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Running Dry: The Challenges of Global Water Scarcity

Discover how innovative strategies offer investors new opportunities in a water-scarce world.

KEY TAKEAWAYS

- Climate change and population growth are creating a global water crisis that will likely force businesses and consumers to face tough trade-offs and sacrifices.
- Water scarcity affects many economic sectors, raising costs and supply chain risks. Most processes require freshwater, which is increasingly scarce.
- Companies are assessing water use and its true cost, adopting water management strategies to mitigate, adapt, and find opportunities in a water-scarce world.

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INTRODUCTION: THE GLOBAL ECONOMY AND WATER STRESS

We often use water without much thought (except in areas that experience chronic water shortages) and probably underestimate its importance to the global economy. Water is essential to life on Earth, but the world is pushing up against the upper boundary of sustainable water consumption. In March 2023, the United Nations convened its first Water Conference in nearly 50 years, urging member states, governments, and the private sector to take decisive action to address the problem.

- UNICEF forecasts that by 2025, half of the world's population will live under water-stressed conditions.
- The World Bank says challenges related to water access and scarcity make water stress one of the most significant risks to economic progress, poverty eradication and sustainable development.
- UNICEF estimates that 700 million people (approximately one out of every eleven people on Earth) could be displaced by intense water scarcity by 2030.

The water crisis is both a critical environmental issue and a serious economic challenge. Here, we explain the leading causes of water stress, its financial impact on different sectors of the economy, and how some innovative companies are confronting the issue.

WHAT IS WATER STRESS (OR WATER SCARCITY)?

Simply put, water stress is an inability to meet the demand for water. That demand comes from people, businesses and cities. Importantly, it includes water needed to maintain healthy ecosystems.

Water stress is not just about quantity but also quality and accessibility. Water that is unfit for use or is inaccessible cannot help to meet water demand. The term water scarcity sometimes means water stress, although there are differences. We stick with water stress here as it is a broader term.

Freshwater accounts for less than 1% of the earth's total available water (excluding glaciers and polar ice),[1] and while the global population is increasing, the world's freshwater supply is not. As the global population increases, water demand grows, adding to global water stress.

Agricultural and industrial activities put significant pressure on freshwater systems across most ice-free land surfaces. Agriculture, manufacturing, and other economic activities consume a lot of water and increase greenhouse gas emissions, thus contributing to climate change-related droughts and wildfires that increase the water demand.

Water stress is also making it harder to grow the food people need to survive—agriculture is responsible for roughly 69% of freshwater use. In comparison, industrial and municipal purposes use 19% and 12%, respectively.[2]

Industrial activities can degrade water quality, leaching trace amounts of harmful metals and releasing chemicals and plastics, all found in municipal water supplies. Fertilizers and other chemicals that end up in lakes and streams can cause eutrophication, a process by which run-off containing nitrogen and phosphorous causes aquatic plants to overgrow. That uses up all the oxygen in the water so that no fish or other animals can live in it.

According to UN Water, a staggering 80% of wastewater globally returns to rivers, oceans and groundwater untreated or unused. This affects water availability and degrades water quality. It also harms wetlands and pollutes and diverts rivers, affecting entire ecosystems.

Water stress is not just a temporary scarcity due to drought. As noted above, it's about quantity, quality and availability. Putting this all together, the world is now unsustainably depleting and degrading its freshwater sources.

Types of Water

Regarding usability, there are several types of water, and they are not interchangeable. Here, we summarize the main types, highlighting the importance of conserving fresh, clean water for its most critical uses.

Fresh vs. Salt vs. Brackish

Most of the time, the terms water scarcity and water use refer to freshwater. Although water covers over 70% of the earth's surface, only about 2.5% is freshwater, and less than 1% is accessible for human use. [3]

While widely available, saltwater is unsuitable for human consumption, agriculture, or most industrial processes. Desalination is energy-intensive and expensive.

Brackish water, a mixture of fresh and saltwater, is typically found in estuaries where rivers meet the sea. It can be used in industrial processes such as heating, cooling, and mining and for specific applications in the oil and gas sector.

Grey vs. Black

Both are types of wastewater. Grey water, generated from activities such as bathing and washing dishes and clothes, can be collected and reused for irrigation and flushing toilets.

Black water contains biological waste (from toilets) and must be treated before it can be safely discharged or reused.

Surface, Ground, Rain and Storm

The primary source of fresh water for human consumption, surface water, as the name suggests, is found on the earth's surface in rivers, lakes, and manufactured reservoirs.

