Water Infrastructure & Resiliency

Industry Report & Investment Case

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Water Industry Overview

Whether it's used to manufacture pharmaceuticals or to brew your morning cup of coffee, water is a vital resource. While 332,500,000 cubic miles of water exist on Earth, a mere 4% is freshwater – and only about 0.9% of that exists as surface water[1]. With global population rising to an estimated 10 billion by 2055[2], the global supply of freshwater will need to be stretched and new sources of potable water will need to be developed. A resilient future depends on innovation in the ways we access and utilize this precious resource.

The global water market is attractive for two main reasons: reliability and opportunity. Due to its essential nature, the demand for water remains consistent despite fluctuations in the economy. But the availability of freshwater is increasingly in question, due to the triple threat of population growth, climate change (with increasing droughts and other impacts from changes in global weather patterns), and water resource contamination from industrial processes. These significant drivers and resulting impacts ensure the need for the continued development of innovative technologies to capture, treat, and distribute water to thirsty consumers – and to all the industries through which water flows.

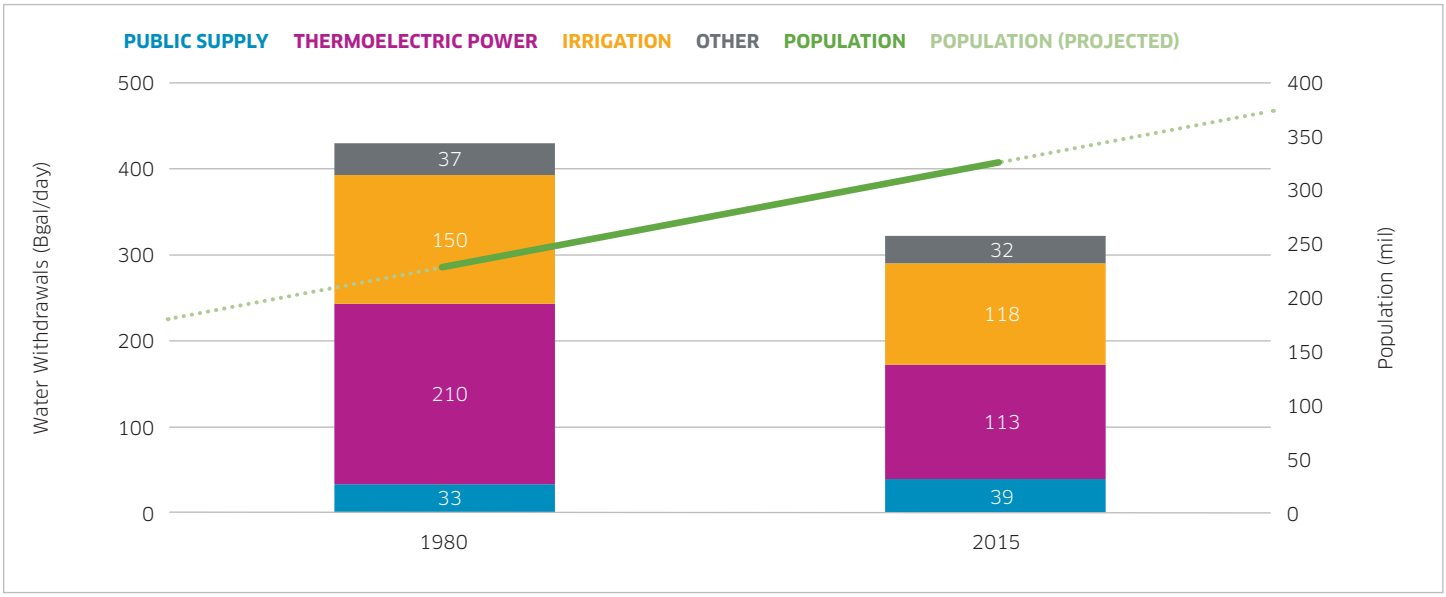
The ISE Clean Edge Water Index (HHO) tracks the performance of U.S.-listed companies that derive a substantial portion of their revenue from the potable water and wastewater industry. Industry exposure includes:

- Utilities and water distribution
- Infrastructure (pumps, pipes, and valves)
- Water solutions (purification and filtration)
- Ancillary services such as consulting, construction, and metering

The Essential Nature of Water

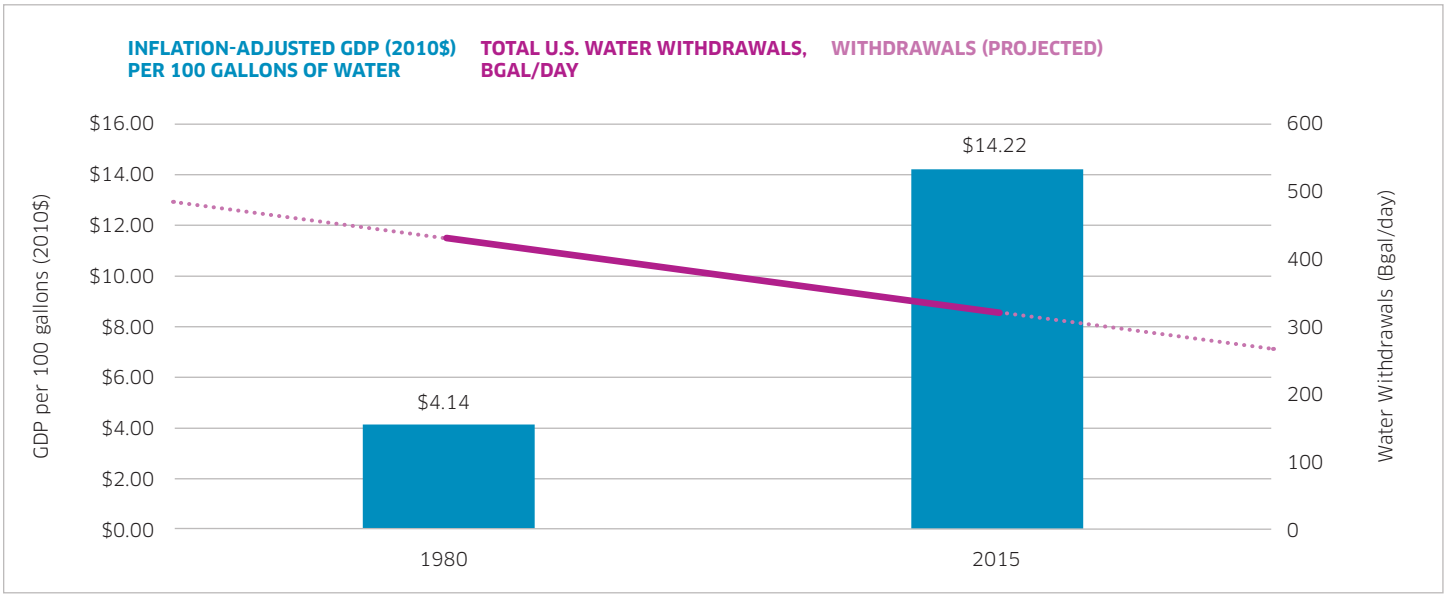
Total per capita water use in the U.S. is around 1,100 gallons per day, though only about 80 to 100 gallons of that is used at home[3]. Withdrawals for agriculture and thermoelectric power production make up a larger part of overall consumption. Many industries also rely on large volumes of water, including materials, textiles, automotive, and construction[4]. However, we're all learning how to conserve water. Total water use has been declining in the U.S. since it peaked in 1980, and economic productivity per gallon of water has continued to rise. Economic productivity is defined as the U.S. GDP divided by the total annual withdrawals from surface water, groundwater, or sea water over a given year. This rise in productivity indicates we are producing more value from less water than ever before.

