Evenlode Stewardship

Water security - The impact of tech companies

Bethan Rose - 2025

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The growing importance of water as a strategic resource

Water scarcity has become one of the most pressing environmental and economic risks of the 21st century. It is no longer only a humanitarian concern, but a material business issue affecting supply chains, operating costs, regulation, and corporate licence to operate. According to the Carbon Disclosure Project (CDP) less than 1.2% of all water on earth is available for human use, with an estimated 6 out of 10 countries at risk of having unsustainable water resource usage by 2050[i]. Furthermore, by 2050 it's estimated that drought will affect over 75% of the global population[ii]. To compound the issue at hand, the CDP estimates that roughly 10% of global emissions are related to water use, storage, distribution and lack of wastewater treatment[iii].

At present, around 2.4bn people live in water stressed regions, defined by CDP as areas withdrawing 25% or more of renewable freshwater supplies[iv]. Within this number, approximately 800m people live under high or critically high-water stress, where more than 75% of available water is used each year[v]. These conditions inevitably lead to water insecurity where basic freshwater needs cannot be met reliably.

Unlike the long-term and sometimes abstract nature of carbon-related climate impacts, the effects of water scarcity are often immediate, local, and financially disruptive. A clear illustration is the recent El Niño climate cycle. El Niño is the warm phase of a climate pattern called El Niño-Southern Oscillation (ENSO); it creates warmer than average sea temperatures in the Pacific Ocean, and that warming has negative knock-on effects altering weather patterns worldwide. In 2023, lower rainfall in the Panama Canal region prevented normal replenishment of the freshwater reservoirs that enable passage through the canal. For ships to pass through the Panama Canal each ship needs approximately 200,000 tonnes of fresh water to move through locks, so a lack of water directly affects their ability to pass. On a normal day, 35 ships pass through the canal, however this was reduced to 24 ships causing delays and rising costs in supply chains. According to Berenberg, to skip the queue one ship paid $4m in charges, while standard transit costs are usually somewhere in the region of $400,000[vi]. This example further highlights the water-related financial impacts on supply chains and the global economy more broadly.

Technology and water: Why the sector matters

Against this backdrop, the technology sector has become a surprisingly large and growing water consumer. While the industry is often associated with intangible digital outputs, the physical infrastructure behind cloud computing, AI, and semiconductors is highly resource intensive.

i CDP Water Security.

ii The Green Amazon.

iii CDP Cost of Water Risks to Business.

iv UNEP Water Shortages.

v UN SDGs.

vi Berenberg ESG – Water: from government to business risk.

As an example, microchip factories consume vast amounts of water to cool machinery and ensure wafer sheets are free of dust and debris. Fabrication facilities also use ultrapure water, which is fresh water processed to extremely high purity to rinse wafers between each process. In this case, the more advanced the semiconductor the more water consumed.

Data centres also consume a huge amount of water. In 2022 Google's total water consumption at data centres and offices was 5.6bn gallons which is the equivalent of irrigating 37 golf courses annually[vii]. Water usage is a huge environmental problem when it comes to the AI boom. One study estimated that AI could account for up to 6.6bn cubic metres of water use by 2027, which is nearly two thirds of England's annual water consumption[viii]. It is also estimated that ChatGPT alone uses the equivalent of one 500ml bottle of water for every 20-50 queries[ix]. It makes you think about whether requesting a picture of a cat riding a motorcycle is actually worth it.

Furthermore, according to the New York Times, Meta's data centre, which was completed last year, typically uses around 500,000 gallons of water a day. It went on to say that one unnamed company was asking for 9m gallons of water a day to run its data centre, which is enough to service 30,000 households. This raises the question: how can data-driven growth continue without deepening water insecurity in the regions that host such facilities?

Why data centres use so much water

The reason datacentres are so resource intensive is that they use a large amount of energy for cooling IT equipment. This cooling is a necessity as without adequate cooling, the servers can overheat and subsequently fail. Additionally, continuous running of servers constantly generates heat which can lead to thermal runway events. This is where an increase in temperature causes a further increase, creating a loop where heat generation outpaces heat dissipation. There are a few ways data centres use water to mitigate this issue. As well as using water directly for cooling, data centres also need electricity to power the servers. Producing this electricity requires indirect use of water, and this usually comes in the form of operating a power plant or hydropower station.

