was already up threefold from 2017 to 2021.

On a consolidated basis, globally, Alphabet's water withdrawal has grown 22.5%, 10.2%, 10.7%, 20.7%, and 15.6% respectively, from 2018 to 2023.[11] This sums to a total of 7.7 billion gallons of water consumed in 2023, equivalent to irrigating approximately 41 golf courses in the southwest of the U.S. The company claims to use non-potable water when possible, however, of the 29 data center cities listed in the 2024 Environment Report, only three used a mixture of potable and non-potable water while the other 26 cities highlighted are solely reliant on potable water.[12]

Tensions between tech companies and data center host cities continue to grow. In 2023, Alphabet faced backlash in Uruguay for planning a data center that would consume 7.6 million liters of water daily—the equivalent of 55,000 people's daily use—all while the country endured its worst drought in 74 years with the capital city of Montevideo declaring a state of emergency due to water scarcity issues.[13] Following public protests, Alphabet revised project plans to reduce the scale and transition to air-based cooling.

Footprint Tradeoff

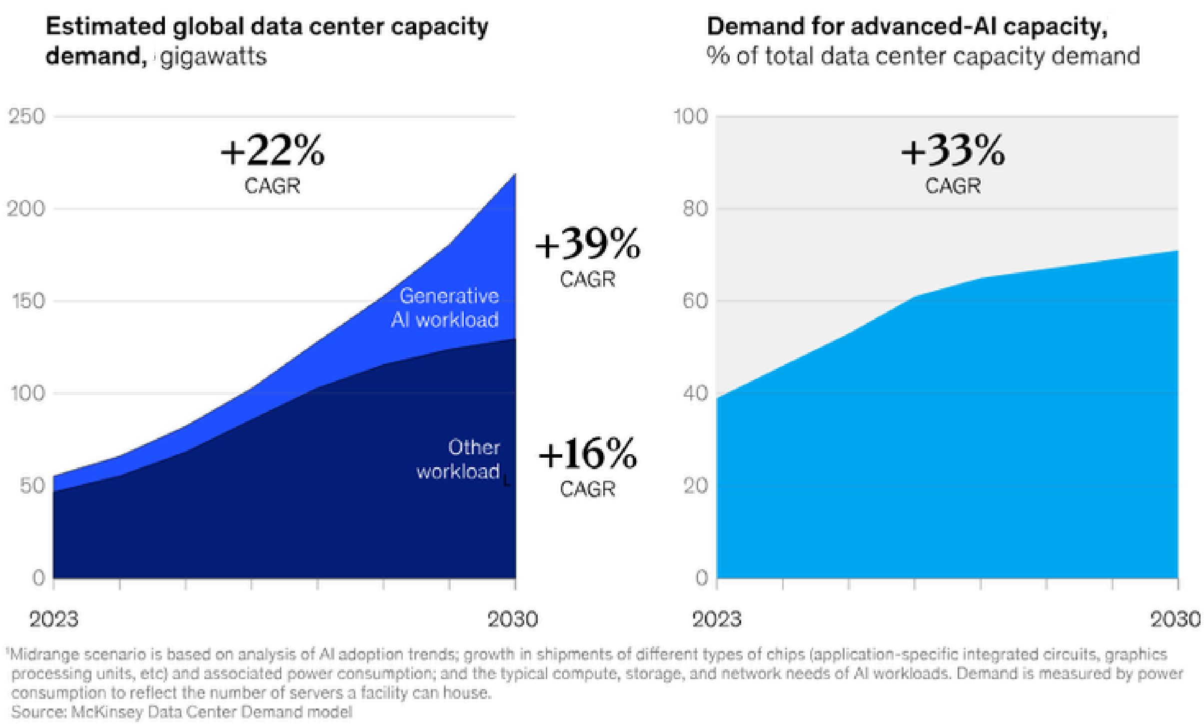
While public scrutiny has largely focused on AI's heavy energy use, large data center operators known as "hyperscalers" have tried to mitigate the high carbon footprints of AI models by switching to clean energy sources. However, these renewable energy offerings are often located in water-stressed regions. Data centers require both seismically stable land and protection from natural disasters, making certain areas more attractive for their infrastructure. This has led to a disproportionate concentration of hyperscalers in the Southwest and Midwest regions of the U.S. Iowa for example, has become a hub for tech companies due to its affordable land, low electricity rates, and leadership in renewable energy generation. However, Iowa is also experiencing one of its worst droughts in decades, with over 60% of the state in drought.[14] In 2020, NOAA ranked Iowa as one of the top three states most vulnerable to drought. The period of drought experienced from 2020 to 2024 was the longest period of drought in Iowa since the 1954-1959 drought.[15] According to the Iowa

Environmental Council, Des Moines Waterworks issued a recommendation for people to limit water use and use bottled water for drinking during a period of drought in 2024.[16] The Jordan Aquifer is the main underground water source for the state of Iowa and it is increasingly under threat. Deeper wells are being drilled to reach the available water, as the aquifer is not refilling at the rate it is being drained. This means outside water needs to be deliberately pumped back into the aquifer so it does not run dry.[17] According to Kerri Johannsen, Senior Director of Policy and Programs at the Iowa Environmental Council, “Concern is growing among experts in Iowa about the state of our aquifers and increasing variability of surface water flows. Our economy is rooted in agriculture, another major water user, and we see increasing competition for this precious resource.”