Groundwater is stored in underground aquifers (layers of permeable rock, sand, or gravel).

Rainwater can be used for various purposes, including irrigation and, with proper treatment, for drinking. Stormwater comes from precipitation and snow/ice melt. It can collect pollutants in urban areas and needs to be managed to prevent flooding and further water pollution.

CLIMATE CHANGE AND WATER STRESS

Climate change acts as a risk multiplier, making the global water crisis even more severe and widespread. With global average temperatures already about 1.1°C (2°F) higher than in the pre-industrial period (pre-1880), experts anticipate we will breach the critical 1.5°C threshold in the next few years, and temperatures will continue to rise.[4]

Climate change is disrupting the hydrological cycle (evaporation, condensation, precipitation and collection), causing destructive floods and droughts and affecting the global distribution and availability of water.

In addition, declining water quality often worsens other impacts of climate change. As contaminants and pollutants degrade water quality, aquatic ecosystems are less able to adapt to climate change. That reduces biodiversity, which causes imbalances that can cascade through food chains, affecting food supplies.

Water stress makes it harder for people and companies to adapt to and tolerate higher temperatures. Ironically, efforts to fight climate change can add to water stress; for example, mining requires a lot of water, but mining copper and other metals is needed to make EV batteries and expand the electric grid to increase the use of renewable energy.

In short, climate change and water stress are intertwined, each one reinforcing and worsening the other.

FINANCIAL IMPACTS OF WATER STRESS

Water stress creates three types of financial risks for businesses: regulatory, reputational, and physical (operational and supply chain-related). These risks arise when water is insufficient, poor quality, or both. Risks related to water stress directly impact enterprise value creation, and managing them is challenging. Alternative water sources are often polluted and may not be geographically available. Existing water treatment technologies are energy- and chemical-intensive. These concerns about water resources have led to an 85% increase in disclosures of private-sector water use over the past five years.[5]

The western U.S. faces growing water stress as droughts become increasingly severe and the region's rising population pushes consumption beyond the natural replenishment rate. This produces legal battles among farmers, communities, and private and public entities over water rights. California, which is responsible for roughly 12.5% of the entire value of U.S. agricultural production,[6] has recently seen a carrot boycott, tribal water disputes, potential water restrictions in certain regions and efforts to invoke historical water compacts.

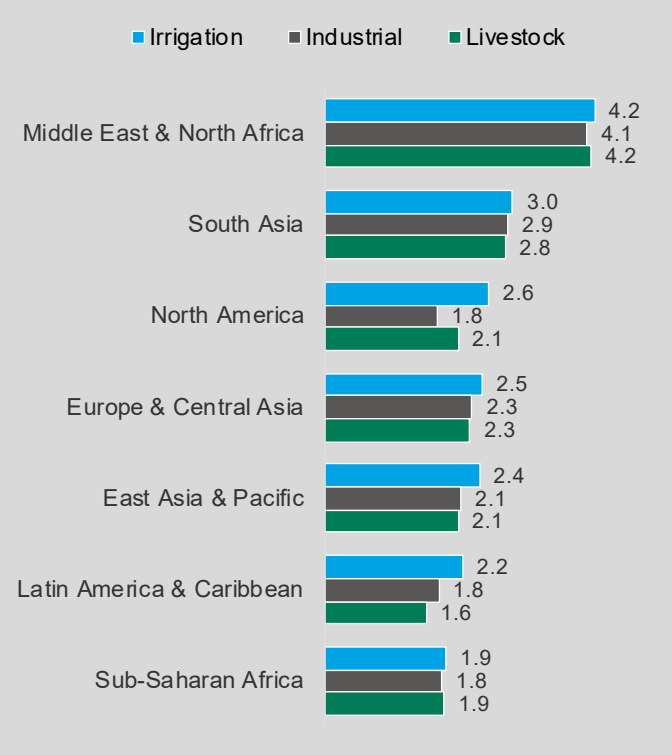
Risk varies by region

Companies operating in various parts of the world must assess location-specific water risk, which varies even within a region. Decisions on whether to establish or expand agricultural or industrial operations in water-stressed regions should consider that the cost of obtaining water may have a material impact on the investment's expected return. In addition, water stress can occur across a company's supply chain.

Figure 1 shows water risk related to industrial use, irrigation and livestock, by region.