U.S. Water Use vs. Population, 1980 and 2015



Source: USGS Water Use Data for the Nation, 2018[4]

Economic Productivity of Water vs. Total Daily Withdrawals, 1980 and 2015



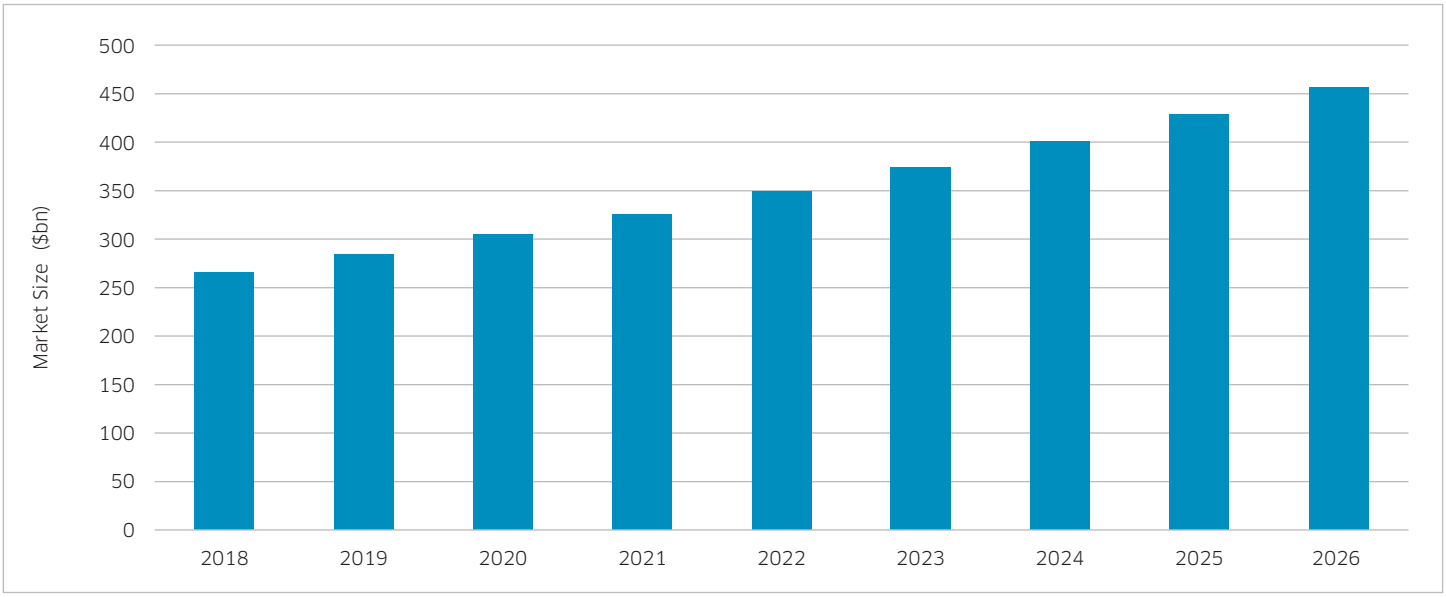
Source: USGS Water Use Data for the Nation, 2018[4]; World Bank Data, 2020[5]

Global access to freshwater is limited, with extreme precipitation and extreme drought linked to climate change becoming more common. In January 2018, Cape Town, South Africa became the first city to announce it was three months away from running out of municipal water. April 12, 2018 was dubbed 'Day Zero.' As another unbearably dry summer and fall progressed, Cape Town saw thousands of residents lining up to collect water from local springs, unable to avoid signs of the impending crisis as they waited in the blazing sun[6]. Cape Town managed to avoid running out of water entirely, but Day Zero serves as a testament to the global need for technical solutions to curb consumption in drought-prone areas. During the same period in 2018, other regions also faced water supply issue. More than a third of the continental U.S. experienced drought and many regions implemented water-use restrictions[7]. Mexico City continued to sink in elevation, due to groundwater extraction outpacing aquifer replenishment – an ongoing problem since the mid-19th century[8]. Chennai, India, a mere 3 years after historic floods, received less than 60% of its typical rainfall during the 2018 monsoon, leading to devastating water shortages the following year[9]. With the future supply of freshwater in question, efficiency is the name of the game. The best players are developing new technologies to do more with less.