Thus, as tech companies flock to the region, they compete for already scarce water resources, putting additional pressure on cities like Altoona and Des Moines, where water supplies are stretched thin. In Altoona, one data center alone consumes the equivalent of a fifth of the city’s total water supply.[14] While pursuing carbon reduction goals, these companies are making a hidden tradeoff. By using water-based cooling systems, they improve their Power Usage Effectiveness (PUE)—which measures data center energy efficiency—yet worsen their Water Usage Effectiveness (WUE). As a result, companies are lowering their carbon footprint at the expense of deepening their water footprint — essentially solving one environmental problem by creating another.

AI’s Accelerating Growth

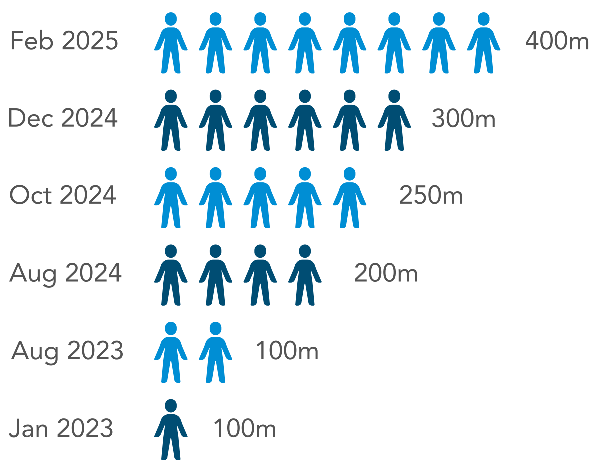
The AI revolution isn’t slowing down. Gartner predicts 90% of companies will adopt generative AI by the end of 2025.[18] Throughout 2023 and 2024, the hyperscalers, have been pouring cash towards capital expenditures to build out their technical infrastructure of servers and data centers; Microsoft, Alphabet, Amazon, and Meta are now forecasting AI spending to exceed $300b in 2025 alone.[19] McKinsey estimates that global data center capacity demand at the midrange scenario will grow at an annual rate of 22% from 2023 to 2030, with data centers able to accommodate gen AI workloads growing at 39% CAGR.[20]



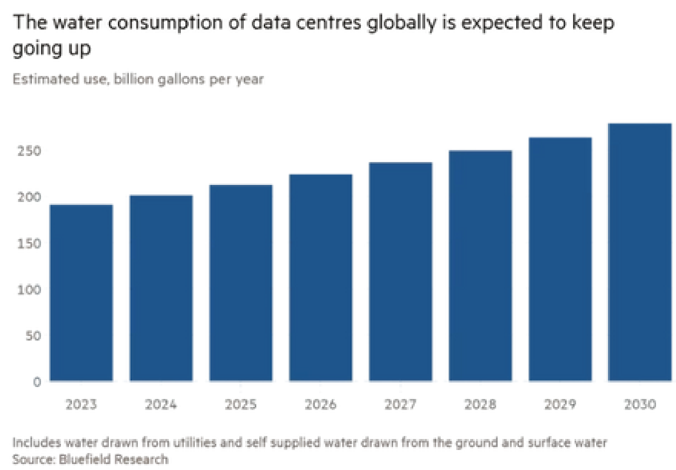
Source: McKinsey & Company

At the user level, ChatGPT's weekly active user count skyrocketed from 50 million in January 2023 to 400 million as of February 2025.[5]

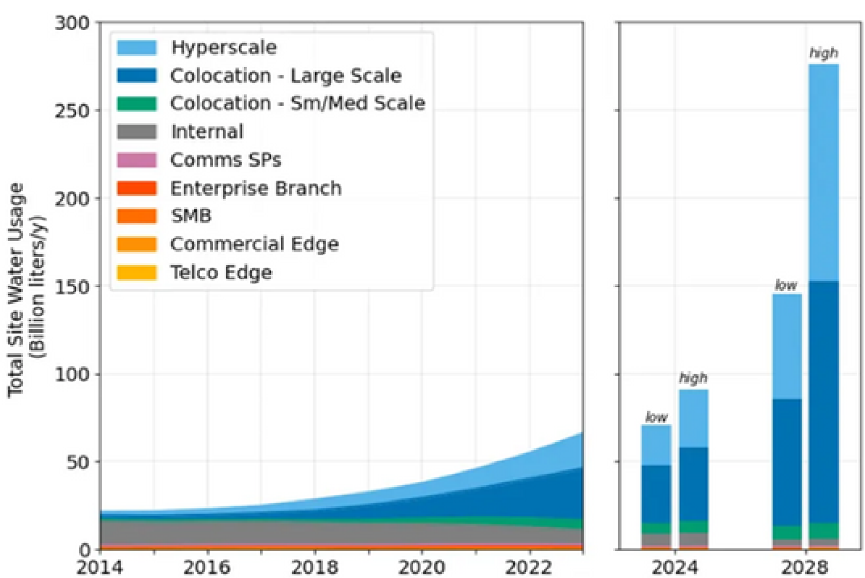
As demand is severely outpacing supply of data centers to support this AI growth, many countries are actively investing in expanding their AI infrastructure. Considered the modern-day arms race, the Trump administration recently announced Stargate, a joint venture between OpenAI, SoftBank, Oracle, and MGX to expand America's AI infrastructure and secure US leadership over China in AI capabilities.[21] The venture plans to invest up to $500 billion in AI infrastructure in the US by 2029. While the EU launched InvestAI, a public-private partnership to mobilize €200b towards AI infrastructure investment.[22]