FIGURE 1

Average Water Risk Based on Gross Demand



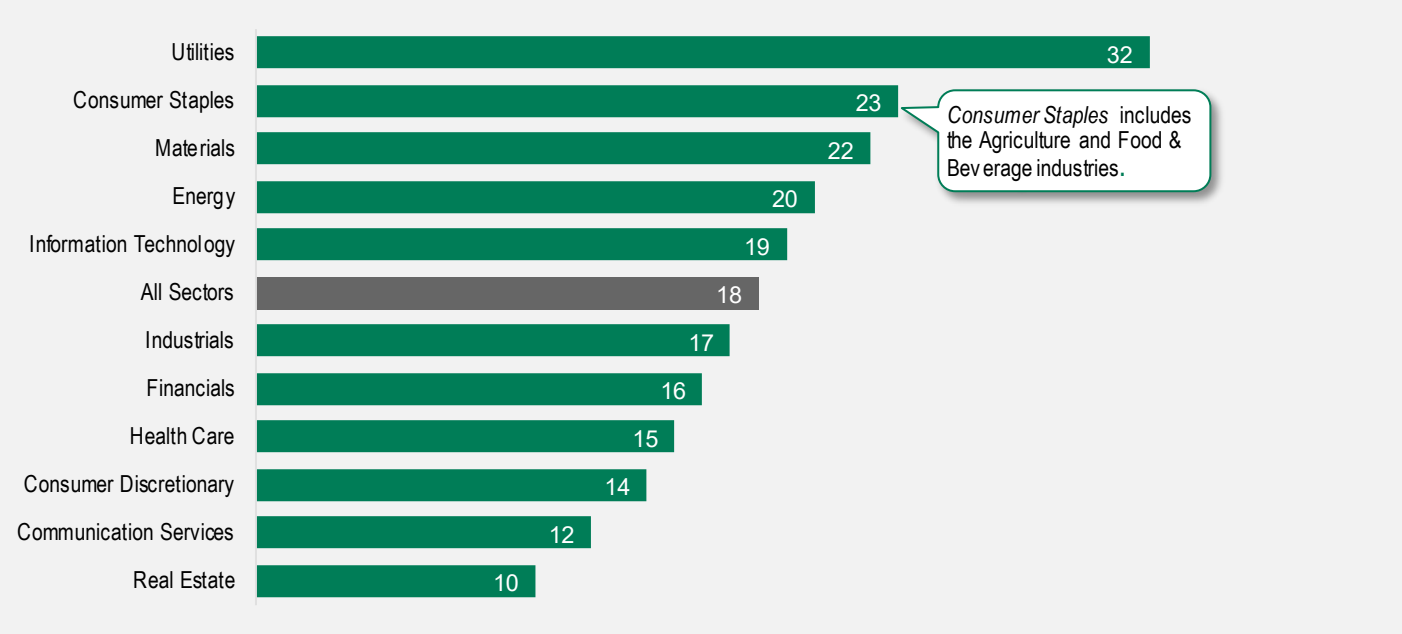
Water risk data is based on Aqueduct™ 4.0, the latest iteration of WRI's water risk framework, which brings catchment-level data to the country and provincial levels using a weighted aggregation methodology based on gross water demand. Gross demand data is used to indicate where the human need for water is greatest and where socioeconomic dependency on water is most critical. Report as of 12/31/2023. Source: Aquaduct™ 4.0

SECTOR-SPECIFIC WATER VULNERABILITIES

Businesses may be highly susceptible to water stress, and unsustainable water use across industries and can increase water stress in the aggregate. **Figure 2** shows the dependence on surface and groundwater across sectors on a scale of 0-100.

FIGURE 2

Sector dependency on surface and groundwater among large companies globally (on a scale of 0-100)



