J.P.Morgan | ERM SUSTAINABILITY INSTITUTE

The Future of Water Resilience in the U.S.

October 2024

If you have only 5 minutes...

Water is increasingly important today

1

Climate change, manufacturing, digitalization, and electricity demand are poised to heighten the mismatch between water supply and demand.

As the variability in supply paired with additional demand drivers continues, there will be a competing prioritization of water use.

There is a funding gap for water in the U.S.

2

Like the energy transition, the level of investment does not match the needed spend.

U.S. water infrastructure is at the end of its useful life, and will need more public and private funding.

Early-stage capital is being deployed toward water, but is limited.

Emerging regulation points to the potential increased cost of water.

And both the public and private sectors can provide capital.

The value of water needs to be considered

3

Water pricing in the U.S. does not reflect the true value of water.

As water becomes more crucial, its impact on strategic decisions could affect corporate valuations.

Water presents a business opportunity, with immediate and localized benefits

4

Corporates can position themselves to capitalize on water as an investable theme, limit business risk, and find the optimal financing.

More capital and business models with mature solutions need to be deployed.

Executive Summary

Ask #1

What is the impact of emerging trends such as increased manufacturing investment, data center growth, and growth in electricity demand on water security?

- **Water supply and demand mismatch:** Emerging trends are contributing to higher water usage, while supply is being impacted by greater variability in precipitation patterns. As supply variability grows, businesses will need to have a robust water strategy to secure access and maintain affordability.
- **Competing prioritization of water use:** High-use sector expansion is particularly impactful in regions already vulnerable to water stress, further straining local water resources. In stressed areas, there will be a need to prioritize water use between daily needs and business use cases, necessitating strong community engagement.
- **Putting a price on water:** Water pricing in the U.S. does not reflect the true value of water. Variability in water supply and/or quality can adversely impact operational resiliency and affect corporate business models. As water is recognized as an increasingly important variable, its influence on strategic decisions could reach a level of significance that impacts corporate valuations.

Ask #2

Where is capital needed and who can provide it?

Water is crucial for about 60 percent of global GDP[1], its scarcity and unpredictability could potentially slow GDP growth by up to 6 percent in highly stressed areas[2], and investment in the U.S. is needed across several areas:

- **Water infrastructure maintenance and development:** There is a substantial funding gap in water infrastructure, with an annual federal shortfall of $91 billion in the United States[2]. Capital is crucial not only for maintaining existing water infrastructure, which is already beyond its useful life, but also for developing new solutions to address water scarcity and stress. Investment into flood control infrastructure is also critical to mitigate increasing climate-related impacts to communities and businesses. Ignoring the need for investment today will only exacerbate future challenges.
- **Water and wastewater treatment infrastructure:** Investment is needed in water and wastewater treatment infrastructure, especially in light of evolving regulatory standards such as new per- and polyfluoroalkyl substances (PFAS) regulations.

- **Innovative technologies:** There is a market opportunity for emerging themes such as decentralized and circular water systems, digital technologies, and business models focused on water and wastewater remediation and management.

Capital can be provided by both public and private sectors

- The government funds water infrastructure through major programs like the Clean Water and Drinking Water State Revolving Funds (SRFs), part of the Bipartisan Infrastructure Law, and the Water Infrastructure Finance and Innovation Act (WIFIA). While there are other funding programs available, these two are among the largest. However, government funding is not always fully utilized and may require incentives or structures to increase use.
- Across the private sector, institutional investors, development banks, corporate investors, venture capital firms, private equity firms, and impact investors can invest in developing currently nascent water solutions as well as scaling, deploying, and optimizing mature technologies and business models.
- Both public and private entities should consider investing because water investment has additional benefits beyond direct uses in agriculture and industries, such as enhancing community well-being and supporting biodiversity, increasing the magnitude of impact per investment.

Ask #3

How are those in the financial sector (e.g., asset owners or managers, investment banks, VCs, municipalities, insurance, raters, etc.) addressing this issue?

The financial sector is increasingly recognizing the importance of water security:

- **Institutional investors:** Top asset managers have disclosed proxy voting policies that outline how they will vote on shareholder proposals related to water management and sustainability. Institutional investors are also directly participating in water investment through the Valuing Water Initiative. The Initiative, comprised of more than 100 investors with over $17 trillion in assets under management (AUM), calls on companies to recognize water as a financial risk.
- **Sustainability funds:** Water is one of the top themes among sustainability funds. Companies with exposure to water revenue (supply, treatment technologies, etc.) attract the highest interest from sustainability investors when compared to the broader market.

But more capital and business models with mature solutions need to be deployed:

- **Private investments:** Private equity and venture capital firms invested over $347 million in water-related startups in 2023, and are on track to more than double this investment in 2024, driving innovation in water technology and business models to deploysolutions.

- However, private investment to date comprises a marginal amount of what is needed to update infrastructure, develop advanced water solutions (such as closed loop water re-use systems and new water treatment plants), and enable long-term sustainability in water management through deployment of both nascent and mature solutions.

Ask #4 How should corporates think about business risk and financing?

- **Acknowledging water risk:** Companies are increasingly recognizing water as a risk, though not at the same scale as carbon. From 2012 to 2019, the number of companies in the S&P 500 with water related targets grew by nearly 80 percent (see Figure 9). While the number of companies with carbon related targets has continued to accelerate, water efficiency targets have largely plateaued since 2019.
- **Securing the right water supply:** As interest in water resources accelerates, companies across various industries are increasingly focused on securing sustainable water supplies. They aim to avoid exacerbating stress in already water-scarce regions and minimize community impact.
    - Despite this growing interest, many corporations remain less informed about water issues compared to energy and carbon. They are seeking guidance on setting ambitious yet achievable water targets and understanding the water equivalent of "Net Zero."
    - Investors and asset managers engaging in ongoing dialogue around water management and supply will continue to drive clarity on best practices for corporates.
- **Using green financing tied to water goals:** Water currently represents a small amount of sustainability linked instruments. Corporates in water-intensive sectors could:
    - Set an internal price reflective of the true value of water to appropriately incentivize capital allocation toward water-themed projects.
    - Set science-based water targets, report transparently, invest in water-efficient technologies, improve water quality management, plan for water use reduction, implement water reuse strategies, and consider the true cost of water in their pricing strategies, aligning capital expenditures and mergers and acquisitions (M&A) with these goals.
    - Leverage partnerships with water-focused innovators and capital providers to develop new technologies and deploy mature solutions tailored for the corporation's water footprint and risk profile.

Contents

1

Emerging Themes in Water

1.1

Why is water so important?

In addition to the obvious ways we all use water daily, there are significant water demands that are harder to see. Water use for agriculture, industry, manufacturing, and many types of power generation remains mostly hidden from the public eye, yet accounts for 90 percent[2] of total freshwater use in the United States. To understand why water is critical to the entire U.S. economy, it is important to grasp the specific significance of water to individual communities, various sub-groups within the private sector, and the larger environment.

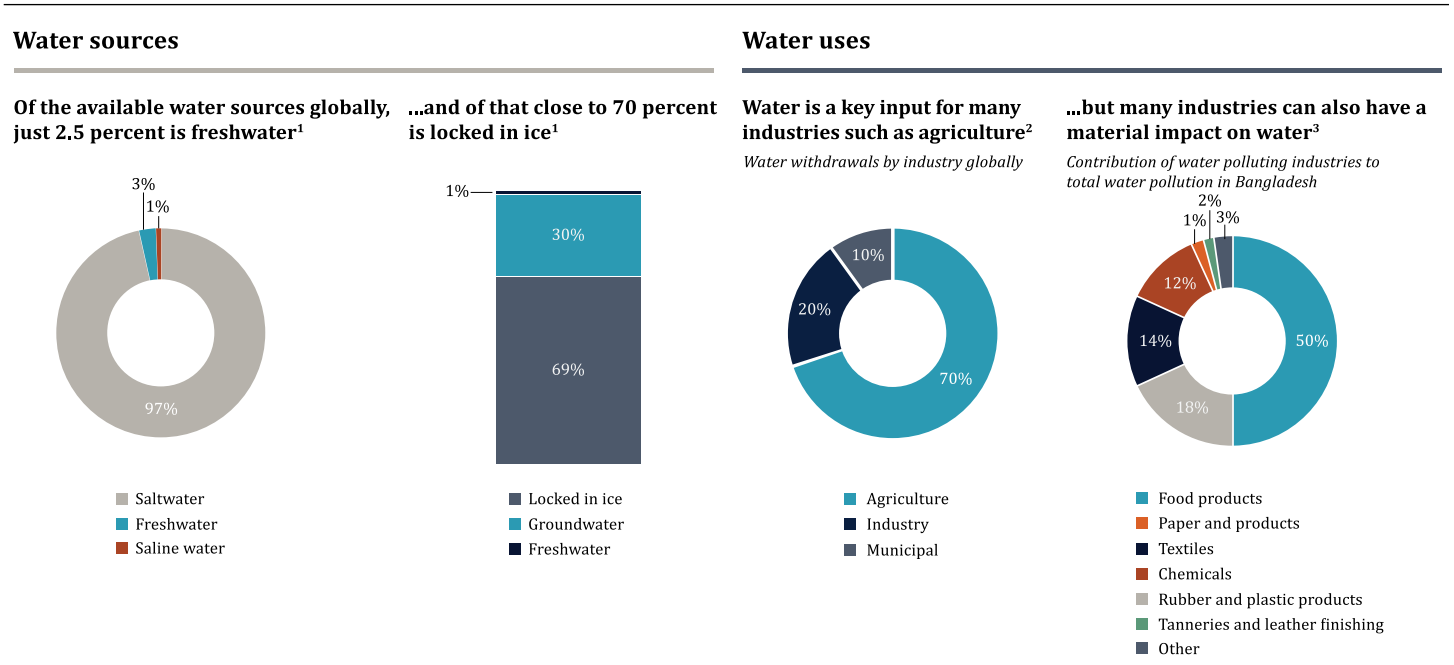


Figure 1: Water is a multi-dimensional and regional issue, with a complex network of sources and uses.

Sources: [1] USGS. [2] FAO. [3] Karmaker et al. (2022)

All of these water users, from individuals in the community, to natural ecosystems, to private sector corporations, are crucial actors in the economy. At present, the economic value of direct water use by industry, municipalities, agriculture, hydropower, recreation, fisheries, and transportation has been estimated at $7.5 trillion per year[2]. However, the indirect economic benefit of water, such as biodiversity health, extreme event protection, and environmental regulation, is estimated to be far greater at $50 trillion per year)[2]. In total, this equates to water impacting roughly 60 percent of global GDP. Continued depletion and volatility of water supply could directly translate into slower GDP growth. The World Bank estimates that, in highly stressed regions, a lack of water availability could impact GDP growth rates by as much as 6 percent[3].

Water plays a crucial role in maintaining ecosystems by supporting the health and balance of various habitats and species via environmental flows (which refers to the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and human livelihoods that depend on them). Overextraction of water beyond the environmental flow can lead to significant ecosystem degradation, as seen in the Colorado River Basin, where drought has caused the deaths of millions of trees along riverbanks, and dwindling streams have caused declines in the populations of aquatic amphibians, fish, and insects.