ChatGPT's Weekly Active Users
Source: Demand Sage



Source: Financial Times



The U.S. data center water consumption in 2028, almost entirely driven by AI, will exceed 2-4x the 2023 level

Source: 2024 United States Data Center Energy Usage Report, Shaolei Ren

The New Wave of Innovations from Silicon Valley

There are several solutions hyperscalers Microsoft and Alphabet are currently pursuing to address the water crisis. Both companies have committed to being net water positive by 2030 which Alphabet described as replenishing 120% of the freshwater volume the company consumes across its offices and data centers as well as restoring and improving the water quality and ecosystem health in the communities it operates in.[11] Microsoft on the other hand describes this pledge as reducing water consumption across operations, replenishing more water than used, providing access to water and sanitation services, and engaging in water policy.[23] Both companies are implementing more sustainable and efficient practices within its offices and data centers by harvesting rainwater as well as reusing and recycling water for grey and black water use. Alphabet and Microsoft also have water treatment facilities at some of their sites to treat grey and black water for reuse.

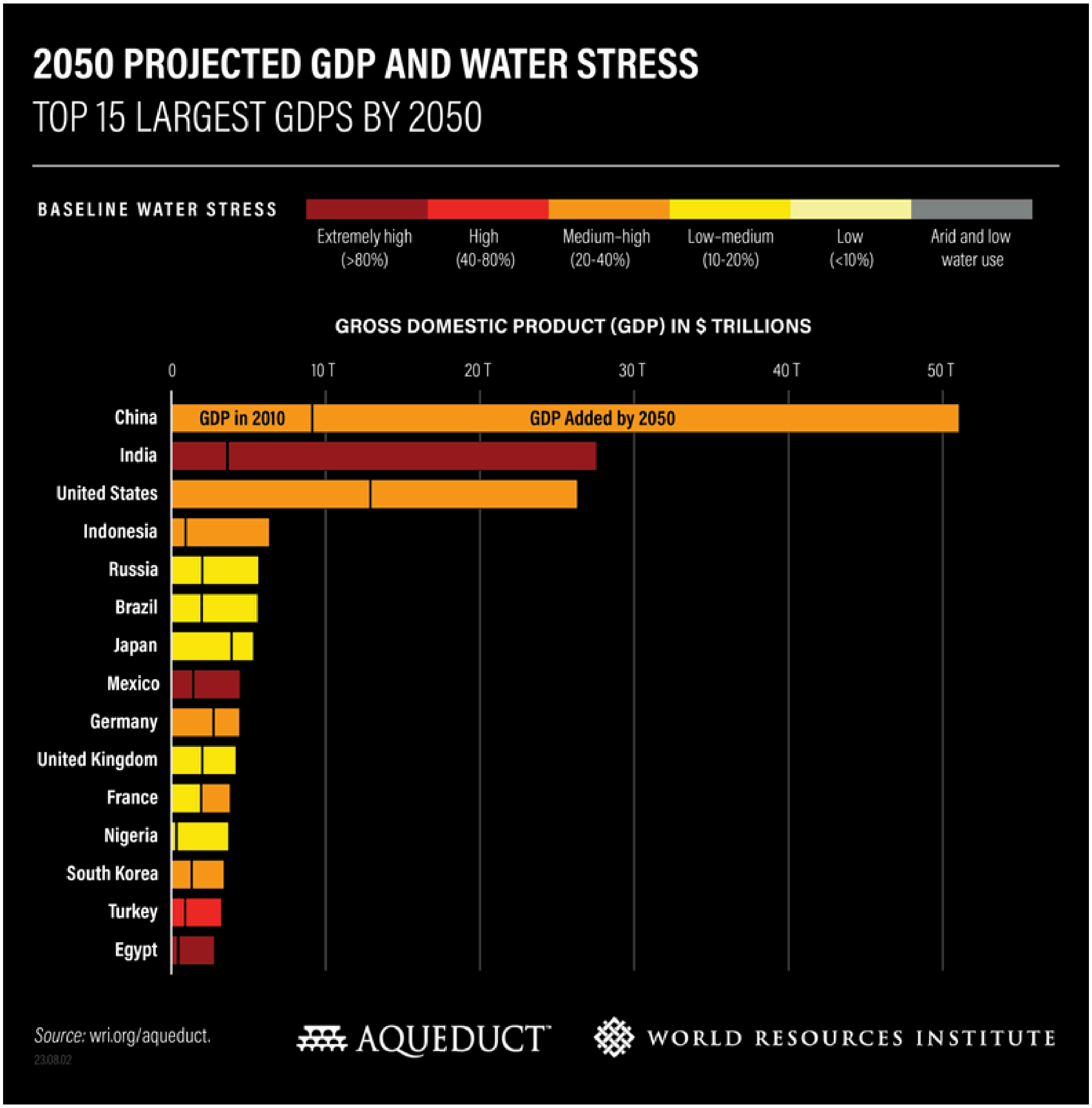
Microsoft has also dabbled in some innovative projects to reduce its water footprint. In the Spring of 2018, a data center was deployed in Scotland's Orkney Islands. Titled Project Natick, Microsoft placed a sealed container 117 feet into the ocean and monitored it for two years. The container was reeled up in 2020 and demonstrated that, "underwater data centers are feasible, logistic, environmentally friendly, and economical." In fact, underwater data centers prolonged server life as on-land data centers are negatively impacted by "corrosion from oxygen, humidity, temperature fluctuations, [as well as] bumps and jostles from people who replace broken components."[24] Despite the positive findings, no updates were provided by Microsoft if this would be mass-deployed. Microsoft also became the first cloud provider to implement two-phased liquid immersion cooling in a deployment environment in 2021. This process utilizes thermally conductive liquid instead of water to cool the servers. Alphabet's AI subsidiary, DeepMind, is testing spatiotemporal diversity of water efficiency as it offloads AI training to when the grid is least energy intensive.[25] This approach attempts to tackle the demand-side portion of the supply-demand energy imbalance by scheduling AI model training to a later time period or from a different location to reduce the water footprint.[11]