Steam-driven natural gas, nuclear and coal power plants not only create steam from water but also need water to cool and condense steam back into water to then be recycled back to the boiler or reactor. Nearly a third of fresh water in the US is for thermoelectric power, which accounts for about 78% of US net electricity generation. The US department of Energy forecasts US data centre direct water use to increase 17 – 33% per annum to 140-275bn litres in 2028. Barclays analysts state that excludes nearly 800bn litres of indirect water use attributed to water consumed to produce electricity[x].

vii CNBC Climate Change Could Push Chip Prices.

viii UNRIC: How Much Energy Does AI Use.

ix Euronews Chat GPT Drinks a Bottle of Fresh Water For Every 20 to 50 questions.

x Barclays Powering AI: Google Reports Surging 2024 Electricity & Water Use.

Alphabet, Meta and Microsoft's global energy demand has grown circa 25% for six consecutive years and these three companies alone account for just over 1% of total US electricity demand with data centres already accounting for just over 4% of US electricity demand[xi]. This is why it's important to take into consideration not only data centre direct water use, but also indirect water use related to powering the data centres.

In terms of direct cooling, newer generations of datacentres are starting to use less power as they use water cooling to replace more traditional power-hungry air-con based systems. Some examples include using direct evaporative cooling, this is where the system draws in outside air and passes it through water saturated pads, this causes the water to evaporate and absorb heat. This in turn reduces the air temperature before it enters the data centre. You can also use indirect evaporative cooling where outside air is cooled by evaporation and then used to cool a separate stream of air that circulates in the data centre. This method is particularly beneficial if humidity is a concern in the data centre, as it keeps the air dry.

According to global consultant Arup, a small one-megawatt data centre that uses a direct evaporative cooling method can consume more than 25m litres of water per year, which is enough to supply more than 200 UK homes. However, it's important to be aware that water cooling is considered to be more efficient than air cooling as water is a better conductor of heat by a factor of 23x versus air and can hold far more heat than air (around 3,234x more by volume)[xii].

Mechanical cooling, which consists of air conditioning or using cooling towers with a chilled water system, is usually required for data centres that are in hot climates. This is opposed to free air cooling which can be used for cold climate locations and consists of pulling in air from the outside and pumping it into the data centre. This reduces reliance on the more energy-intensive systems.

Data centres in hot climates rely more heavily on mechanical cooling systems, such as chilled water loops or cooling towers. These facilities are often built in regions already facing high water stress - including parts of Asia-Pacific, Africa, and the western parts of the US. Furthermore, because electricity is usually a greater cost factor than water, operators tend to build where power is cheap - which often overlaps with drought-prone areas.

It is thought that most AI specialised data centres use evaporation-based cooling systems. **So, what are the large industry players doing about it?**

Case study: Microsoft

Microsoft operates more than 400 data centres worldwide, with further expansion planned. Like most major hyperscalers, the company has introduced water-related targets, including a commitment to become 'water positive' by 2030 - meaning it aims to replenish more water than it consumes across its global operations (including both owned and leased data centres). **However, this target does not**

xi Barclays Thematic Investing powering AI.

xii Bernstein Sustainable Alpha – An ESG Thematic Primer.

include water consumed indirectly, for example through their supply chain or for power generation.

Despite its growing data infrastructure, Microsoft reported a 26% year-on-year reduction in total water consumption. A useful metric here is Water Usage Effectiveness (WUE), which measures the volume of water used per kilowatt-hour of electricity consumed. Microsoft currently reports a WUE of 0.3 L/kWh - 18% below its baseline - versus an industry average of around 1.8 L/kWh. The company attributes this to its advanced liquid cooling systems, and water-reuse technology.

Microsoft is also transitioning away from traditional air-cooled data centres to chip-level liquid cooling designs. The direct-to-chip liquid cooling replaces evaporative cooling with mechanical air-cooled chillers. The trade-off here is between water and electricity use. The replacement of evaporative cooling with mechanical cooling will increase its Power Usage Effectiveness (PUE), a metric which measures data centre energy efficiency. For context, the closer the PUE to 1x the more efficient the data centre.