The combination of overextraction and climate change is causing unpredictable fluctuations in surface and groundwater levels, making blue water availability (i.e., water in lakes, rivers, and reservoirs) increasingly erratic. Seasonal variability and changes in precipitation patterns are leading to more extreme wet and dry seasons, exacerbating the instability of river flows and reservoir levels.

Similarly, green water (i.e., water held in soil for plants) is experiencing heightened volatility due to erratic and intense rainfall events driven by climate change. This disrupts the natural infiltration of water and affects soil moisture levels, which in turn impacts agricultural productivity.

Observed U.S. precipitation change[1]

Water stress in the U.S.[2]

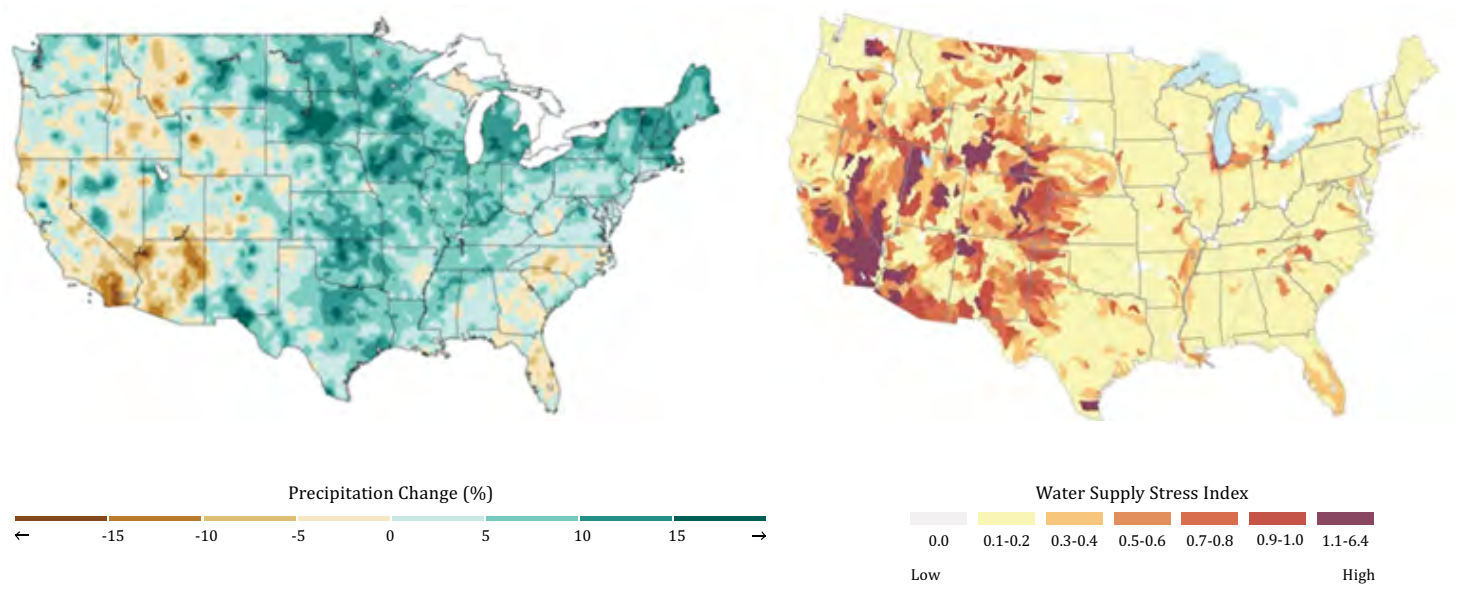


Figure 2: Observed precipitation changes in the U.S. between 1901-1960 and 1991-2012.

Sources: [1] US Global Change Research Program; [2] Water supply stress index for the U.S. based on observations, with widespread stress in much of the Southwest, western Great Plains, and parts of the Northwest. National Climate Assessment

The associated climate impacts of U.S. water system operations are significant, and underappreciated. For example, approximately 12 percent of California's energy use[4] comes from distributing water. As strategies are developed to mitigate water risk, consideration should be given to the emissions footprint of possible solutions. In general, decentralization of water and wastewater systems has potential to reduce the need for conveyance, thereby significantly reducing water system-related climate impacts.

The growing instability of water resources is also pushing us closer to disrupted ecosystem services, threatened biodiversity, and impacted human livelihoods. There is an urgent and growing need to build resilience into our collective water management practices if we are to have reliable water for use in the future. A watershed is considered stressed when demand consistently surpasses available supply— a scenario already unfolding in many regions of the country.

Climate Change and Water

The water cycle and climate are deeply interconnected. Variations in temperature directly influence the rates of water evaporation and precipitation, which is evident as hotter summers result in droughts and wildfires. Climate change not only impacts the amount of rain or snow we receive but also alters their distribution. In the U.S., we are already observing shifts in precipitation patterns, with some regions experiencing increased rainfall and snowfall, while others, like the Southwest, see significant reductions.

Fresh Water Supply and Demand

The supply of fresh water in the U.S. has been decreasing in many parts, a situation exacerbated by rising demand. The primary driver of this increased demand is the nation's growing and shifting population. Many people are moving to warmer, sunnier regions that are already facing water supply challenges. Additionally, new demands from reshoring of manufacturing and AI-based data centers will further strain water resources.

Projected changes in water withdrawals

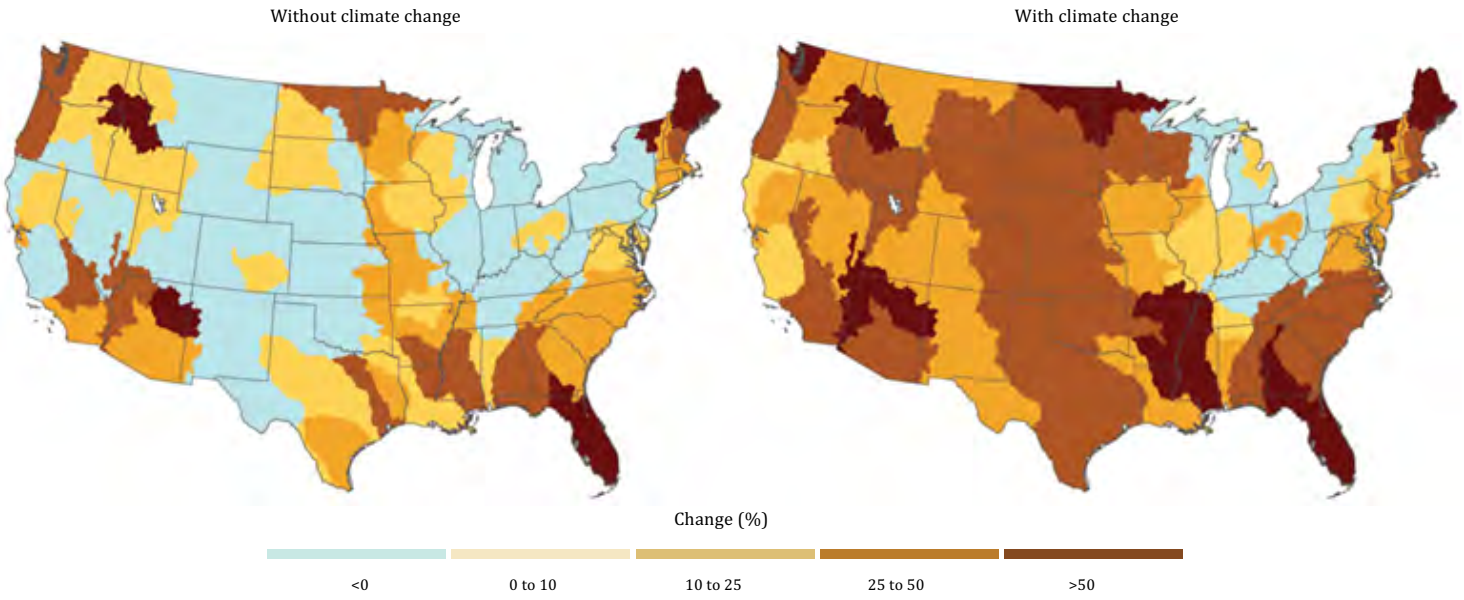


Figure 3 illustrates the projected water demand stretching from 2005 to 2060, considering changes in population and socioeconomic conditions, both with and without factoring in climate change.

Source: National Climate Assessment

1.2

Changes in domestic demand

A shift in demand, stressed resources, emerging public policy, regulatory compliance, climate change, and ageing infrastructure serves as the backdrop for the transformational activities influencing the emerging water insecurity crisis in the U.S.

Following the global COVID-19 pandemic, a national refocusing of industrial policy has spurred the reshoring of manufacturing once conducted overseas. This restructuring is likely to have a significant impact on the country's water dynamics, as manufacturing is a high-use water sector (see figures below).

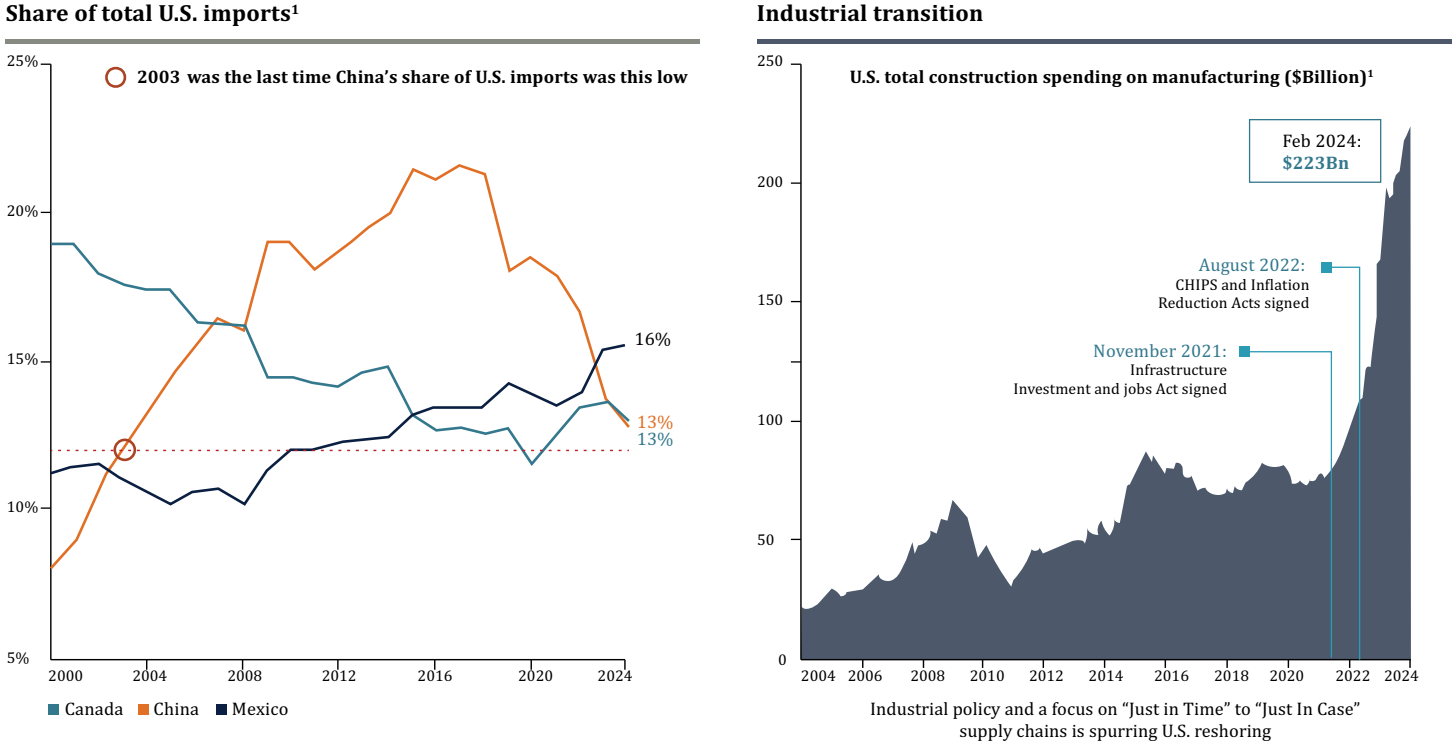


Figure 4: U.S. imports have been trending down as total spending on manufacturing in the U.S. has been rising.