However, these current practices are not enough to address the water scarcity issue. Alphabet shared in its 2023 Environmental Report that "water-cooled data centers use about 10% less energy and emit roughly 10% less carbon emissions than [its] air-cooled data centers."[11] This shows that the large cloud providers are not thinking about water as a resource worth protecting. And as promising as the new innovations sound, it is not being deployed.

Risks of Not Caring

Dependent on water as a critical resource in their operations and growth, the materiality of water to tech players and their investors cannot be overstated. A failure to manage water use responsibly particularly regarding community impacts or adequately assessing water-related risks can result in severe consequences for these companies including operational disruptions, regulatory challenges, reputational damage, and financial losses.

Water scarcity is now a material risk that threatens global economic growth. According to the World Resources Institute (WRI), "31% of global GDP—a whopping $70 trillion—will be exposed to high water stress by 2050, up from $15 trillion (24% of global GDP) in 2010." The WRI projected water stress levels of the top 15 largest economies in 2050, with China, India, and the United States facing medium to extremely high-water stress. Additionally, WRI forecasts that water shortages could lead to GDP losses of 7-12% in India, China, and Central Asia, while much of Africa could see GDP declines of up to 6% by 2050. These projections underscore the urgent need for sustainable water management policies to mitigate economic risks.[26]



The CDP estimates that $15.5 billion assets are already at risk due to community opposition and regulatory changes related to water stress. Given these mounting risks, investors are increasingly demanding transparency and disclosure from companies regarding their water consumption, risk mitigation strategies, and long-term sustainability plans.

As transnational corporations, these tech companies are also expected to adhere to international human rights norms, including the UN's recognition of safe drinking water as a fundamental human right. Operating data centers in regions facing high or extremely high-water stress, these companies are at risk of over-consuming and depleting community water. Such actions would violate the UN-defined human right to water General Comment 15, where everyone has the right to safe, sufficient, acceptable, physically accessible and affordable water for personal and domestic use.[27] Several countries with constitutional provisions protecting the human right to water have already taken legal action against companies including revoking their social license to operate. In 2003, PepsiCo had its water-use license revoked in Pudussery, India due to accusations that PepsiCo bottling plants were over-consuming and depleting community groundwater.[28] PepsiCo had been drawing significant amounts of groundwater in a drought-stricken region, leading to severe water shortages for local farmers and residents. Additionally, the plant was accused of polluting local water sources with toxic sludge. Public backlash grew, leading the local government to revoke PepsiCo's water extraction license, effectively shutting down the facility. This case became a landmark example of corporate water mismanagement leading to regulatory action, highlighting the risks companies face when failing to address local water concerns. Tech companies operating in water-stressed regions could face similar regulatory pressure and operational disruptions if they do not implement sustainable water management practices that account for community water needs.

Tech companies are already facing community backlash. After 3 years of backlash in Uruguay, Alphabet scaled back the project and switched to air-based cooling and was finally able to start construction.[29] In other locations, Alphabet has faced delays and permits being denied due to water supply concerns. Such community disputes can result in project delays, legal challenges, and potential restrictions on water usage.

Simply put, by operating in already water stressed regions, data centers face threats to their water supply not only from drought but also from direct competition with municipalities and agriculture for limited resources. As these risks escalate, it is imperative for tech companies to adopt responsible water management practices that account for both the impact of water risks on local communities and the potential business consequences of water scarcity. Ensuring long-term, sustainable water stewardship requires proactive engagement with the communities in which they operate. Water is inherently local, and addressing these challenges demands site-specific strategies that balance corporate needs with community resilience.

The growing water crisis in the United States is likely to prompt some companies to relocate their data centers to other countries with more abundant water resources. However, this practice has raised concerns among researchers, who are labeling it "data colonialism." In this context, U.S. companies are seen as exploiting the eagerness of global governments to boost their economies by accepting exploitative terms without conducting proper due diligence. This underscores the need for greater transparency, disclosure, and the implementation of responsible water stewardship practices.

Disclosure Hurdles

There is a severe underreporting of water metrics and actual consumption across the tech sector. A review of sustainability reports reveals a stark disparity between carbon and water disclosures. While carbon emissions receive detailed, standardized reporting—often broken down across Scope 1, 2, and 3 emissions—water-related metrics are typically limited to just one to three vague figures. This imbalance obscures the growing water risks associated with AI development and highlights the need to improve water reporting to the same level of rigor and accountability as carbon.