What is Driving Growth?

Growth in the water sector is multi-faceted and the driving factors vary by region. Larger cities and increased population mean urban water supplies will be stretched further. Rural areas face higher costs of distribution. Wet areas may face flooding, and arid regions extreme drought. Infrastructure, though, is at the forefront of water industry discussions. Utilities need to replace aging infrastructure, and many are considering new technologies to meet a changing landscape and growing demands: automated data collection, built-in efficiency mechanisms to prevent leakage, and treatment technologies that can respond quickly and efficiently to changes in source water. The global market for treatment technologies will grow rapidly. A 2019 report from Fortune Business Insights, a market research consulting firm focused on disruptive technology markets, projects the global water and wastewater treatment market to reach $456.68 billion by 2026, up 72% from $265.30 billion in 2018[10]. The U.S. market will lead this expansion, with investment coming from federal, state, and local government – as well as an increasingly large pool of private funds.

Global Water and Wastewater Treatment Market Value, 2018-2026



Source: Fortune Business Insights, 2019[10]

The Rise of Resilient Infrastructure

The water treatment and distribution infrastructure in the U.S., and across most of the developed world, needs extensive upgrades. Much of it was installed in the mid-20th century, with estimated lifetimes between 75 and 100 years. In the U.S., large swaths of the nation's million-mile-long pipe network will need to be replaced in the next 25 years, a growing concern among water industry professionals. The American Water Works Association (AWWA), a nonprofit scientific and educational association dedicated to water quality and supply, presented a survey of 1,853 North American water professionals in its 2019 State of the Water Industry report. The participants ranked "renewal and replacement of aging water and wastewater infrastructure" as the number one issue facing the water industry, with 63% of participants noting it as "critical." This is the seventh consecutive year that infrastructure has topped the list, highlighting the need for massive investment. As also noted in the AWWA report, the EPA estimates a required investment of at least $472.6 billion over the next 20 years. While many water utilities aim to be full-cost operations, covering all future investments with the revenue gained from utility services, most cannot afford these upgrades at the rates they currently charge. To prepare for future expenditures, about two-thirds of utility respondents noted they had intentions to raise water rates in the coming year. Sixteen percent of respondents also indicated they were considering a public-private partnership[11].

Issues Facing the Water Industry in 2019 as Ranked by All Respondents (n = 1,853)

RANKING	CATEGORY	RANKED CRITICALLY IMPORTANT (%)
1	Renewal and replacement of aging water and wastewater infrastructure	63
2	Financing for capital improvements	55
3	Long-term water supply availability	55
4	Public understanding of the value of water systems and services	40
5	Watershed/source water protection	39

Source: American Water Works Association 2019 State of the Water Industry[11]

Most water distribution infrastructure is underground. Digging up old pipelines for maintenance presents an opportunity to integrate new technologies and develop more resilient infrastructure. Point-of-use water metering is already relatively common in countries with developed distribution infrastructure, and the adoption of smart meters presents a compelling economic case. Automated meter reading and advanced metering infrastructure (AMI) make more frequent data collection at more locations possible, allowing utilities to pinpoint leaks in the system. With more than 240,000 water main breaks each year in the U.S., rapid response to leaks can save utilities thousands of dollars in wasted water[12].