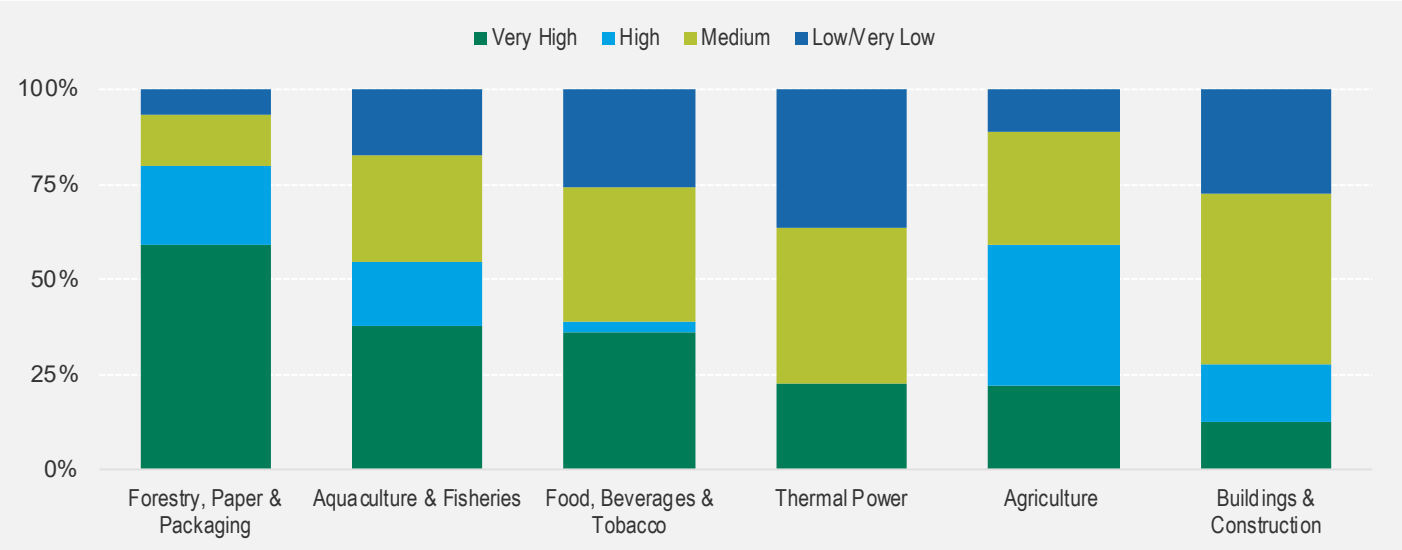
Data as of 3/31/2023. The dependency score considers the level of reliance that a business's direct operations have on different ecosystem services, as well as the expected resilience risk of the ecosystem providing these services. Source: S&P Global Sustainable.

Freshwater is obviously needed to grow crops and produce food and beverages, but water is also highly material to many manufacturing processes, such as filtration, and prevents disruptions (such as by controlling pests and cooling data centers and nuclear power plants).

Figure 3 shows the extent to which water dependence is material to companies in key nature-dependent industries (agriculture, aquaculture, food and beverage, and forestry, paper and packaging), based on a materiality scale of 1 to 5, where 5 means the materiality of water is very high across a range of uses.

FIGURE 3

Financial Materiality of Water Dependencies Across Key Industries.



Data as of 1/30/2023. Source: *Jefferies Research*

Here, we discuss how the economics of a subset of the industries shown in Figure 2 depend on water:

Agriculture

Almost 70% of global freshwater is used for agriculture. Water is essential for growing crops and raising livestock, which are the backbone of the global food supply.

Forestry, paper and packaging

These industries use substantial amounts of water to make products and cool down machinery. Chemicals and waste from these processes can pollute bodies of water, harming water quality and aquatic ecosystems. Cutting down trees for lumber and paper worsens water stress by disrupting natural water cycles.

Power

Water is needed for many forms of power production, not just hydropower but also for cooling thermal power plants, and declining water availability can increase heat and electricity prices. A lack of water to cool power plants in India reduced electricity production by 8.2 terawatt-hours between 2017 and 2021, enough to power 1.5 million households for five years.[7] Hydrogen fuel, which creates zero carbon emissions if produced using renewable energy, is made with water.

Industrial

Manufacturing processes use water for cooling and cleaning, and making textiles and chemicals requires large amounts of water. The quality and quantity of available water can directly impact industrial output and costs, affecting profitability, production levels, and GDP growth.

Technology (data centers)

Data centers use vast amounts of water for cooling and to generate electricity. In fact, tech is among the top 10 industrial and commercial sectors in terms of water consumption.[8] Because of their enormous water needs, many new data centers (including those that power generative AI) are moving away from arid areas or to places where solar and wind power are relatively abundant. Water can impact a data center's operational efficiency and reliability, which can have a trickle-down effect on the entire economy.

Mining

Mining depends heavily on water to process ore and minerals, control dust, and transport slurry. This makes mining operations vulnerable to water scarcity. Acquiring water rights can be costly, affecting a mining project's economic viability, and mining activities can have serious impacts on water quality and surrounding ecosystems due to acidic runoff and by releasing contaminants like heavy metals that make their way into groundwater.