Moreover, water is not disclosed in an equivalent Scope 1, 2, and 3 frameworks. Many companies underreport their true water consumption by excluding water embedded in electricity generation and water used in leased third-party data centers. As a result, a company's full water footprint remains unclear—hampering investors' ability to assess water-related risks and opportunities accurately.

When companies choose not to disclose key metrics related to their water use, it erodes investor trust. Transparency is essential for informed decision-making and for driving systemic change. In today's increasingly deregulatory landscape, where policy often falls short, corporate disclosure plays an even more critical role in enabling public and investor oversight. Microsoft, for example, has gone to great lengths to keep its data center water usage private, resulting in costly legal battles. In Goodyear, Arizona, the company has been notably opaque, even redacting specific water consumption figures from city records by claiming the information is "proprietary." Meanwhile, Amazon Web Services (AWS), the world's largest cloud provider, does not disclose water use from its global network of data centers, despite the massive volumes required for cooling. This lack of transparency raises serious concerns about accountability in an industry with a rapidly growing water footprint.[30]

Furthermore, water is a local problem, while carbon is a global problem. Water supply impacts in one region directly impacts the local communities, while carbon emissions impact climate change globally regardless of where the emissions originated. Therefore, water related disclosure metrics should be framed within the local community context. According to Riley Egger, Land, Water, & Wildlife Program Director at The Coastal Conservation League in South Carolina, "We value protecting water resources and being able to make fully formed decisions about how to manage the state's groundwater and surface water resources. Transparency is essential. Without proper forecasting, planning, and community engagement, resource-intensive industries, like data centers, can have broad implications for both the environment and communities."

It must become common practice to include water consumption in environmental reports as more regions become subject to water stress. Companies must explicitly break out water usage by location as well as clearly state where the data centers are located. Information on location will provide insights into the water stress status of the region the company is operating in. Meta offers a more transparent example—reporting embedded water consumption from purchased electricity and third-party data centers, including metrics on operations located in high water-stress regions.

Shared Resource = Shared Responsibility

Addressing the water crisis requires collective action —no single company or individual can solve it alone. Tech companies, investors, policymakers, and communities must work together to ensure sustainable water use and long-term resilience. Investors, in particular, play a crucial role by pushing for greater transparency, accountability, and water stewardship across the industry. As AI's water demand accelerates, investors must engage with tech companies in their portfolios to promote responsible water use and protect community water supplies.

Beyond hyperscalers, there are opportunities to engage companies across the AI value chain. For example, colocators—companies that rent space in colocation data centers rather than operating their own facilities—often assume they have little control over water-related impacts since they do not directly manage data centers. However, they can play a crucial role by demanding greater transparency on water usage from their third-party providers. By pushing for increased disclosure, colocators can help establish water reporting as an industry standard, driving greater accountability.

Contrary to popular belief, colocators tend to consume more water per unit of computing power than hyperscalers. This is because colocation facilities serve multiple tenants with varying efficiency levels, while hyperscalers optimize their data centers for maximum efficiency. Hyperscale data centers can invest in advanced cooling technologies and water management systems tailored to their needs, while also rapidly deploying the latest energy-efficient server hardware. In contrast, colocation centers face constraints in adopting cutting-edge cooling solutions due to the diverse requirements of their tenants, many of whom operate on different upgrade cycles and may use older, less efficient servers. As a result, colocation facilities often have higher water consumption per unit of computing power. While advancements in cooling technologies and efficiency improvements continue, the rapid expansion of AI-driven computing suggests that overall water consumption in data centers will rise despite these gains. This underscores the urgency for colocators to acknowledge their role in water stewardship and take proactive steps to mitigate water-related risks.

WATER STEWARDSHIP BEST PRACTICES

01

Adopt a water positive goal, ensuring that more water is replenished than is consumed. Water is a highly localized, shared resource, underscoring the need for replenishment projects to be implemented where water is extracted. Companies should prioritize investments in regions facing high water stress and where their operations have significant water consumption.

02

Adopt a Human Right to Water policy that adheres to the UN's declaration in General Comment 15 which describes that "the human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water."A company can thus "ensur[e] sustainable access to water resources" through a comprehensive company policy on the human right to water, using General Comment 15 as a sound and appropriate model. In contrast to water risk mitigation plans, adopting a formal Human Right to Water policy centers water related risks to people not just impact to the business. It commits the company to proactively engage with local communities in which they operate.

03

Develop and execute a comprehensive water stewardship strategy to guide sustainable water management across operations.

04

Adopt third party water stewardship standards such as CDP Water. Submit data to CDP Water Survey to enhance transparency and accountability as well as aiding in industry benchmarking.

05

Set and publicly disclose water reduction targets with clear, time bound goals and prioritizing high water risk water basins.

06

Utilize WRI Aqueduct Tool to identify where operations contribute to water stress and prioritize mitigation efforts.

WATER STEWARDSHIP BEST PRACTICES

07 Disclose water risk assessment tools used and frequency of assessments.

08 Operates under a water risk framework or conduct regular water risk assessments to proactively address vulnerabilities.

09 Routinely engage with third-party data center providers to assess water-related risks and their impact to local communities, while advocating for efficient water management practices. In addition, encourage third-party data centers to increase disclosure of water-related metrics and report to the CDP Water Survey.