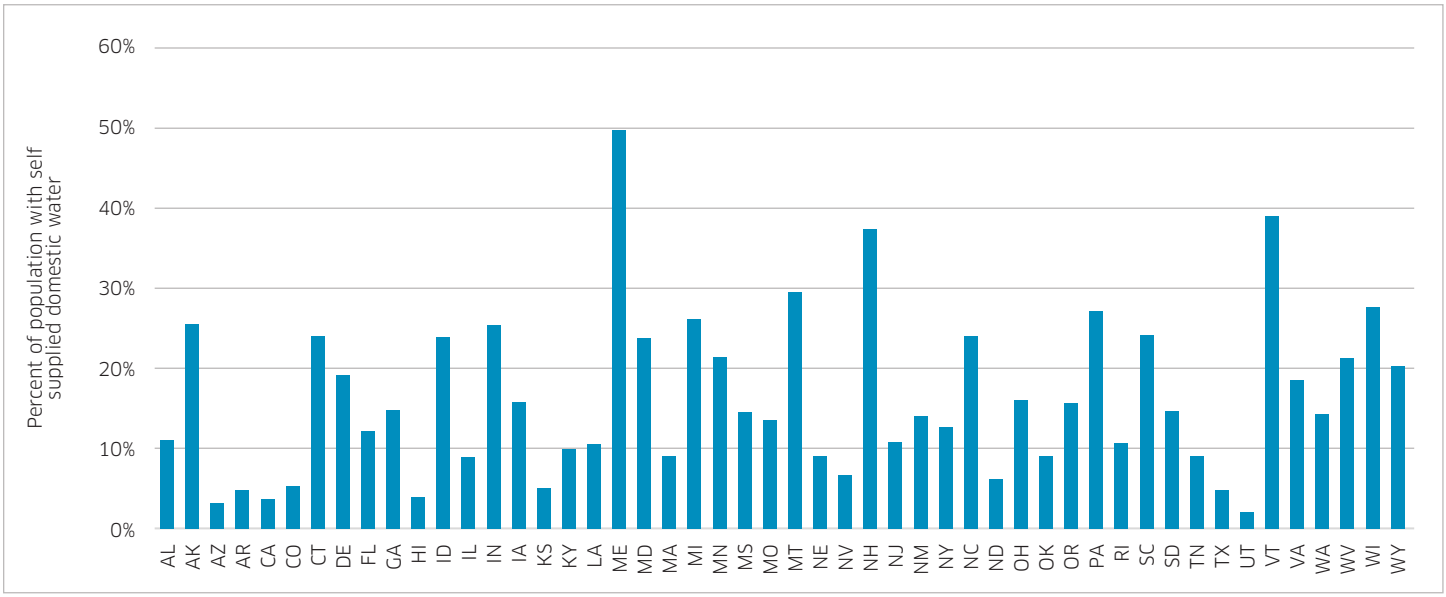
Smart meter infrastructure can also allow utilities to recover more quickly after natural disasters. Following Hurricane Irma in 2017, the Provo Water utility in Providenciales in the Turks and Caicos Islands in the Caribbean was able to re-pressurize its system and start distributing water just four days after being knocked offline, thanks to data from its Itron AMI system installed one year earlier[13].

The use of smart water management technologies also provides customers with the information needed to implement more effective conservation strategies. The U.S. market, particularly water utilities, is responding to an influx of smart metering technologies. According to a 2020 report by Markets and Markets, a business-to-business research firm focused on emerging opportunities and threats, the U.S. will retain the largest share of a smart water management market projected to grow to $21.4 billion by 2024[14], followed by Asia, Europe, and the Middle East.

The smart water movement is about more than quantity, though – it's also about quality. With hundreds of potential water contaminants, collecting and sending samples for laboratory analyses can take days, leaving water utility plant operators unable to respond effectively to water quality changes. Water quality sensors allow for real-time monitoring and response to contamination. The 2014 crisis in Flint, Michigan serves as a stark reminder of what can happen when utilities are slow to respond to water quality data. The city's drinking water supply was contaminated with lead from corroded pipes after a change in the source water. The slowness of the response left thousands of residents sipping dangerous amounts of lead. Crises like these highlight the need for data-driven solutions – the total number of lead service lines is still unknown, according to the U.S. Government Accountability Office[11]. Increased public awareness of water quality issues will continue to push the treatment market toward digital technologies.