Sources: [1]US Census Bureau, FRED latest data as of September 2024; percent of total U.S. imports and construction spending are seasonally adjusted.

Of particular importance is where this increased manufacturing will be located. Early signals indicate that data centers, semiconductor fabrication, and hydrogen gas development are all set to increase in water-stressed regions of the country.

Locations of existing and planned hubs for water intensive manufacturing compared to the locations of WRI Aqueduct High and Extremely High Water Stress

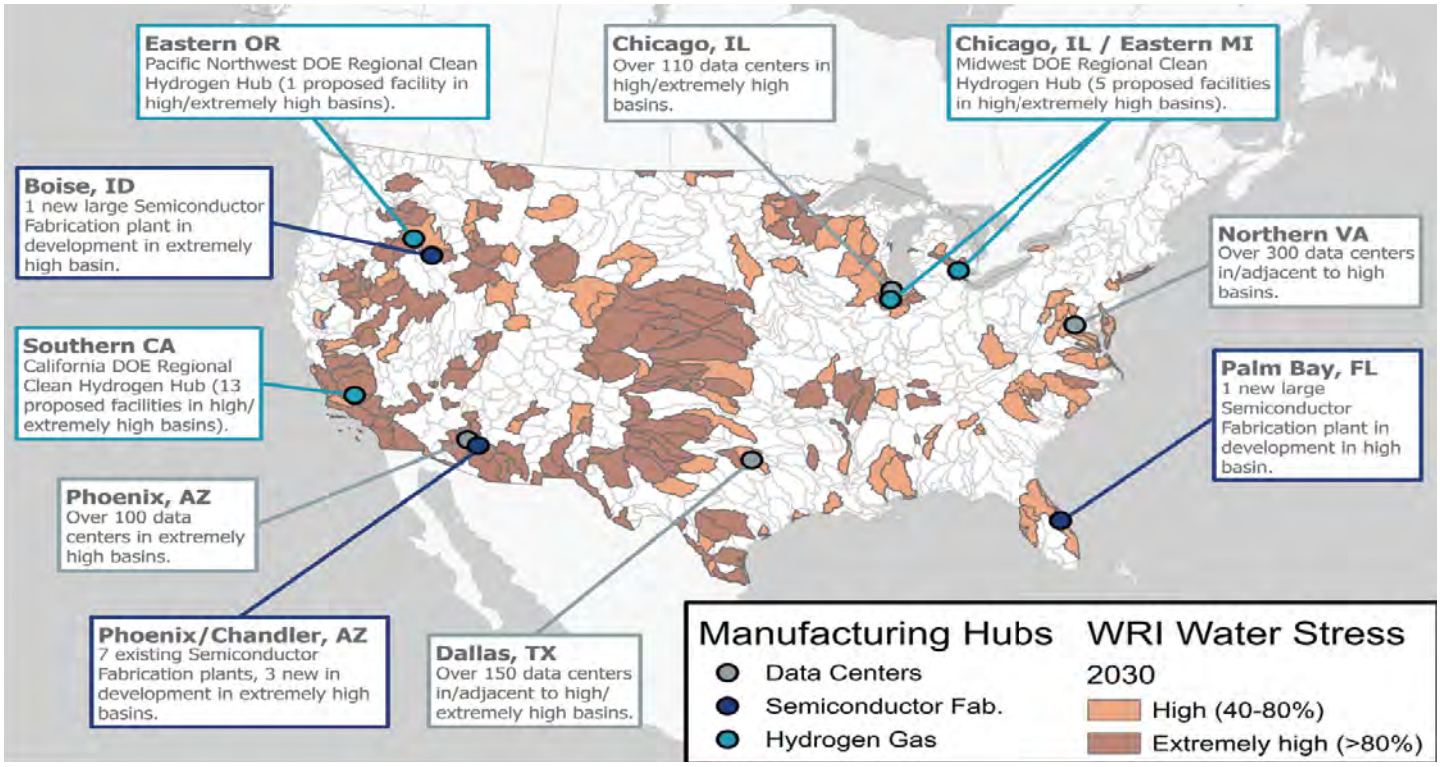


Figure 5: Locations of existing and planned hubs for water intensive manufacturing (data centers, semiconductor fabrication plants, and hydrogen gas facilities) compared to the locations of WRI Aqueduct High and Extremely High Water Stress.

Sources: WRI Aqueduct, Z2, Dgtl Infra, Energy Monitor.

A mishandling of water risk could cause real disruptions to global supply chains as well, with particular implications emerging from the rapid growth of AI. Water is essential to both semiconductor manufacturing and data center cooling operations, two crucial AI-related business activities.

Data centers in particular use significant amounts of water, often from drinking water sources, to dissipate heat produced by servers. On average, a mid-sized data center consumes roughly 300,000 gallons of water per day. Large data centers can use between 1 to 5 million gallons of water per day, which is comparable to the amount used by a town of 10,000 to 50,000[5] people. In total, U.S. data centers used more than 75 billion gallons of water in 2023[6].

Incremental water demand from data centers is often added in areas that already experience water stress. In the U.S., 20 percent of the water used by data centers today is drawn from already stressed watersheds, presenting risks to the technology industry and the surrounding communities and environment[7].

While site selection for data center locations today is heavily influenced by accessibility to cheap, clean power (e.g., Texas, Nevada, and Arizona), incremental water stress on these locations is expected to impact site location for future data centers.

Though data center growth is a notable trend, the broader impact of AI on the water sector expands well beyond cooling technologies in data centers. In order for data centers to operate, they must be equipped with semiconductor chips. The manufacturing of these chips has significant implications on water resources – from quantity to quality to waste discharge. Fab production (1) requires large amounts of water, with withdrawals of leading semiconductor producers often reaching multiples of the large hyperscalers[8], (2) requires ultra purified water, and (3) discharges highly toxic wastewater that is saturated with chemicals and heavy metals[9]. As semiconductors are the foundation of the AI supply chain, the future water management of their operations will be critical for the water sector.

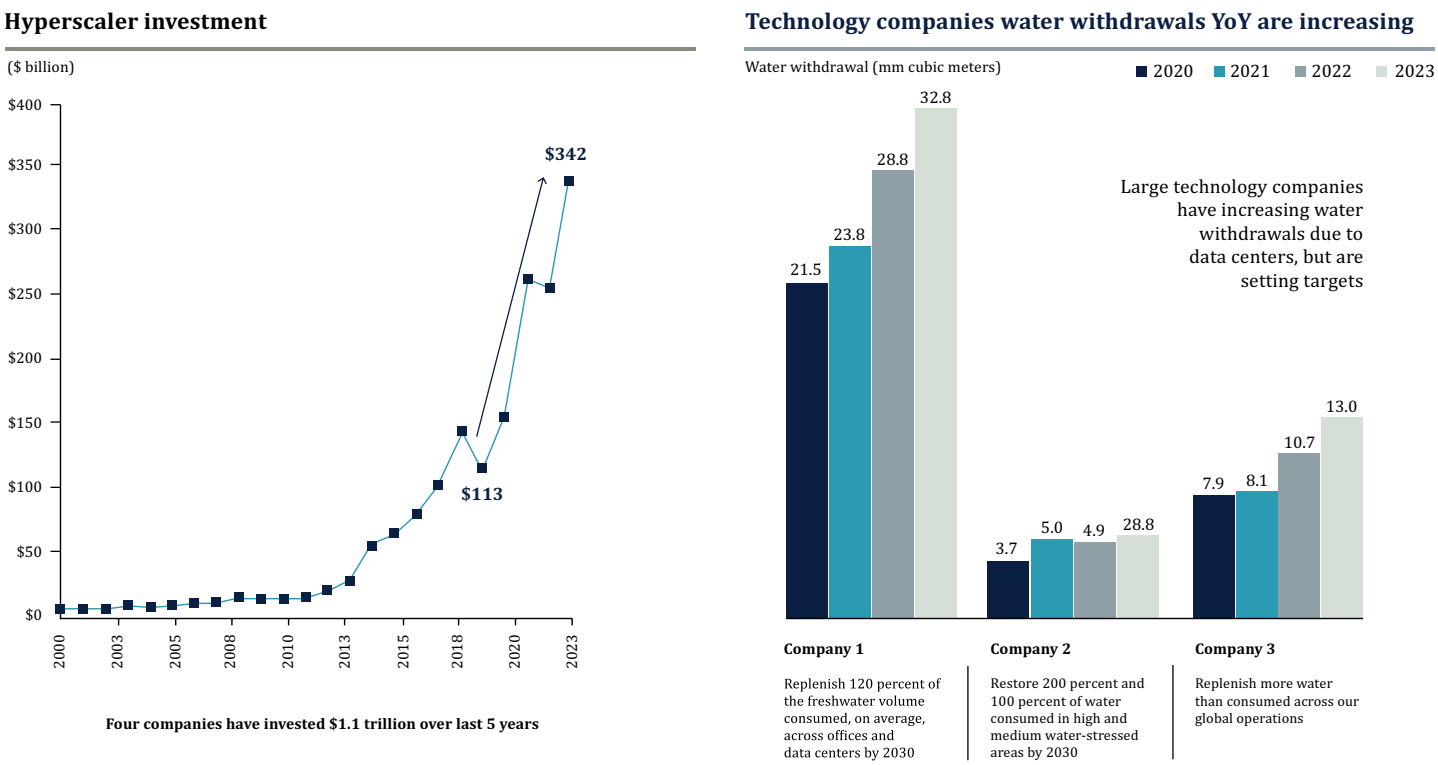
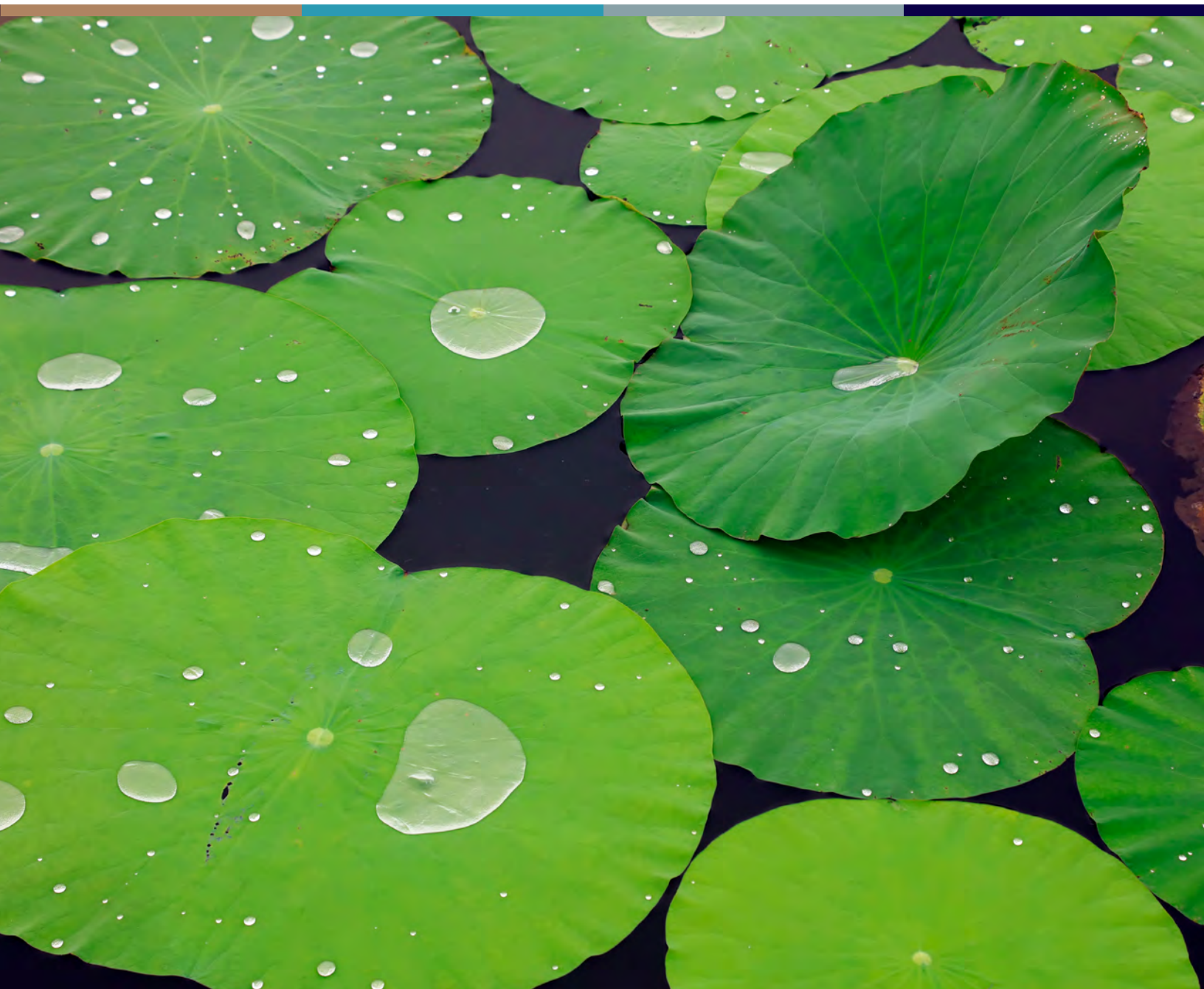