10 Water efficient operations: Utilize zero or low-water cooling technologies, such as air-based cooling, closed-loop systems, or reclaimed/recycled water, as well as implementing water efficiency improvements where possible. Conduct routine water monitoring of water intensive operations.

11 Signatory to water conservation groups such as CEO Water Mandate, Water Resilience Coalition (WRC), Alliance for Water Stewardship (AWS), and WASH Pledge—whereby signatories commit to integrating water sustainability into their operations and public reporting.

12 Engage with suppliers on water conservation and water risk disclosures.

ASSESSING WATER RISK EXPOSURE IN YOUR PORTFOLIO

Here are some ways investors can assess the risk of extractive water exposure within their portfolios:

Refer to a company's Environmental, Social, and Governance ("ESG") or Corporate Social Responsibility ("CSR") report for the following items. If not disclosed, request companies to report:

- Water usage data:
  - Total water allocated
  - Total water discharge
  - Total water consumption inclusive of consumption from energy generation and third-party data center providers
- Total water withdrawal
- Total volume or percent of total water consumed in regions with high or extremely high baseline water stress
- Percent of water recycled and reused
- Total contracted water replenishment (This applies to companies who have committed to replenish more water than they consume, like Microsoft and Alphabet)
- Disclose water replenishment project locations
- Percent of replenishment in locations they source water for their operations

ASSESSING WATER RISK EXPOSURE IN YOUR PORTFOLIO

- Management strategy for assessing and mitigating water risks, including engagement approach with third party data center providers, disclose process for internal governance and oversight on water risks
- Disclose approach to stakeholder and community involvement in water risk management within communities they operate especially water sensitive areas
- Disclose watershed partnerships in high water stress areas and rationale for partnership (i.e. water availability, water access, water quality)
- Where the data centers are located:
  - Use this data to determine the percentage of data centers that are located regions with high or extremely high baseline water stress
- Common data center efficiency metrics:
  - Power Usage Effectiveness ("PUE") measures how efficiently data centers use energy
    - Divide (amount of power used by computers) by (amount of power used by computers and to cool the data centers)
      - # closer to 1.0 = better => implies no extra power is being used to cool the data centers; it's just power used for compute
      - Land-based Direct Current ("DC") using Alternating Current ("AC") = PUE 1.4
      - Land-based DC using passive cooling = PUE 1.2
      - Natick DC = PUE 1.07
  - Water Usage Effectiveness ("WUE") measures the efficiency and sustainability of data center operations in terms of water
    - Divide (the liters of water used for humidification and cooling of the data center) by (the total annual amount of power (measured in kWh) needed to operate the data center IT equipment)
    - Lower WUE ratio = more efficient use of water resources
    - The average data center has a WUE of 1.8L per 1kWh. Data centers with a WUE of 0.2 L/kWh or less use less than one cup of water for every kilowatt-hour consumed by IT equipment

ADDITIONAL RESOURCES

Ceres Valuing Water Finance Initiative	A global investor-led effort aimed at engaging companies with large water footprints to value and act on water as a financial risk. Providing investors with resources for engagement including benchmarking, proposal templates, and engagement strategies.
UN Human Right to Water	A UN-recognized right stating that everyone is entitled to sufficient, safe, acceptable, physically accessible, and affordable water for personal and domestic use, as outlined in General Comment 15.
CEO Water Mandate	A UN Global Compact initiative mobilizing business leaders on water stewardship, including corporate commitments to sustainable water management, collective action, and public policy engagement.
Making AI Less "Thirsty": Uncovering and Addressing the Secret Water Footprint of AI Models	A research study detailing the hidden water consumption of AI models, highlighting the environmental impact of AI-driven data centers and the need for sustainable cooling solutions.
The Economics of Water	An OECD Global Commission report examining how water is valued, managed, and used. It advocates for governing water as a global common good, requiring collective action to ensure equitable and sustainable access.

We hope this report has provided valuable insight into AI's water footprint, empowering investors to engage with tech companies across the value chain to promote responsible water use and safeguard community resources. Through collective action, we can drive more sustainable water practices as AI continues to expand, ensuring that local communities have reliable access to water, are protected from resource depletion, and are not left to bear the unintended consequences of technological growth.

Appendix

Brief Overview of the Human Right to Water: UN Declarations

The world is witnessing increasing conflict over competing demands for depleted supplies affecting the availability, accessibility and affordability of safe and acceptable water, especially in emerging countries. In November 2002, the Committee on Economic, Social and Cultural Rights adopted General Comment No. 15 on the right to water. Article I. states that "the human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights."[31] Comment No. 15 also defined the right to water as the right of everyone to sufficient, safe, acceptable and physically accessible and affordable water for personal and domestic uses.

On July 28, 2010, the United Nations General Assembly explicitly recognized the human right to water and sanitation and acknowledged that clean drinking water and sanitation are essential to the realization of all human rights. This Resolution 64/292, calls upon states and international organizations to "provide financial resources, help capacity-building and enable technology transfer to help countries, in particular developing countries, to provide safe, clean, accessible and affordable drinking water and sanitation for all."[32]

While the human right to water policy does not require that corporations set forth detailed plans to meet the above goals, it does require that each company consider these issues and formally commit to the moral boundary that each issue sets forth.