While everyone consumes water, centralized water treatment will likely never reach 100% of the global population. Point-of-use treatment options will dominate the market in areas where there are still no plans for centralized infrastructure, or where the cost of building such infrastructure is prohibitive. As of 2017, for example, approximately 13% of Americans supplied their own drinking water from a household well[4]. These wells are not exempt from declining groundwater levels and changing precipitation patterns. For many water-pressed regions globally, especially those without distribution infrastructure, a decentralized system such as an atmospheric water generator (AWG), which condenses liquid water from humidity in the air, can be a reliable source of clean water. AWG makers such as Zero Mass Water, GENAQ, and Akvo already offer residential units. These systems will become increasingly relevant at a municipal scale for use during emergency water shortages. In September 2017, the EPA signed a Cooperative Research and Development agreement with Watergen to develop its AWG GEN-350 system as a water production and supply solution[15].

Percent of Population in Each U.S. State Using Household Wells (2015)



Source: USGS Water Use Data for the Nation, 2018[4]

Emerging Trends & Tech Opportunities

As noted throughout this report, there is a range of significant opportunities for new and emerging technologies in the water sector. Other technologies and megatrends poised to greatly influence the sector in the coming years include:

- **Digitization.** As water becomes scarce, the cost of freshwater is rising. As a result, efficiency measures must be implemented – requiring data to inform decisions. Smart meters, sensors, AI, big data, and other digital technologies will be at the forefront in the management of water, efficiency, and leak detection.
- **Microplastics Everywhere.** The issue of microplastics is gaining a lot of attention in scientific journals, the news, and increasingly corporate boardrooms. Microplastics are any plastic particles which have broken down to 5 mm or less in diameter, typically found polluting waterways. They are produced by clothing, litter, and industrial processes. Addressing microplastics contamination with techniques such as filtration techniques to remove them from both wastewater and potable water will become a growing trend.
- **Forever Chemicals.** Research into the health effects of contaminants like per- and poly-fluoroalkyl substances (PFAS) are driving more stringent regulations in drinking water. These chemicals are commonly used to provide waterproof, greaseproof, or nonstick coatings, but persist for an extremely long time in the environment. Scientists can't yet predict the half-life of these molecules, as they do not degrade under normal conditions[16]. While no contaminant limit currently exists for PFAS under the Safe Drinking Water Act, the EPA has issued

preliminary determinations to regulate the two most common forms - PFOS and PFOA[17]. This has driven investment in R&D for treatment technologies like carbon filtration, ion exchange, and reverse osmosis. Consumer concerns about these "forever chemicals" and other contaminants could also lead to significant market growth in the point-of-use treatment segment, particularly reverse osmosis[18].

- **Desalination.** Coastal areas are impacted by increasing demand on freshwater aquifers, which can result in saltwater intrusion. In response, desalination plants are being implemented globally. Saudi Arabia sources about 50 % of its drinking water supply from saltwater[19]. In the U.S., population-dense coastal areas are starting to invest in desalination. Poseidon Water is poised to open a 50 million gallons per day desalination plant in Huntington Beach, California by 2023[20]. As populations rise and coastal areas shift with the climate, these plants will become an attractive option for more cities.
- **Water Reuse.** Circularity is all the rage right now – and water is part of that trend. Instead of treating wastewater as "waste," a growing number of companies and utilities are looking to reuse these streams. In the U.S. Southwest, years of drought restrictions have triggered cities to invest in wastewater recycling. Denver Water is building a recycling plant that can serve 43,000 households – and is only one of 12 water recycling facilities in Colorado[21]. Other industries investing in water recycling include oil and gas, mining, and thermoelectric power. All this contributes to a strong market for modular treatment units as well as water storage systems and consulting services.
- **Leak Management.** A major issue facing aging water infrastructure is water lost via leakage. At least 6 billion gallons of water are lost to aging, leaky pipes every day in the U.S. – a stunning 14% of daily consumption[12]. A growing number of companies are working to address the issue, utilizing increased data from smart meters to identify leaks and tighten distribution infrastructure.