These figures are impacted by the cooling techniques used. With higher precision chip-level cooling, data centres can operate cooling systems at warmer temperatures[xiii]. As an example, Microsoft disclosed its PUE as 1.18x in 2022, that's versus an industry average of 1.6x. Barclays analysts believe that since AI will be largely deployed by hyperscalers, AI data centres will be efficient from a PUE perspective. However, this doesn't fully account for the environmental impacts such as the indirect water usage.

To support its water-positive target, Microsoft has funded 76 projects (worth $34m) in 25 locations, and they estimate that this amounts to over 100m^3 (1 cubic metre is 1,000 litres) of estimated volume to be replenished over their lifetime. They are also supporting 89 water replenishment and access projects. Some examples of these projects include water for Chilean schools, providing students with clean water in India and the restoration of wetlands in North Dakota. While these are noble initiatives, a key question remains: how much of this investment is occurring in regions where Microsoft data centres operate, rather than in unrelated geographies?

Case study: Amazon

Amazon Web Services (AWS) is estimated to operate around 215 data centres worldwide. AWS states that its cloud infrastructure currently spans 117 availability zones across 37 geographic regions, with plans for additional expansion in New Zealand, Saudi Arabia and Chile. Notably, Chile and Saudi Arabia are both rated as extremely high water-stress regions (>80%)[xiv], meaning that future AWS build-outs may intensify local resource pressure.

Like Microsoft, in 2022 AWS also announced their commitment to being water positive[xv] by 2030, meaning that they will return more water to communities and the environment than they use in their data centre operations. In 2024, AWS was 53% of the way towards being water

xiii Barclays Powering AI: Microsoft Electricity Use.

xiv World Resources Institute Highest Water Stressed Countries.

xv Water positivity is measured as reused and replenished water divided by total water withdrawal minus anything from sustainable sources.

positive. They are doing this through water efficiency, using more sustainable water sources, reusing water in the communities by using the discharged water from the data centres, as well as replenishing water.

In 2024, AWS also began implementing integrated liquid cooling components. This combines air and liquid cooling capabilities for both powerful AI chipsets and AWS's network switches and storage servers. This design is expected to reduce mechanical energy consumption by up to 46% compared to previous designs during peak cooling conditions. As a result, they reduced cooling water needs by 946m litres in North America. The implementation of new technologies contributed to a global data centre WUE of 0.15 L/kWh.

In 2024, AWS reported that 24 of its 215 data centres – approximately 10% - used recycled water for cooling. While the company aims to quadruple this number by 2030, it remains unclear how many newly built facilities will adopt this approach, given AWS's expansion over the next few years. Furthermore, AWS also has agreements with seven utility companies, enabling 4bn litres of fresh water to be preserved for community use. Additionally, 5 data centres have operational rainwater capture systems in place which helps reduce the demand on community water resources. While a step in the right direction, it is important to remember that AWS's global infrastructure is large and some of this work is currently a drop in the ocean compared to the global need.

Case study: Alphabet

Alphabet operates approximately 105 data centres globally. According to World Resources Institute Aqueduct data (2019), several of these facilities are located in high (40–80%) or extremely high (>80%) water-stress regions, including Belgium and Thailand.

In 2025, Google reported a year of low PUE at 1.09x but surging water use for evaporative cooling. Google's water withdrawal and consumption increased 28% and 27% year-on-year to 11bn gallons and 8bn gallons respectively. This is equivalent to the water irrigation needs of 54 golf courses annually in southwestern US[xvi]. This contrasts with Microsoft who indicate their new data centres won't use water from evaporative cooling – a choice that comes with a trade-off between water and electricity use. Meanwhile, Google report that 72% of their freshwater withdrawals come from sources at low risk of water depletion or scarcity.

Alphabet announced its own water-positive commitment in 2021, targeting the replenishment of 120% of the freshwater it consumes by 2030. The company claims to have replenished 64% of its freshwater usage (4.5bn gallons) through 112 active projects across 68 watersheds.