Figure 6: Hyperscaler investment through time and increase in technology company water withdrawals year over year from 2020 to 2023.

Sources: Public company disclosures

2

Water is Underfunded



2.1

Public funding isn't enough

In the U.S., the water sector has been historically underfunded by both public and private sectors. The U.S. Water Alliance notes that based on total capital spending on water infrastructure (including operations and maintenance) at the local, state, and federal levels, 2024 spending is projected at $179 billion. However, estimated investment needs are $270 billion–there is a $91 billion shortfall in public spending[10].

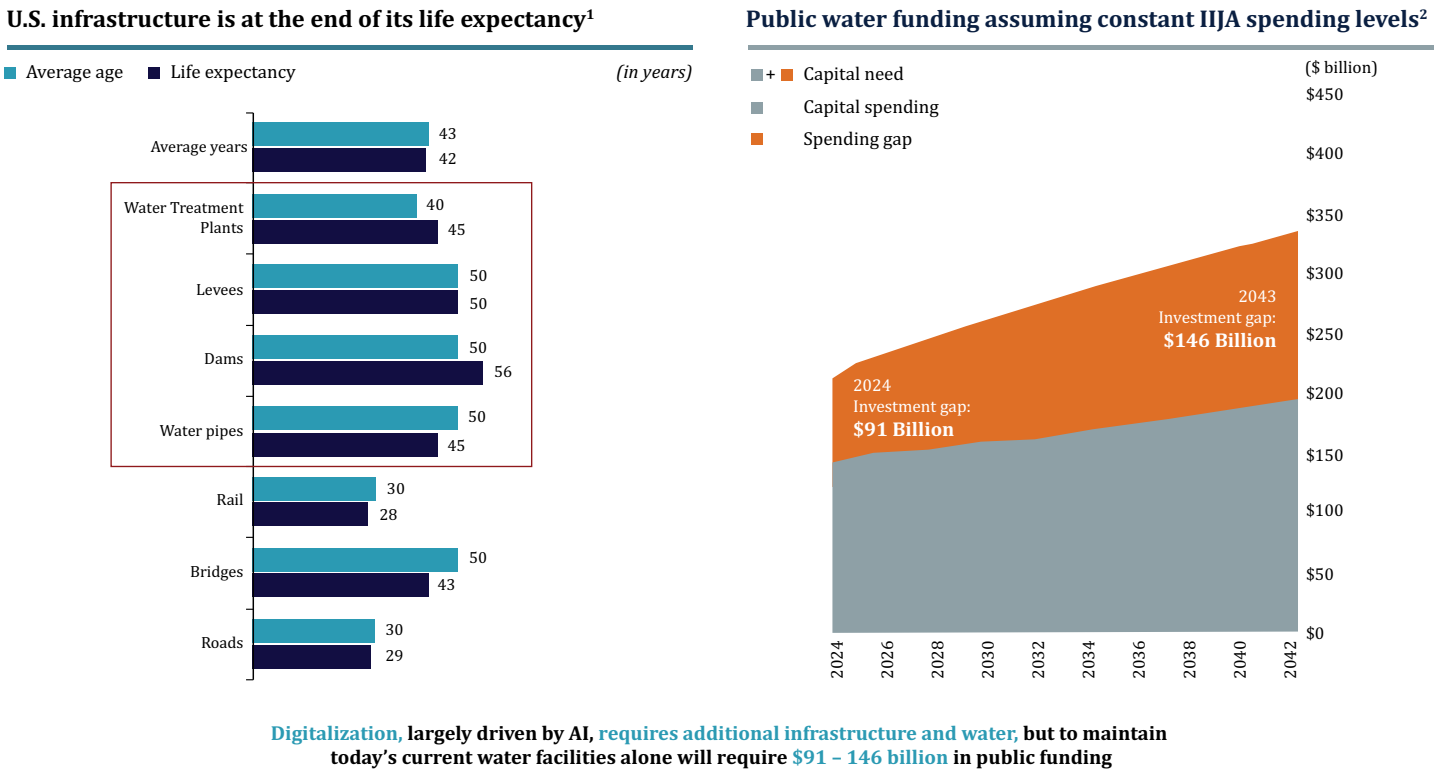


Figure 7: Average age of water related infrastructure vs. life expectancy shows impending need for funding. Maintaining today's water facilities will require $91–146 billion in public funding, as shown above. Trends like digitalization are amplifying the problem with additional needs for infrastructure and water. Note: The Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law, is a United States federal statute enacted and signed into law on November 15, 2021.

Sources: [1] As of 2022, American Civil Society of Engineers; [2] Value of Water Campaign and American Society of Civil Engineers, "Bridging the Gap: The Power of Investments in Water"

Parallel to critical trends such as reshoring of manufacturing and the build out of data centers to support AI, there is an emerging regulatory landscape within the water sector. In April 2024, the Biden-Harris Administration finalized the first ever national drinking water standard, which aims to combat PFAS contamination in drinking water[11].

The PFAS family is a class of approximately 15,000 compounds resistant to water, stains and heat, and used to make products across dozens of industries. Referred to as "forever chemicals" as they do not naturally break down, PFAS have been linked to cancer, kidney disease, immune disorders, and other health problems.

The EPA has earmarked $1 billion per year investment to address PFAS contamination, but the new rule may wind up shifting a much greater financial burden onto corporates, clean water utilities, and ratepayers. The EPA estimates the costs for public water systems and primacy agencies to implement this regulation are approximately $1 billion per year[12]; other studies have estimated the annual cost to be closer to approximately $4 billion per year[13].

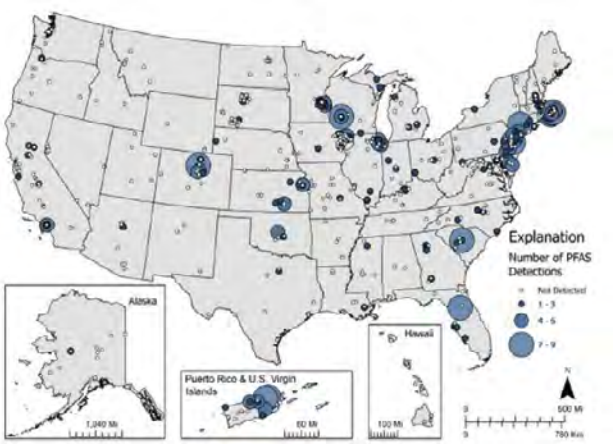
Ultimately, litigation and regulatory enforcement actions against corporates and utilities tied to PFAS could reach trillions of dollars and become a primary mechanism to enforce and fund monitoring, cleanup, and future reduction. The threat of such litigation is likely to accelerate capital expenditures (CapEx) for improving domestic and industrial water or wastewater treatment infrastructure, creating a significant market opportunity to develop innovative technology and deploy existing technology using new business models that can reduce the costs of remediation.

What are PFAS?

PFAS are a class of approximately 15,000 compounds resistant to water, stains and heat, and used to make products across dozens of industries

- Referred to as "forever chemicals" **as they do not naturally break down**: have been linked to cancer, kidney disease, immune disorders, other health problems[1]
- PFAS chemicals are estimated to be contaminating drinking water for over **200 million Americans**[1]

USGS estimates at least 45 percent of tap water could have PFAS[2]



Biden-Harris administration finalizes first-ever national drinking water standard

EPA announces $1 billion investment to address PFAS in drinking water (Apr 2024)[3]

- This investment is a part of a $9 billion investment through the Bipartisan Infrastructure Law (BIL) to help communities with drinking water impacted by PFAS
- An additional $12 billion is available through the BIL for general drinking water improvements, including addressing emerging contaminants like PFAS

Financial implications of New PFAS standards

New rule proposal from EPA may wind up shifting the financial burden onto clean water utilities and ratepayers[4]

- The EPA estimates the costs for public water systems and primacy agencies to implement this regulation are approximately **$1.5 billion/year**[5]
- Other studies have estimated the annual cost to be closer to **~$4 billion**[6]
- **Liability Concerns -** Litigations against corporates and utilities involved in PFAS **could reach $ trillions**[7]

Select Municipalities	Cost Implications of PFAS Standards[8]
Hudson, MA	PFAS cleanup contributed to increasing water utility rates by 18 percent
Wellesley, MA	PFAS cleanup contributed to increasing water utility rates by 50 percent
Hawthorne, NJ	Hawthorne, NJ: PFAS cleanup contributed to increasing water utility rates by 13 percent in both 2023 and 2024
State of Wisconsin	Dept. of Natural Resources may have to drill new wells for PFAS treatment, could cost up to **$2 million/well**
State of Minnesota	Removing/destroying PFAS from water and biosolids leaving Minnesota's WWT facilities could cost between **$14-$28 billion over 20 years**[9]

Figure 8: At least 45 percent of the nation's tap water is estimated to have one or more types of the chemicals known as per- and polyfluorinated alkyl substances, or PFAS, according to a new study by the U.S. Geological Survey. Not all PFAS are detectable with current tests; the USGS study tested for the presence of 32 types.