Beyond Carbon: Water and ESG

In July 2010, The UN General Assembly recognized water as a basic and universal human right. Yet despite water's essential nature, 2.2 billion people globally live without safe access to drinking water services[22]. There is demand for innovation in this sector, and continued innovation will be needed through the decade and beyond. The World Economic Forum has ranked water scarcity and water crises among its top global risks since 2012[23]. Water is at the center of the climate crisis, and many communities will experience water scarcity issues without intervention. UN estimates show that intense water scarcity could displace 700 million people by 2030[22]. This will lead to increased political tensions around water – driving investment into new water sources and disruptive technologies to treat, store, and distribute this resource efficiently. Innovative companies are already investing in research and development. In January 2020, Xylem opened a research and development hub at its headquarters in Singapore, dedicated to creating solutions in resilient infrastructure, leak management, and predictive maintenance[24].

Countries Most Exposed to Water Risk, 2019

RANK	COUNTRY
1	Qatar
2	Israel
3	Lebanon
4	Iran
5	Jordan
6	Libya
7	Kuwait
8	Saudi Arabia
9	Eritrea
10	United Arab Emirates

Note: Rankings based on average exposure to baseline water stress, flood risk, and drought risk

Source: World Resources Institute, 2019[25]

With a future ripe for innovation, resilience building, and improving lives globally, the water market is strongly tied to ESG goals, and ESG-focused investors are responding. In October 2019, water utility stock price gains were outpacing the market due to concerns over water scarcity and a steady rise in ESG investments[26]. As water has become more important to investors, sustainability-minded companies are starting to report their water management data in addition to their carbon footprints. Historically, granularity in water use data has been relatively low. For global large-cap companies, water withdrawal data coverage is around 43%. This means less than half of the largest companies track and report how much water they take from surface water or aquifers. In certain sectors where water is a material issue, like semiconductors and mining, coverage is around 80%[27].

There is no doubt that increased digitization will enable continued improvements in data collection and reporting. As this trend continues and more water use data is available, ESG portfolios will increasingly target water neutrality as a goal, investing in companies that can reduce their net water consumption and negative impact to zero. Water is also favorable to ESG investors because it allows investment into infrastructure. Historical underfunding of infrastructure by the public sector has forced private infrastructure investment. These investments are increasingly scrutinized for their ability to respond to environmental and social issues[28]. By investing in resilient infrastructure and targeting strong ESG goals, investors are participating in a positive transition to privately funded infrastructure.

How Can People Invest in Water?

The ISE Clean Edge Water Index (HHO) is designed to track the performance of companies that derive a substantial portion of their revenues from the potable and wastewater industry. Industry exposure includes water distribution, infrastructure (pumps, pipes, and valves), water solutions (purification and filtration), and ancillary services such as consulting, construction, and metering.

To be eligible for inclusion in the Index, a security must meet the following criteria:

- The issuer of the security must derive a substantial portion of their revenues from the potable and wastewater industry, according to Clean Edge
- Be listed on the Nasdaq Stock Market, the New York Stock Exchange, NYSE American, or the CBOE Exchange
- Have a minimum worldwide market capitalization of $100 million
- Have a minimum free float of 20%
- Have a minimum three-month average daily dollar trading volume (ADDTV) of $500,000
- One security per issuer is permitted
- Have “seasoned” for at least three months on an index recognized market
- The issuer of the security may not have entered into a definitive agreement or other arrangement, which would likely result in the security no longer being Index eligible
- May not be issued by an issuer currently in bankruptcy proceedings
- The issuer of the security may not have annual financial statements with an audit opinion that is currently withdrawn

The Index is evaluated in March and September. The criteria are applied using market data as of the end of January and July. Securities meeting the criteria are included in the Index. Security additions and deletions are made effective after the close of trading on the third Friday in March and September.