SOCIETAL CONSEQUENCES OF WATER STRESS

With water demand exceeding supply, there are growing debates over how to price water and about privatizing water rights. Still, water use and pricing are mostly unregulated. This largely stems from the view that people are entitled to unfettered access to fresh water and because its availability is location-specific.

Thus, assigning a "fair" price to water that reflects its true value, including the cost to access, transport, use, and recycle it is challenging. This lack of pricing data for water has significant implications for portfolio managers as we consider water an undervalued asset.

Assessing the actual value of the water used to run a business can help a company to better manage financial risks and identify new cost-saving opportunities. The 2022 CDP water report notes that 16% of the companies that participated in its survey have established an internal price for water to better reflect its cost in their operations. Importantly, the companies that compute a price for water say that opportunities related to water efficiency are six times greater than those reported by companies that do not compute a price for water.

Quick Gulps: Water-related Developments

Data from Aqueduct shows that 31% of global GDP will be exposed to high water stress by 2050, compared to 24% in 2010. India, Mexico, Egypt and Turkey will account for more than half of the total.

The IFC estimates the cost of producing non-potable recycled water can be as low as $0.32 per cubic meter, and producing potable water can cost $0.45, more cost-effective than desalination at $0.50 per cubic meter.

In the National Library Board in Singapore, one of the most water-stressed countries in the world, reports that the Changi Water Reclamation Plant treats up to 900 million liters of wastewater daily – an amount of water that would fill about 350 Olympic swimming pools.

INVESTMENT CONSIDERATIONS IN A WATER-STRESSED WORLD

Businesses in water-dependent sectors may only be sustainable over the long run if they mitigate and adapt to water risk. To evaluate sustainability issues companies face, we focus on water stress mitigation, adaptation, and innovation. Here, we provide examples of what some companies are now doing in this area:

Water Stress Mitigation

Actions to prevent or minimize water stress include:

Adopting water-efficient technologies to reduce consumption

In agriculture, this includes drip irrigation and soil moisture sensors that determine precise watering needs. Factories can install closed-loop water systems that recycle and reuse water within a facility and upgrade to equipment that requires less water.

Reducing water waste

This often involves identifying and repairing leaks in water distribution systems, which can be a significant source of water loss. Advanced treatment technologies can be used to recover and reuse wastewater. Many companies and "green" builders are investing in water-efficient equipment and processes, upgrading to systems with lower water requirements or modifying existing processes to reduce water use.

Water Stress Adaptation

Adjustments to practices, processes and designs to cope with water scarcity may involve:

Developing drought-resistant crops

Companies are cultivating crops that minimize water loss and use water more efficiently to survive when water is scarce. As droughts become more frequent and severe, these crops become crucial to food production and security. Reducing a crop's dependence on regular rainfall helps agriculture businesses avoid financial losses and stabilize food prices.

Shifting to water-efficient processes and reducing reliance on freshwater

Many companies are adopting water-efficient processes to minimize their water footprint, reducing water use in manufacturing, recycling wastewater, and improving water management. Some are exploring ways to use less pure water, such as brackish water, for certain processes.

Designing buildings to collect and use rainwater

Sustainably designed buildings collect and channel rainwater from rooftops and surface areas into storage tanks for reuse. Designing buildings to collect rainwater reduces the demand for municipal water supplies and mitigates the impact of runoff on urban drainage systems, supporting sustainable urban water management.

Water Use Efficiency and Innovation

Innovative technologies are driving revenue growth while reducing water stress:

Desalination technologies

Water scarcity is widening the demand for desalination, and the cost has declined significantly in the last 10-15 years to as low as US$ 0.4-0.6 per cubic meter.[9] Up to now, desalination has been used mainly in the Middle East, but China plans to double its desalination capacity over the next five years, and other countries are exploring its viability. Brine waste produced from desalination can generate new revenue streams through products such as gypsum, magnesium, salt, potassium and lithium. This also reduces the negative biodiversity impacts of discharging waste into marine ecosystems.

Water collection technologies

Innovative technologies are being used to draw fresh water directly from the atmosphere (from dew or fog). This is particularly useful in areas where conventional water sources are scarce or polluted. The most prevalent approach (some 90% of the market) uses a condenser and cooling coil technology or something similar to draw moisture from the air (note that these systems are susceptible to air temperature and humidity levels).[10]

THE ROLE OF GOVERNMENTS AND REGULATIONS

Growing water stress calls for more robust governance and mandatory disclosures of water management across industries. The U.S., United Kingdom, European Union, and international organizations are intensifying their focus on water management and treatment. The U.S. government has allocated roughly $585 million to water infrastructure repairs,[11] and a new standard to combat PFAS ("forever chemicals") in drinking water and a $50 billion Lead Pipe and Paint Action Plan have been enacted.[12] The UK has introduced a water plan that allocates £1.6 billion for infrastructure to combat pollution and restricts PFAS chemicals.[13] The EU recognizes water treatment and nature-based solutions within the taxonomy criteria for sustainable water use.