Sources: [1] The Guardian, [2] USGS, [3] EPA, [4] American Water Works Association (AWWA), [5] EPA, [6] AWWA , [7] Bloomberg Law, [8] NBC News, [9] Minnesota Pollution Control Agency (MPCA)

2.2

Private investment can lessen the gap

Corporates have increased their focus on water targets, but financing with water key performance indicators (KPIs) does not mirror this trend. 'Corporate' environmental targets are increasingly focused on both carbon and water, while in green financing (e.g., green bonds and sustainability linked bonds), the focus remains primarily on carbon and emissions.

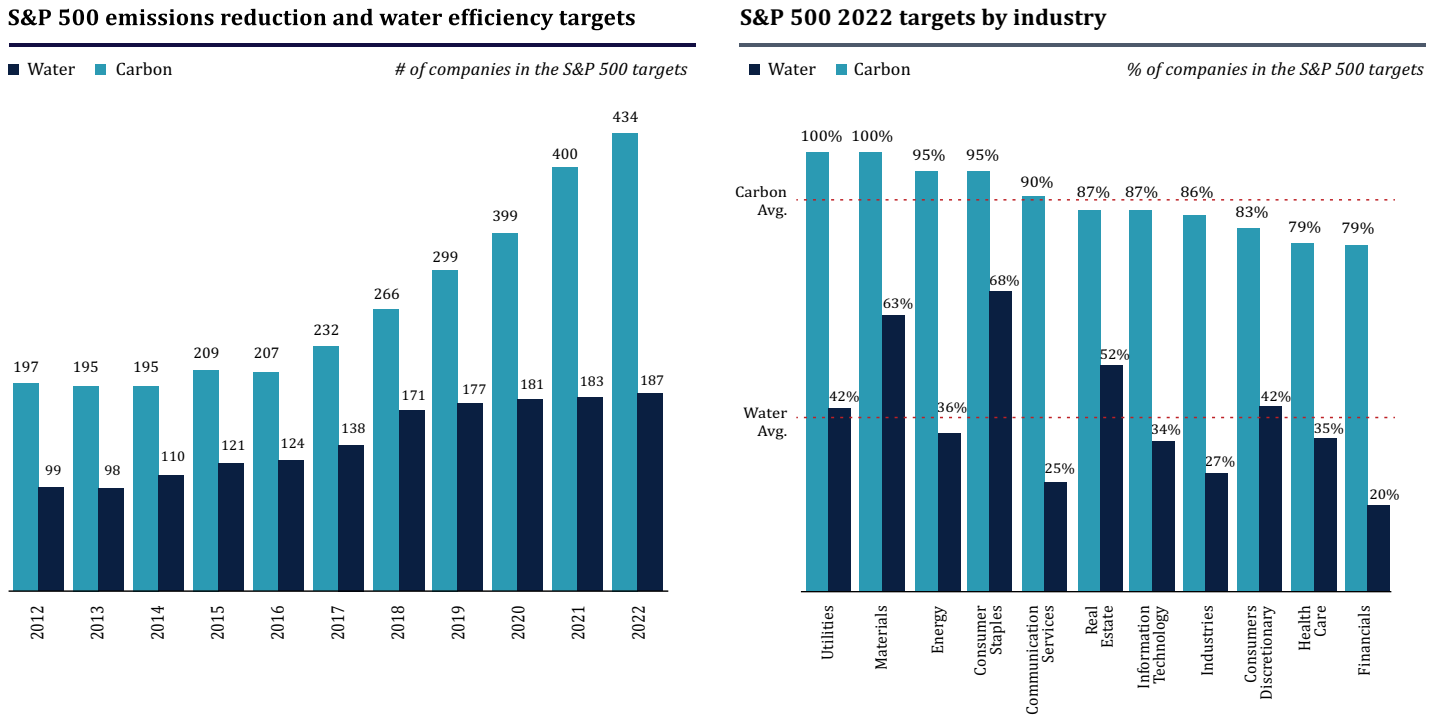


Figure 9: The number of companies with water targets are increasing, and up until 2019 were following a similar trajectory as carbon. Within industries in the S&P 500, there is limited correlation between the number of water and carbon targets.

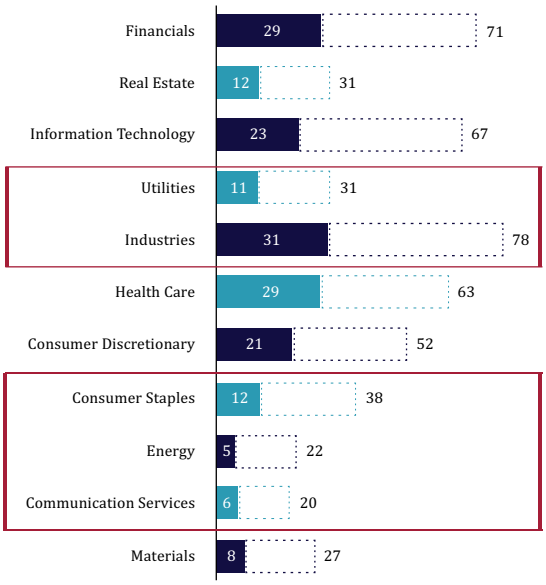
Source: Analysis based on LSEG as of August 2024. Water efficiency and GHG emissions reduction target data as of December 31, 2022

Across sectors, about 35 percent of companies in the S&P 500 have set water efficiency targets, yet in the first half of 2024, less than 1 percent of the KPIs tied to Sustainability Linked Issuances were directed toward water.

Similarly, capital flow from the private sector into water has been limited. Though early-stage climate technology has gained significant momentum as an investable asset class in recent years, water technologies have been largely overlooked in the climate innovation ecosystem.

Figure 10 on the following page shows that of the $160 billion of venture capital invested in climate technology from Q1 2020 – Q2 2024, technologies dedicated to water have only attracted approximately $2 billion, or approximately 1.25 percent of the total investment.

Across sectors about 35 percent of companies in the S&P 500 have set water efficiency targets[1]



Sustainability linked bond targets are not in line with increasing corporate targets on water[2]

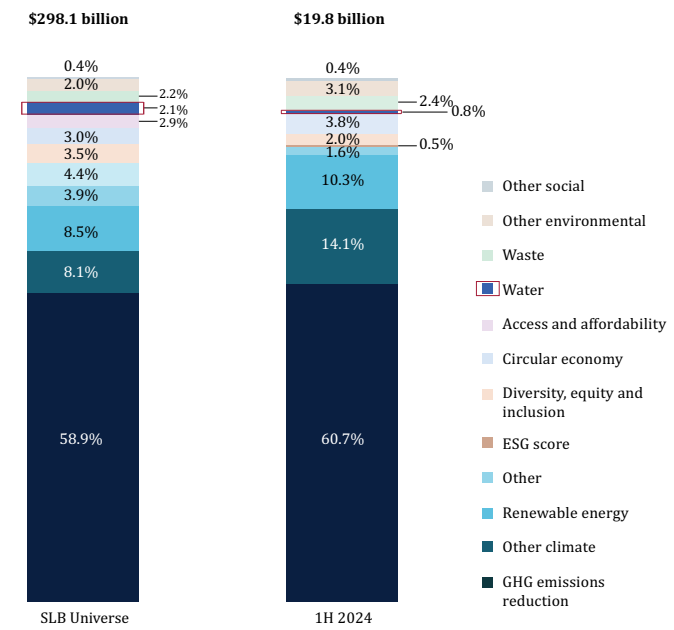
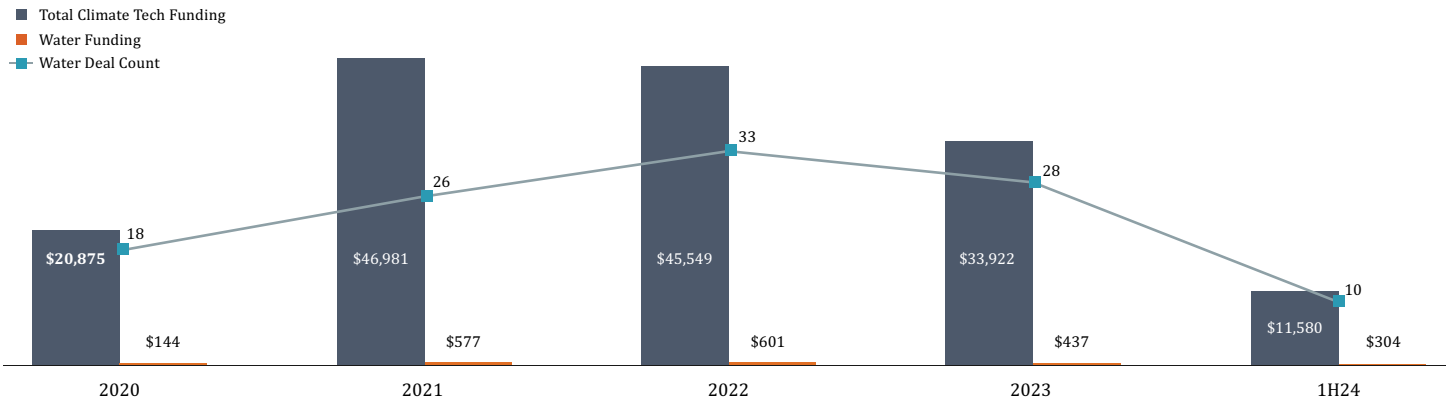


Figure 10: In the sustainability linked bond universe, the focus remains primarily on carbon and emissions.

Source: Analysis based on [1] LSEG as of August 2024. Water efficiency target data as of December 31, 2022, [2] BloombergNEF.

Venture capital investment in water technologies has been relatively mute



YoY funding	2020	2021	2022	2023	1H2024	Total
Energy	$51	$319	$98	$15	$289	$771
Food & Land Use	$82	$89	$372	$65	$7	$614
Industry	$10	$145	$124	$348	$5	$633
Climate Management	$1	$12	$8	$8	$3	$32
Built Environment	$1	$12	$0	$1	$0	$14
Total	$144	$577	$601	$437	$304	$2,064

Figure 11: 2020 – 1H2024 Private capital funding toward water (in million of dollars).

Source: Analysis based on Sightline Climate database as of August 14, 2024.

Investment into scaling, deploying, and optimizing existing or mature water solutions is a critical avenue of private sector participation in funding U.S. water systems. Outside the core segment of water technology, segments like traditional infrastructure and digital systems also represent a significant market opportunity associated with implementation of sustainable water solutions in the U.S.