Before this, the human right to water had been absent from the 1948 Universal Declaration of Human Rights. Both the 1979 Convention on the Elimination of All Forms of Discrimination against Women and the 1989 Convention on the Rights of the Child referenced water and a right to health, but the 2010 UN General Assembly formally established it as a human right.

"It is now time to consider access to safe drinking water and sanitation as a human right, defined as the right to equal and non-discriminatory access to a sufficient amount of safe drinking water for personal and domestic uses—drinking, personal sanitation, washing of clothes, food preparation and personal and household hygiene—to sustain life and health. States should prioritize these personal and domestic uses over other water uses and should take steps to ensure that this sufficient amount is of good quality, affordable for all and can be collected within a reasonable distance from a person's home."

- Office of the UN High Commissioner for Human Rights on the Right to Water, September 2007

On July 28th 2010, 122 countries voted to adopt the resolution, 41 abstained and 29 did not vote. The United States of America, Canada, United Kingdom, Netherlands and Australia were among the abstentions.

In his explanation of the United States vote, John F. Sammis, Minister Counselor to the Economic and Social Council argued that the abstention to the Human Right to Water Resolution was moreover a procedural caveat, not so much the substance of the resolution. After this interpretation, it was never ratified, nor signed. While Sammis' reason was due to procedural violations, many scholars believe that the United States shuns treaties that give other international bodies (like the United Nations) governing authority over the nation. While the President can sign treaties, the Senate needs 2/3rds majority to ratify. Politics can thus impinge that process.

The United States has signed several international agreements that recognize the importance and protection of water but do not explicitly recognize it as a human right. For example, the International Covenant on Economic, Social, and Cultural Rights (ICESCR) recognizes water as "indispensable for leading a life in human dignity." The United States has also signed the Convention on the Rights of the Child (CRC) and the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW). Both recognize clean drinking water as vital to survival. In signing, as opposed to ratifying a treaty, the United States is obligated to refrain from acts that go against the mission of the treaty. Signing is not as binding of an obligation as ratifying.

The United States has ratified the International Covenant on Civil and Political Rights (ICCPR) and the International Convention on the Elimination of All Forms of Racial Discrimination (ICERD) which both necessitate the protection of right to life and means of survival as well as access to housing and public health.

Water as a right is implied but not explicitly stated.

States and Local Water Rights Notes

- The UN Human Right to Water is recognized by some states, and local law even if not recognized federally. The Obama Administration recognized the right to water in international law but did not carry the relevance to U.S domestic law.

- The United States promotes the Clean Water Act and Safe Drinking Act as well as Environmental Protection Agency (EPA) regulation that establishes guidelines for water quality but does not address a right to water.

- Some states have recognized the human right to water in their constitutions or passed green amendments including broader environmental rights. Massachusetts, Montana, Pennsylvania and New York have embedded the right to water in their state constitutions while Illinois and Hawaii have asserted the right to a clean and/or healthy environment.

- California passed a bill in 2012 declaring, "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes" and Virginia passed a similar resolution on access to clean water in 2021.[33]

NorthStar's Previous Human Right to Work Activism

NorthStar became concerned that without a clear federal policy recognizing the human right to water, corporations would face an inherent conflict between profit maximization and basic human use, especially, as water ownership in the United States is a complicated labyrinth of state laws and definitions. Typically, the federal government is more concerned with water quality as opposed to how water is allocated. This allocation is largely left to the states to determine. Although, surface waters (streams, lakes, rivers and coastal waters) are a public good, it is the "water rights" defined as the right to use, manage, divert or sell the water that takes precedence. Water rights vary by state and are divided by eastern and western boundaries. Eastern states typically apply Riparian Rights doctrine, meaning water rights belong to those landowners whose land touches the water body of concern. For example, if your land borders a body of water, under riparian rights, you have the legal right to make reasonable use of that water. As long as you are not polluting the water, or diverting it substantially, you have a right to that water.

In the western United States, states adhere to doctrine of prior appropriation or a hybrid of prior appropriation and riparian rights. Prior appropriation is allocation by permit, time limited and administered by the state.[34] Prior appropriation is based on three key principles:

1."**First in time, first in line**." This means that whoever first lays claim to the water has beneficial use and senior right to that water.