It's also important to think about energy sourcing alongside these targets. Alphabet has a renewable energy target to achieve 24/7 carbon free energy for all its operations globally by 2030. This contrasts with targets that focus on procuring 100% of renewable energy from power purchase agreements (PPAs). This distinction is important as virtual

xvi Barclays Powering AI: Microsoft Electricity Use.

PPAs are an example of poor-quality renewable energy contracts that obscure the true carbon impact of an activity. This is due to poor location matching, as companies can claim renewable energy coverage on separate non-local grids that are not connected to their assets. Shifting to an hourly matched carbon-free system is increasingly important. Positively, we are now seeing the likes of Microsoft and Alphabet sign the 24/7 Carbon-Free Energy Compact. This is an important step given the carbon and water challenges that data centres present.

However, progress is not linear. Although Microsoft has committed to becoming carbon negative by 2030, it recently disclosed a 30% rise in emissions, driven in part by the growth of data-centre infrastructure. This highlights the paradox of digital sustainability: the infrastructure required to deliver low-carbon services over the long term, can itself generate substantial carbon and water burdens.

Rising litigation, community pushback and project delays

It's not only climate targets that are at risk. Water scarcity is no longer just an environmental or operational issue, it is increasingly a source of legal, regulatory and reputational risk for technology companies. Although large-scale litigation related specifically to data-centre water use has been limited so far, early warning signs are emerging as local communities face resource depletion while corporate infrastructure expands.

As a result, there continues to be concerning levels of community backlash. According to Berenberg research, approximately $64bn of investment has already been delayed or blocked through community backlash in the US. That's about 14% of global data centre capex currently being stalled due to local activism[xvii]. Examples include:

- Alphabet's planned $200m Chilean data centre, which was halted and redesigned following public pressure linked to drought conditions. Google subsequently agreed to re-evaluate cooling technology and reduce water dependency.
- Alphabet's $850m project in Uruguay, which was forced into environmental review due to concerns over water diversion and ecosystem stress. The company has since committed to shifting from water cooling to air cooling and capping peak annual energy use.

Beyond planning delays, state-level legislative responses are emerging. In Georgia - a major hub for data-centre construction due to low electricity prices - some counties are proposing bills that would require data centre operators to cover the cost of rising electricity demand, protecting households from higher utility bills. While the policies centre on energy, the underlying driver is the same: communities are increasingly starting to question the benefits of AI and whether they should absorb the environmental and financial externalities of its infrastructure.

Solutions and alternatives: What can companies do?

A key mechanism gaining traction is internal water pricing, similar to internal carbon pricing. This assigns a monetary value to each unit of water used, incentivising reduction and

[xvii] *Berenberg Sustainability Weekly.*

enabling dedicated funding for replenishment. According to CDP, only 18% of technology firms currently use such a system. Microsoft is one of those companies. Their fee was established in FY20 and is used to fund replenishment and access projects around the globe. It is charged to business groups based on annual water consumption projections at a rate which is determined with historic data and guidance from experts. This is a positive step forward that helps incentivise solutions.

From a direct perspective, one technique is to use radiators with fans in a closed-water circuit where the water is recycled or reused however, this can be expensive. Companies can also spray water into the air to make it more humid and lower the temperature but then there are negative knock-on effects like metal corrosion. There is also the idea of floating data centres where the IT equipment is cooled using the natural temperature of the water that the data centre floats on. Research is also being conducted on products that further allow for direct cooling of chips and equipment that dissipates heat.

Microsoft's development of a new closed-loop design whereby the water it uses doesn't evaporate but is constantly circulated between servers and chillers is viewed as a welcome innovation. They call this method *zero water*. Microsoft claim that this will save them 125m litres of water per year that each data centre uses. While this is positive for newly constructed data centres, it doesn't address the environmental problems in the existing infrastructure.

Unfortunately, retrofitting conventional data centres for AI is difficult and costly. As AI dedicated data centres will generally be built to suit with new cooling techniques, most conventional data centres lack scale and access to sufficient power. Slowly we can see the industry trying to come up with solutions but working on the direct energy and water issues is just one piece of the puzzle. We also asked Microsoft about the potential to retrofit older generation data centres, but they outlined it isn't something they would usually disclose. We assume this is not a priority for the company and as mentioned above, it's expensive.