For example, only approximately 10 percent of total capital expenditures for a typical desalination plant is dedicated to "water technology". The remaining 90 percent of development cost is dedicated to surrounding project components like buildings, piping, and other site or civil infrastructure as well as engineering and construction costs. Only a small component of investment into "water" entails direct investment into "water technology".

2.3

Why is water investment so far behind?

The societal and economic rationale for water investment is clear. Water investment can improve resilience of sectors and economies, and overall health and quality of life. But despite providing both public and private benefits, water investment struggles to scale because (1) public and private sector incentives vary and are not always in alignment, (2) water is vastly undervalued, (3) there is limited historical water investment and transaction data.

Aligning public and private incentives would help address capital allocation.

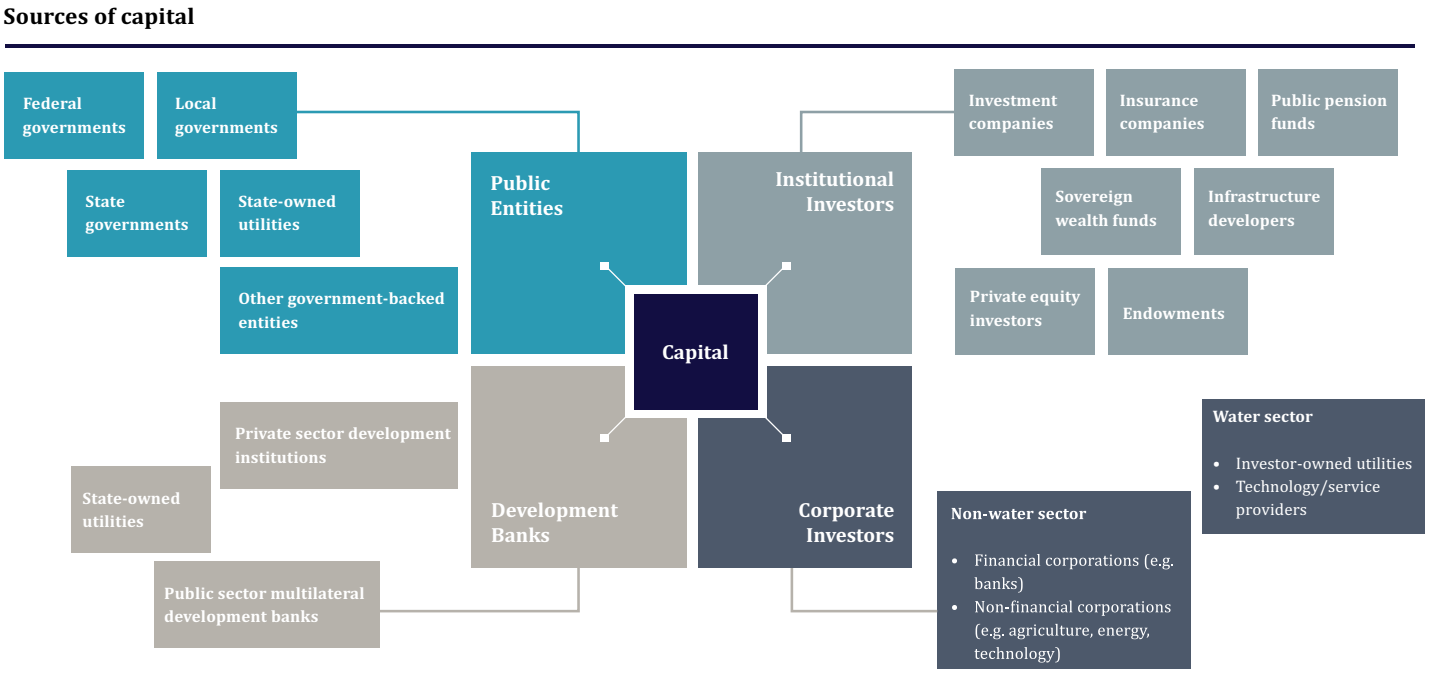


Figure 12: Visual representation of the sources of capital.

Historically, misaligned incentives (e.g., varying mandates, investment objectives, risk appetites and liquidity needs) have restricted participation from most of these investor groups. Structures leveraging multiple pools of capital can align public and private incentives and risk appetites to increase investment flows.

Despite current challenges, such as low water prices and limited policy incentives, corporates can internally strategize to align incentives and effectively assess capital deployment toward water. Although water infrastructure projects require substantial initial investment and have long payback periods (e.g., 20-30 years), they offer long-term economic and environmental benefits. Innovative financing mechanisms like public-private partnerships can help mitigate the challenges of heavy upfront capital and long payback periods. Due to the essential and inelastic nature of water demand, investing in water infrastructure could provide natural downside protection and a hedge against inflation – as inflation is one of the key components of rate adjustment by water utilities[14]. Additionally, water projects align with sustainable development goals (SDGs) and benefit from policy and regulatory support, further reducing investment risks. By committing to these investments, corporates and investors can play a pivotal role in ensuring sustainable water management and securing future economic gains.

3

Financial Sector Response is Growing

3.1

Investors show more interest in water

As awareness of the economic and financial significance of water continues to grow, investors are taking an interest in water sector participation. This includes corporate and investor-led coalitions.

On the investor-led side, asset managers and other financiers are asking companies to understand their impact on water and are unlocking financing for water infrastructure projects.

The Valuing Water Initiative

The Valuing Water Initiative, comprised of over 100 investors with more than $17 trillion in assets under management (AUM), is calling on companies to recognize water as a financial risk. The initiative emphasizes six science-based expectations: water quantity, water quality, ecosystem protection, access to water and sanitation, board oversight and public policy engagement.

On the corporate-led side, coalitions and alliances are emerging to promote sustainable water use.

The Water Resilience Coalition

The Water Resilience Coalition is a CEO-led initiative focused on water stewardship at a basin level. Out of the UN Global Compact and Pacific Institute, this coalition aims for a positive water impact by 2030 on 100 priority basins that support over 3 billion people.

Alliance for Water Stewardship

Many corporates, NGOs and public sector members are also part of the Alliance for Water Stewardship. Their International Water Stewardship Standard outlines a universal framework of best practices for major water users to ensure sustainable water use[15].

As sustainable water use has become more prevalent in company strategies, we see investors and corporates alike coming together to define and implement the most sustainable water use practices.

Additionally, investor interest can be seen by the amount of money invested by sustainability-focused funds in companies focused on water. Water is one of the top themes among sustainability funds. Companies with exposure to water revenue (supply, treatment technologies, etc.) attract the highest interest from sustainability investors when compared to the broader market.

Sustainability-focused fund ownership across the S&P 500[1]

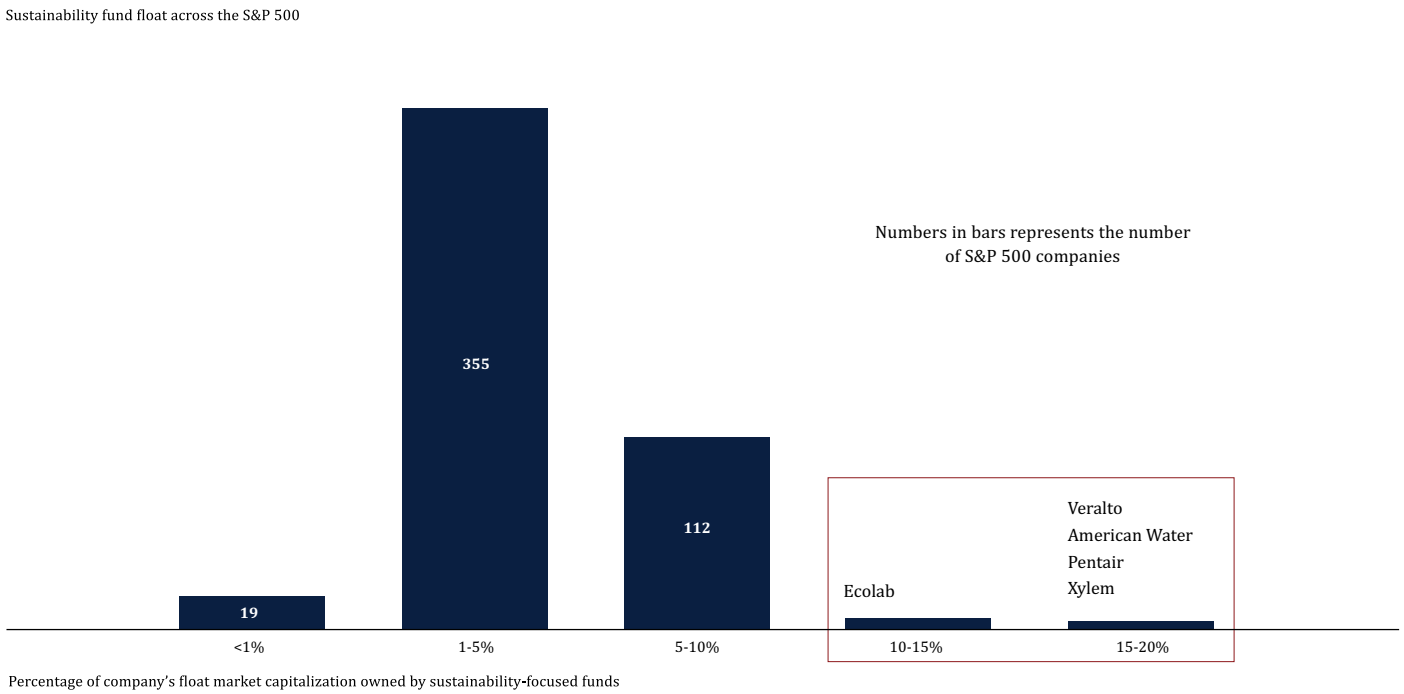


Figure 13: Within the S&P 500, companies with a material amount of water revenue attract the highest amount of sustainability-focused fund investment as a percentage of a company's float adjusted market capitalization.

Source: [1]Analysis based on LSEG as of August 2024, representing data from the second quarter of 2024

BlackRock	"We may engage companies that face risks and opportunities related to land use and deforestation, **access to fresh water,** or the ability to secure scarce resources critical to the transition to a low-carbon economy."
Legal & General Investment Management	Expects disclosures on various areas including **water use, quality commitments and strategies, policies, targets, amongst others.** Strongly encourage companies to also **report via the CDP Water and Forest questionnaires.**
State Street	Expects disclosure to **align with TCFD Governance, Strategy, Risk Management & Targets, and Metrics & Targets** (when relevant). May **review the company's disclosure against industry and market practice** (e.g., peer disclosure, relevant frameworks, relevant industry guidance).
Fidelity Investments	Expects companies to **disclose governance and oversight of resource management** and provide quantitative disclosure of material impact to natural resources. **Encourages companies to establish quantitative time-bound targets,** like water intensity.

Figure 14: Top asset managers by AUM have water proxy voting policies.