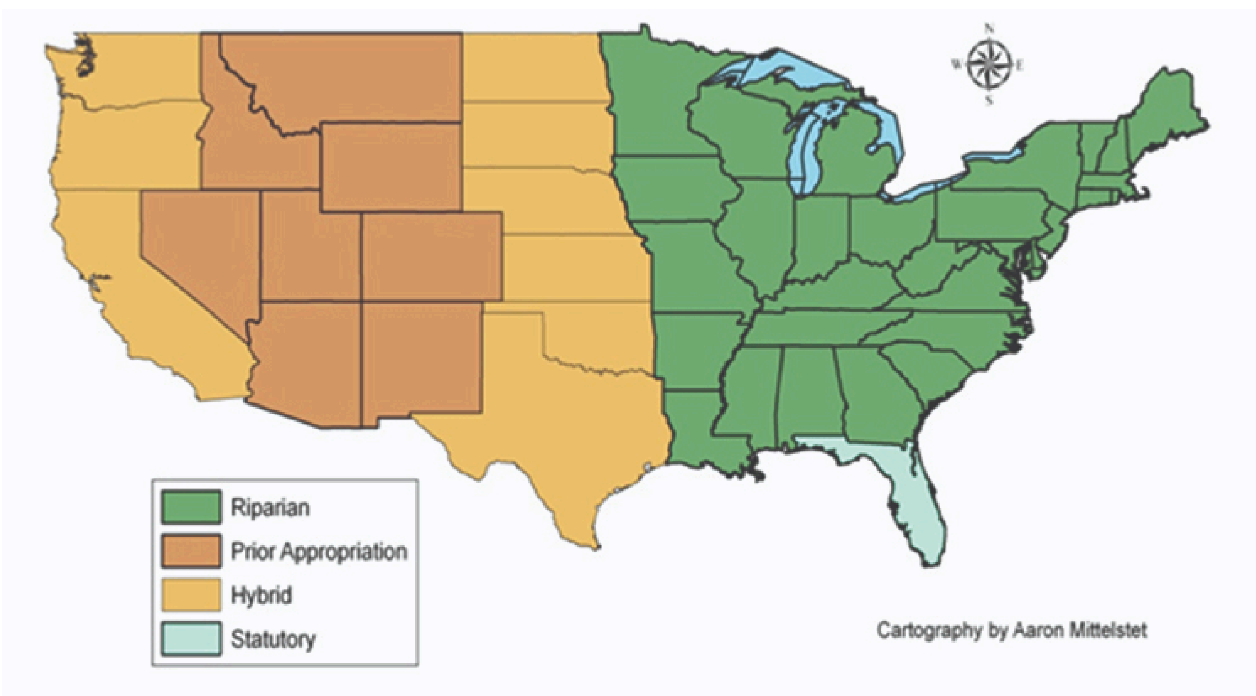
2."**Use it or lose it**." Water rights are not written in stone if not being used. Failure to exercise your water right could result in the right being revoked.

3.**Water rights are separate from land ownership, making the right tradable**. Unlike Riparian Rights, water rights according to Prior Appropriation are treated like property that can be sold, leased, bought or inherited. Water can thus be transferred from public to private use. For example, a farmer could sell their water rights to a company running a datacenter.

We believe that any solution to resolve competing water interests must start from the right place—that is, prioritization of the human right to water. Putting any other concern first creates risk of human rights violations and a potential material damage to brand reputation and goodwill. NorthStar successfully negotiated a adoption of human right to water policies at six public corporations:

- Connecticut Water Services
- PepsiCo (Co-filers: Unitarian Universalist Service Committee ; Boston Common Asset Management)
- Intel Corporation (Co-filers: Unitarian Universalist Service Committee)
- Johnson & Johnson
- Procter & Gamble
- Green Mountain Coffee Roasters

Legal Systems for Water Rights in the United States[34]



NorthStar's concerns about the negative effects of the privatization of U.S. domestic water utilities led us to bring a shareholder resolution in the 2012-2013 proxy requesting the adoption of a human right to water policy at Aqua America, a company which "operates regulated utilities that provide water or wastewater services in the United States". Despite water safety regulations, water companies fall short of the human right to water tenets in the communities they serve. According to a report by Food & Water Watch (FWW), the Aqua America was criticized for allegedly:

- "Voraciously eating up small [public water utilities]," then raising the water rates and surcharges to such high rates that some residents can no longer afford to pay their bills;

- Doubling water rates for 110,000 residents in 15 Florida counties, dubbed by FWW as "unfair, discriminatory and downright unconstitutional";

- Charging residents in Illinois for water they had not used—such as "270,000 gallons of water on a vacant lot," or "water bill[s] vary[ing] the size of . . . waterline pipe from month to month";

- Providing water to NC residents which contained carcinogens uranium and radium; uranium levels five times higher than allowed by the EPA;

In NorthStar's third year of bringing shareholder resolutions at Aqua America and following a number of joint discussions, we have come to believe that what we were proposing, that is, prioritization of the human right to water above corporate interests, was such a radical concept for traditional corporations that the principle of a human right to water must be elevated to an industry wide issue.

- **Safety**: how might the safety of the community water supply be affected by our company's manufacturing processes? How will wastewater be treated and reused? How can we ensure that no contaminated wastewater will leach into water used for drinking and sanitation?

- **Sufficiency**: water is a finite, essential resource for life. How will our operations affect water volume in local communities? Understanding that taking water from one community and returning to another does not qualify as water balance, how will we guarantee that we do not over deplete water resources of any community, especially those in a water crisis?

- **Acceptability**: water must be acceptable to those in the community. Dirty water cannot be used for cleaning bodies, dishes, food, or clothing. How will the company be transparent with local communities regarding the water supply. Will the company engage directly with local officials, families, and businesses to ensure that its intended water quality has been successfully reached?

- **Physical Accessibility**: water scarcity and over depletion by corporate use can lead to water resources becoming suddenly unavailable to the masses without day-long hikes to remote reserves. How will the company promise local communities that it will not deplete local access to water?

- **Affordability**: it is not acceptable for water that was once plentiful and affordable (or free) to suddenly be regulated, piped and controlled through rationing or high prices. Local communities in developing nations have found themselves suddenly responsible for administering water now piped and distributed through a faucet, which has costly implications for upkeep and use. How will the company engage with local governments to ensure that the company's involvement in the water supply does not lead to escalating water prices for the community members?

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