OUR PERSPECTIVE AS ACTIVE MANAGERS

A company's water use and vulnerability to water stress are often difficult for investors to evaluate, as mandatory disclosures are negligible.

As active managers, we discuss a company's water dependence and management as part of our engagement activities. This includes whether and how a company:

- Analyzes the cost of its water use to quantify hidden costs and improve its water management strategy
- Maintains a quality assurance and water management program to ensure that water discharges comply with regulations and are assessed for environmental impact
- Assesses the risk of water stress across its operations.

When evaluating municipal bonds and sovereign debt, we look for policies ensuring sustainable water resource use. This includes:

- Developing plans that balance water needs across households and businesses
- Promoting water reuse and recycling
- Setting standards for water quality and efficiency.

Policies should also address equitable water distribution, including vulnerable communities. Incorporating climate change projections into water management planning can further enhance the resilience of water systems.

CASE STUDIES IN CORPORATE WATER STEWARDSHIP

Nestlé: Pioneering Water-Saving Practices[14]

Nestlé faces water-related risk due to its dependence on agricultural commodities such as cereals, coffee, dairy and sugar, and it conducts annual assessments of water risk at its sourcing locations.

In Pakistan and South Africa, where drought and water stress are a persistent concern, the company works with dairy farmers to use water sensors and water-saving techniques in animal feed production. Nestlé calculates a cost for water use, which has led to innovative practices in its milk facilities—it now has six zero-water factories that rely entirely on water from evaporated milk. One of these factories in Mexico has been able to profitably sell its excess water to other industries during drought periods.

In the Extremadura region of Spain, agriculture uses nearly 90% of the available freshwater. Nestlé works with the local tomato supply chain to improve water-use techniques, including installing new technologies such as buried irrigation, humidity sensors and flow meters.

The company's Miajadas facility in Extremadura was the first food factory in Europe to obtain gold-level certification from the Alliance for Water Stewardship (AWS) and aims to certify all Nestlé Waters sites to the AWS Standard by 2025.

Ford's Journey to Zero Fresh Water Use[15]

Ford has set an ambitious long-term target of using zero freshwater across its manufacturing facilities globally and has reduced water withdrawals by roughly 40% thus far.

The goal was driven by the company's view that governments worldwide will inevitably impose limits on water withdrawals.

Fresh water consumption at its vehicle assembly and engine plant in Chennai, India, is just 1.17 cubic meters per vehicle, an incredible achievement compared to 7.3 cubic meters per vehicle only a decade ago. Ford's use of grey water in non-production activities and its smart water efficiency processes allow the company to recycle almost 100% of its industrial wastewater.

At Ford's Vietnam assembly plant, which draws from the Thai Binh River, there are no specific water-use regulations or restrictions. However, a sewage treatment plant that enables Ford to recycle water at this facility has recently been installed.

Alphabet (Google) and Thirsty Data Centers[16]

Google's global data centers consumed approximately 4.3 billion gallons of water in 2022, comparable to the amount needed to maintain 29 golf courses in the southwest U.S. each year. Water-cooled data centers use about 10% less energy and thus emit roughly 10% less carbon emissions than many air-cooled data centers, helping the company to reduce its carbon footprint.

However, cooling with water puts more stress on water resources. The company seeks alternatives to freshwater whenever possible and now uses reclaimed or non-potable water at over 25% of its data center campuses. For example, a data center in Georgia is cooled by recycling local municipal wastewater that would otherwise be released into the Chattahoochee River. Google treats any of this wastewater that is unused before returning it to the river.

ENDNOTES

[1] https://www.usgs.gov/special-topics/water-science-school/science/where-earths-water#:~:text=In%20the%20first%20bar%2C%20notice,serves%20most%20of%20life's%20needs.

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[13] https://www.gov.uk/government/news/new-plan-for-cleaner-and-more-plentiful-water

[14] https://www.nestle.com/sustainability/water

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[16] https://blog.google/outreach-initiatives/sustainability/our-commitment-to-climate-conscious-data-center-cooling/

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