Sources: Investor engagement guidelines, BlackRock Climate and Decarbonization Stewardship – applies to funds with explicit decarbonization or climate-related investment objectives; State Street Proxy Voting and Engagement Policy – applies to all companies; LGIM North America Corporate Governance and Responsible Investing – applies to all companies; Fidelity Sustainable Proxy Voting Guidelines – applies to companies held by Fidelity's sustainable investing strategies

4

Water is Changing the Shape of the U.S. Economy

4.1

Water reliability as a business risk

From a corporate perspective, water serves a variety of business functions across critical industries; serious business interruption risks associated with water, such as **process input scarcity, wastewater disposal constraints, and flooding-related impacts, are reflective of the true value of water.**

Proper acknowledgment that reliability of water supply and wastewater disposal can be critical to avoid business interruptions and stranded assets can drive corporations to properly manage water use.

As a result of both business need and investor interest, corporate end-users of water are increasingly aware of their own water footprints (water usage and wastewater discharge from operations) and are implementing initiatives to improve water sustainability to offset growing demand[16].

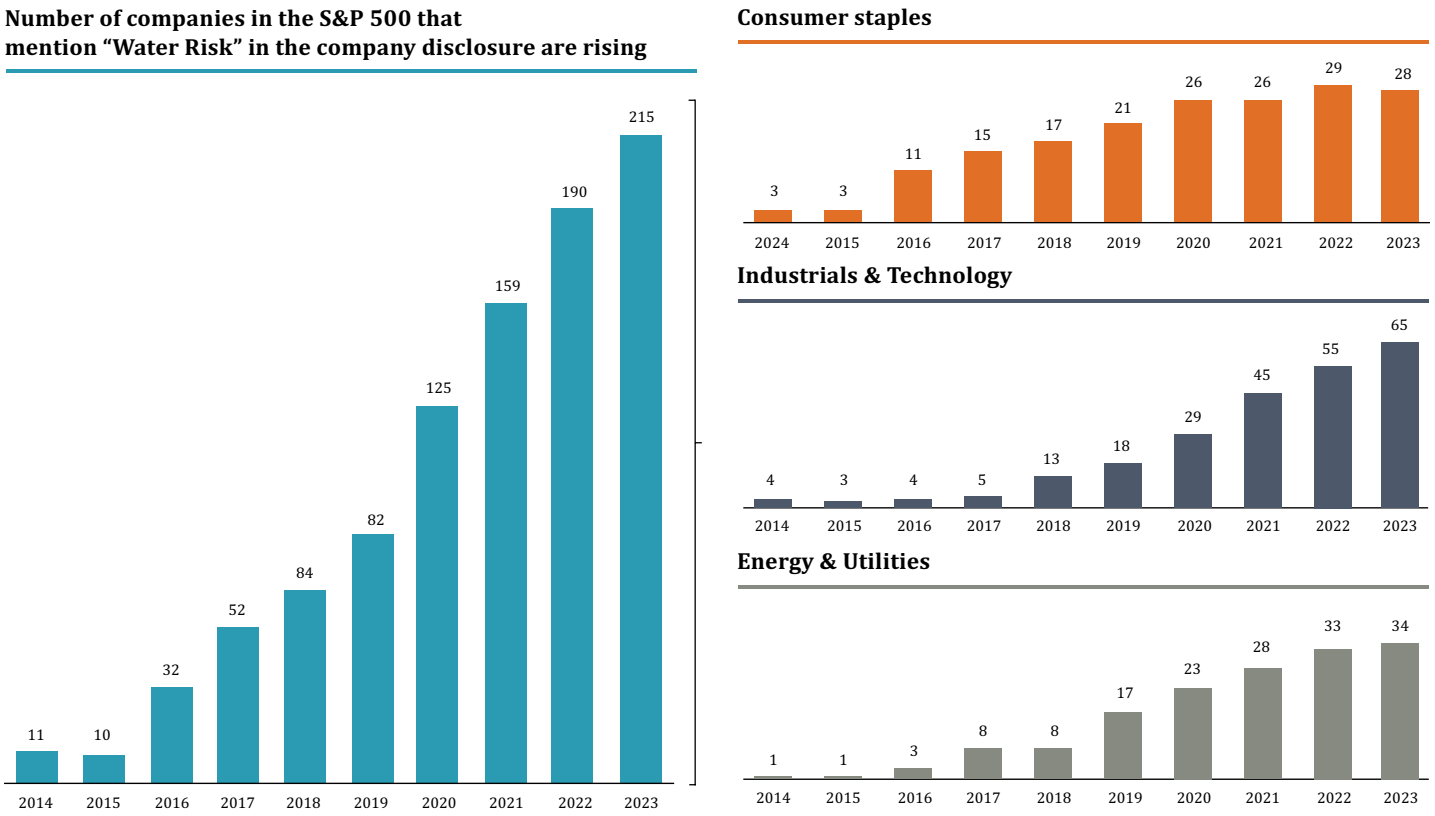


Figure 15: Companies are increasingly taking note of water as a risk.

Sources: Analysis based on AlphaSense Document Trend tool, U.S. Filings, Global Filings, Companies House Filings, Private Company Profiles, Press Releases as of August 2024.

Stranded asset risk can be physically driven by short-term volatility (such as drought, flooding, and severe weather events) and/or long-term change (such as increased water stress, water scarcity, or declining water quality). Regulation can also strand assets by reducing the available water supply through statutory measures, or by otherwise tightening water-related regulations (e.g. wastewater discharge requirements). Assets can also be stranded by community opposition that affects public reputation and/or market positioning.

In general, long-term physical drivers, like stress and scarcity, present more stranded asset risk across sectors than short-term drivers like flooding and drought. Overall, the industrial segment faces the least risk - this segment is protected from many of the physical drivers by urban infrastructure (i.e. flood control structures). Agriculture is the most directly exposed to water supply limitations, both short- and long-term. "Non-quantity" drivers, like water stress, quality, regulation, and community opposition, have the most impact on energy.

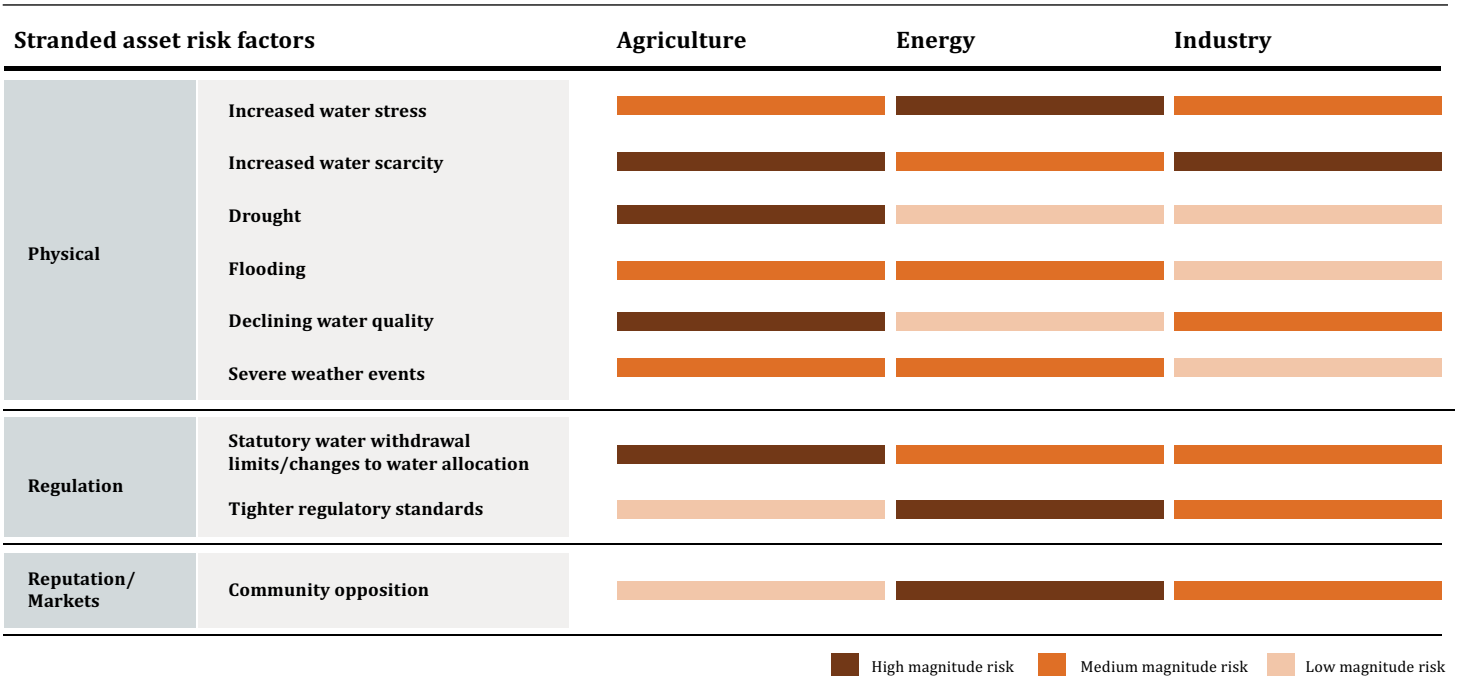


Figure 16: Stranded asset risk factors and how different sectors may be impacted by different physical, regulatory, or reputational elements of water risk.

4.2

The importance of water value vs. price

Accurate water pricing, or lack thereof, can have a significant effect on investors' and corporates' participation in water financing. Historically, the purchase price of water in the U.S. has been far below its actual economic value. However, continued pressure on water resources and infrastructure is pushing up water prices. For example, data shows that the average water, wastewater, and stormwater bill in the U.S. rose more than 10 percent between 2023 and 2024[17].

Beyond the purchase price of water, quantifying the true value of water can ultimately be influential in providing the right incentive for capital providers and corporates to allocate resources toward water solutions and business resiliency. For corporations, the true value of water includes the price paid to a utility or other water provider, the cost of investment required to ensure reliable water service (i.e., new infrastructure), and the portion of revenue that is dependent on the current water supply.

Below are three key mechanisms for water pricing in the U.S., where water pricing is generally fragmented:

Water Utility Bills

Many utilities use a combination of a fixed fee (base) and a variable fee (volume) for their water rate structure. Fixed charges include the price a customer pays to help cover costs for maintaining infrastructure; variable charges are priced based on usage (EPA).

Water Rights

A water right is legal permission to use water for a beneficial purpose such as farming or industry. Corporates across Technology and Energy are highly engaged in buying water rights from private landowners, government, or other corporations to ensure future water supply for operations (California Water Board).

Water Markets

Water futures trading is a nascent market, following the launch of the first ever water futures by CME in December 2020 (CME Group). The Nasdaq Veles California Water Index helps price risk associated with water scarcity in California, and is particularly relevant for the Agriculture industry.