Elon Musk's AI startup is powering most of its data centre in Texas using mobile gas generators and several companies have also indicated plans to develop gas plants with carbon capture to directly power data centres. However, this is currently not a cost efficient or a truly scalable solution.

As power demand becomes the bottleneck for data-centre expansion, nuclear energy has returned to the discussion - particularly small modular reactors (SMRs). Microsoft has already signed deals on nuclear energy and has also recently joined the World Nuclear Association. According to an Edie article, the key areas of collaboration with the association are expected to include small modular reactors and other advanced nuclear technologies.

SMRs are nuclear reactors that are "small" (defined as 300 megawatts of electrical power or less) and would be installed in a modular fashion at power generation sites[xviii]. For context, conventional nuclear plants are around 1,000 megawatts and are custom built.

xviii Union of Concerned Scientists – The Equation.

According to the equation article the only SMR currently under construction is in China, with projects in countries like the US not expected to come online until 2030, or later. There is also the argument that SMRs are less costly and quicker to build than large reactors. However, according to the principle of economies of scale, smaller reactors generally produce more expensive electricity than larger ones. One key sticking point is the assumption that because of their size they might be safer or lower risk than large reactors. However, the passive safety features (without the need for electrically powered coolant pumps) of SMRs may not work in extreme events and if the SMR is located close to populated areas this could expose people to dangerously high levels of radiation.

It is hoped that data centres could use SMRs to address their energy challenges, however they currently lack the necessary waste infrastructure required for nuclear reactors, such as spent fuel pools and systems for treating radioactive waste. Several risks remain and the fundamental issue is the power needed to support current data centre expansion simply does not yet exist.

What this means for companies: Strategic and ESG implications

The convergence of AI expansion, rising water stress, and community scrutiny means the operating environment for hyperscalers will look very different over the next 2–5 years. The key issue is not simply whether companies have targets, but whether they can deliver operational models that scale sustainably without triggering local resistance, regulatory intervention, or reputational damage.

Over a few days in September 2025, OpenAI announced deployment plans that would equate to the power need of around 17 nuclear plants or about 9 Hoover dams. This is approximately the same amount of electricity needed to power more than 13m US homes[xix]. **This raises a fundamental question: how will society and infrastructure systems absorb this demand without accelerating water scarcity and carbon emissions?**

Microsoft has already seen emissions rise nearly 30% despite its net-zero pledge, with data-centre expansion cited as a primary driver. Additionally, the company historically had a renewable energy target that heavily used PPAs however, they have now had to switch their strategy to focusing on 24/7 carbon-free energy - signing the 24/7 Carbon-Free Energy Compact is a step in the right direction. Microsoft also continues to invest in new technologies that reduce the water burden evidenced by their zero-water design. This technology will be actioned in any new data centre going forward.

The rapid expansion of AI and cloud infrastructure is placing new levels of pressure on finite water resources. While efficiency gains and corporate pledges are welcome, absolute consumption continues to rise. Without credible solutions, the sector risks missing environmental commitments, facing regulatory and legal challenges, and encountering physical limits on growth.

Some argue AI will help solve environmental problems, others note it may worsen them by

xix CNBC OpenAI AI Arms Race.

accelerating energy and water demand. Reality will likely sit between the two, but only if companies act at the pace of the problem, not the pace of their growth ambitions.

At Evenlode, we continue to engage with Microsoft, Amazon and Alphabet on three priority areas:

1. Clarity on direct and indirect water use - companies rarely disclose the embedded water in their electricity consumption, meaning total footprints are understated.
2. Geographical alignment of replenishment projects - water restored in one country does not solve depletion near a data centre 5,000 miles away.
3. Transition plans for existing infrastructure - new-build "model data centres" do not address the thousands of legacy facilities built on outdated cooling systems and water assumptions.

We will also keep monitoring data-centre expansion through our ESG risk matrix to ensure these issues are reflected in portfolio decision-making.