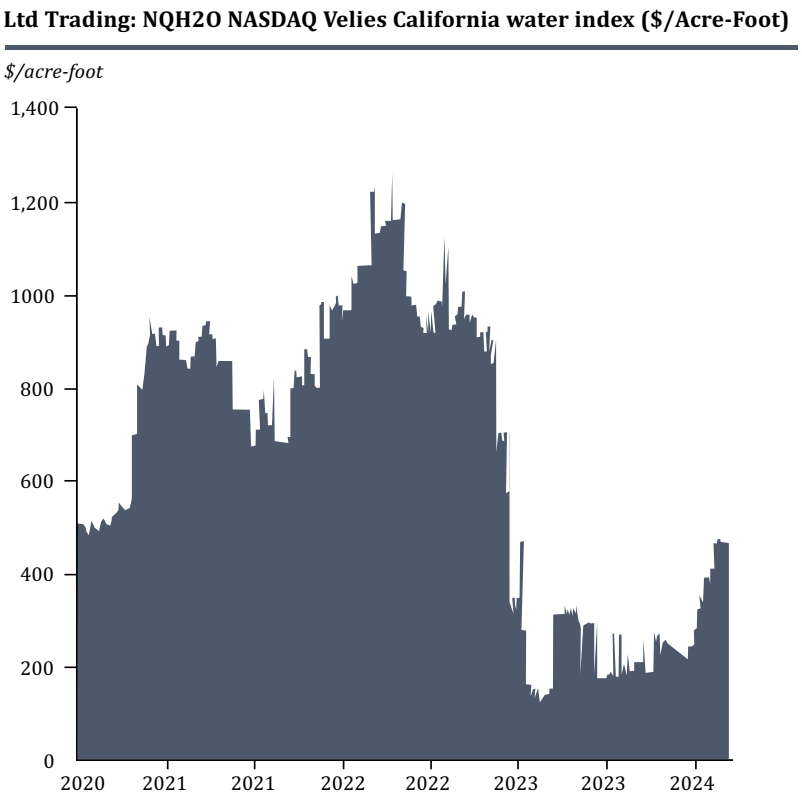


Figure 17: Price of water in California.

Source: NASDAQ

The number of companies using water pricing is growing, but total use of water pricing is low compared to carbon pricing use. Out of roughly 2,800 companies in the MSCI All Country World Index (AWCI), a total of 648 companies used internal carbon pricing in 2022 while only 120 used water pricing.

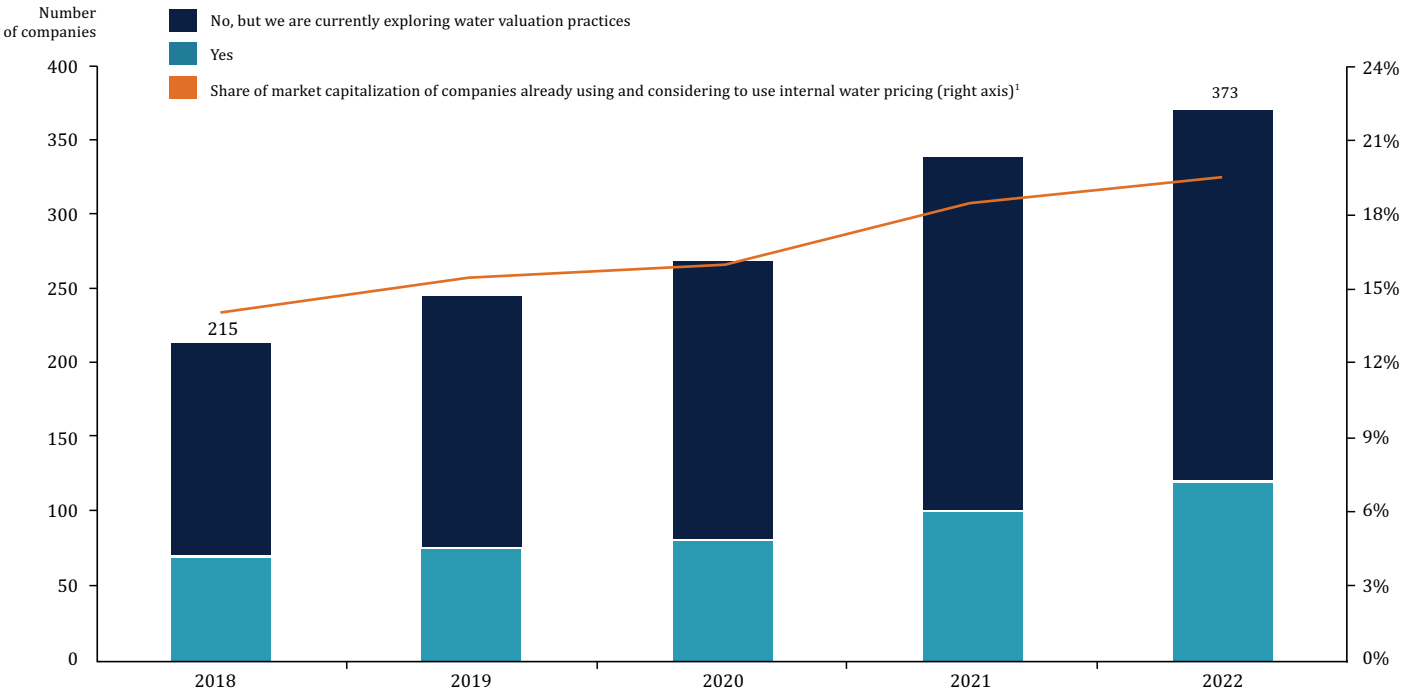


Figure 18: Companies using internal water pricing.

Sources: CDP database, DWS analysis 2023, DWS Investment GmbH as of March 15, 2023, [1]MSCI All Country World Gross TR Index, Market cap as of February 28, 2023

Conclusion

The current gap in U.S. water funding from both the public and private sectors is being exacerbated by growing areas of demand. Widespread digitalization creates an increasing water need, as companies look to secure computational power and technology industries build data centers to secure data. This gap is further widened by the inefficient use of technology that already exists.

Without additional funding and efficiency mechanisms to deploy existing capital, new areas of demand will continue to worsen the funding gap. However, corporates and investors are becoming interested in putting capital to work in the water space, as evidenced by investor surveys on key areas of interest for future investments.

Correcting the mismatch between growing water demand and unstable water supply will require coordination and market mechanisms that increase both efficiency and total capital invested. Historically, public and private markets coordinate through partnerships, whether public, private, or combined. We can expect to see more partnerships develop with the adoption and rise of AI.

Building best in class data centers to support AI and the resultant increase in computing power will require materials, power, and water. The same partnerships and funding mechanisms can be used to address all of these resources.

Corporates should consider various water solution financing options

Select Strategic Levers		Water pricing	Consider an internal price on water to appropriately incentivize capital allocation
		Assess Stranded Asset Risk Factors	Determine what risk factors the business is exposed to, to prioritize capital allocation to specific water solutions
Financing options	Debt/Cash	Joint Ventures	Participate in a water solution joint venture to leverage combined expertise, share risks, and drive innovation
		In-house development	Allocate capital toward in-house development of water solutions to foster innovation, maintain control over proprietary technologies, and address sustainability challenges directly
	Equity	Co-investment	Leverage co-investments to access new areas of expertise, deal flow, and capital, in line with water goals
		Funds of funds	Use a fund of funds to invest in water, diversifying risk and accessing expert management
		Corporate VC	Use a venture arm to directly invest in water solutions for access to innovation and strategic growth
		Accelerators	Procure innovative water investment opportunities and technologies by participating in a water focused accelerator
	Debt	Carbon credit bond for water	Structure bond(s) with a carbon credit coupon supporting water projects
		Supply Chain Financing	Align supply chain to water goals
		Green bonds	Use a green bond framework, with aligned projects to achieve water goals
		SLL with water KPIs	Use water KPIs in sustainability linked loan

Figure 19: Water solutions financing options.

Sources: Public disclosure.

Call to action for corporates

In addition to the above suite of financing solutions, the following initiatives can broadly be viewed as best practices for corporate water action.

For water-intensive companies:

Set science-based water targets and report transparently

Companies should consider regularly disclosing water-related risks, impacts, and progress toward sustainability goals. To avoid negatively impacting water availability, especially in water-scarce regions, businesses need to assess water use across operations and supply chains. Setting reduction targets based on local conditions is crucial, particularly in stressed watersheds. Firms should also improve supplier reporting and traceability of water-intensive inputs, engage suppliers to identify water use reduction solutions, and provide incentives for water efficiency and reuse.

Invest in water CapEx and OpEx

Investing in technologies that reduce water consumption and improve waste water recycling is critical. Leading companies are developing wastewater treatment plants and exploring innovative methods like waterless cooling systems. Extending water-positive efforts across supply chains is essential, as demonstrated by consumer companies reducing downstream water usage by encouraging efficient product use.

Water quality is also a growing concern due to pollutants like microplastics, metals, and chemicals. Companies should assess water quality impacts across operations, supply chains, and product life cycles, set appropriate targets, and prioritize actions to reduce harmful discharges. Corporations should align capital expenditures and investment activities with pollutant reduction goals, focusing on eliminating persistent pollutants and heavy metals.

For solution providers in the water sector:

Expand water technology solutions and seize innovation opportunities

Helping companies and utilities achieve water neutrality or water positive goals presents significant business opportunities for water solutions providers. This includes opportunities to develop new technologies as well as to scale, deploy, and optimize mature technologies and other solutions.

- **Water-intensive sectors and companies:** Opportunity to more effectively measure, monitor, report on water footprint
- **Pure-play water technology companies:** Opportunity to complement traditional utility model, implement digital and distributed technologies, such as advanced treatment
- **Traditional Utilities:** Opportunity to partner with pure-play technologies, and become more efficient in large-scale operations, while maintaining revenue streams

Drive innovation through strategic venture investment

Stay at the forefront of water management, recycling, and treatment technologies by investing in new technologies and innovation by partnering with venture capitalists or establishing in-house corporate venture capital (CVC) arms. Collaborating with venture capitalists accelerates the commercialization of new solutions. Creating CVC arms allows direct funding and scaling of emerging innovations, enhancing the capacity to address corporate and municipal demand for sustainable water solutions and remaining competitive in a rapidly evolving market.

Below are eight interrelated elements for corporates in water intensive sectors to consider implementing in their water management plans:

Eight strategic levers for corporates

Element	Best-In-Class-Action	Positive Action
Target Setting	Publicly set a short-term water use reduction target across all operations	Set water-specific conservation and efficiency targets
Monitoring	Conduct quarterly water use and discharge monitoring for all operated assets	Conduct routine water monitoring for largest facilities or high-water-use assets
Reduction Plans	Develop and disclose comprehensive water reduction plans, prioritizing high-risk water basins and assets	Develop and disclose water conservation initiatives, with timelines for key operations
Water Reuse	Commit to achieving 100 percent water recycling or reuse in operations by 2030	Develop plans to increase water recycling or reuse by 2025
Measurement & Reporting	Demonstrate commitment to water sustainability by adopting third-party water stewardship standards (e.g., CDP Water)	Report water withdrawal, use and discharge metrics separately from other environmental data
Culture	Regularly promote water management as a priority from senior leadership to operators and contractors	Educate and engage the workforce on the importance of water stewardship as operational best practice
Third-Party Engagement	Undertake independent, third-party water audits to validate measurements and identify opportunities for improvement	Learn from best practices disseminated by leading industry groups and water coalitions
Mergers and Acquisitions	Improve water use efficiency of acquired assets and pursue responsible management of water-related risks during dispositions	Include water sustainability as a key factor in due diligence during M&A activity

Figure 20: Best-in-class actions for corporates in water intensive sectors to consider implementing in their water management strategies.

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We also thank all the participants who provided valuable insights and feedback during the New York Climate Week Water Roundtable.

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Endnotes

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