As of June 30, 2020, the ISE Clean Edge Water Index (HHO) held 36 stocks and its sector exposure was heavily weighted in Industrials (66%) and Utilities (25%) according to the ICB classification. The remaining two ICB sectors were Health Care (5%) and Basic Materials (4%).

Index Breakdown

ICB INDUSTRY	WEIGHT (%)
Industrials	66
Utilities	25
Health Care	5
Basic Materials	4

Source: Nasdaq, June 30, 2020

The ISE Clean Edge Water Total Return Index (HHOTR) has demonstrated long-term alpha generation through security selection. It was able to outperform both the Nasdaq US Benchmark (NQUSB) Total Return Industrials and Utilities industry indexes in all 1-, 3-, 5-, 7- and 10-year time horizons. It also outperformed Nasdaq U.S. Benchmark Total Return Index (NQUSBT) in the 3-, 5-, 7-, and 10 year time horizons.

Total Return Statistics

	HHOTR (%)	NQUSBT (%)	NQUSB INDUSTRIALS (%)	NQUSB UTILITIES (%)
1Y	14.6	17.0	11.0	3.7
3Y	14.0	12.6	10.4	8.6
5Y	17.0	11.9	12.3	11.3
7Y	12.5	12.2	11.7	10.6
10Y	14.8	14.1	14.0	11.5

Source: Nasdaq, August 12, 2010 – August 10, 2020

The ISE Clean Edge Water Total Return Index (HHO) also shows a distinguished value proposition with low-to-moderate correlations to the aforementioned three Nasdaq benchmarks: NQUSB (91.7%), Industrials (93.4%), and Utilities (65.8%).

Correlation with Benchmarks

	NQUSBT (%)	NQUSB INDUSTRIALS (%)	NQUSB UTILITIES (%)
HHOTR	91.7	93.4	65.8

Source: Nasdaq, August 12, 2010 – August 10, 2020

With 36 stocks in the ISE Clean Edge Water Total Return Index (HHO) (much lower than that of the benchmarks its being compared to here), it should come as no surprise that it is slightly more volatile (than the three benchmarks). But, with higher volatility doesn't mean that it is riskier. Instead, although the index's correlation measure and sector exposure both suggest that the index will be more like an Industrials than Utilities sector index, its maximum drawdown is actually more in-line with that of Utilities.

Annualized Volatilities

	HHOTR (%)	NQUSBT (%)	NQUSB INDUSTRIALS (%)	NQUSB UTILITIES (%)
1Y	37.5	34.0	37.6	38.2
3Y	25.0	22.9	25.4	24.5
5Y	22.0	19.7	21.7	21.1
7Y	20.2	17.7	19.6	19.3
10Y	21.0	17.7	19.9	17.7

Source: Nasdaq, August 12, 2010 – August 10, 2020

Historical Maximum Drawdown

HHOTR (%)	NQUSBT (%)	NQUSB INDUSTRIALS (%)	NQUSB UTILITIES (%)
-36.2	-34.8	-39.5	-36.2

Source: Nasdaq, August 12, 2010 – August 10, 2020

Conclusion

The global market for water, as highlighted in this research report, is governed by a looming threat of shortage and a rapid expansion in disruptive technologies. Drivers vary by region, but renovation and replacement of aging infrastructure is sure to dominate investment in the near future. Some other key takeaways include:

- As the demand for more accurate, granular data on water use rises, utilities and industries will turn to digital solutions including smart meters and water quality sensors.
- Extreme weather and a rise in contaminants from industry will drive municipalities and individual consumers alike to find resilient ways to treat, store, and use water.
- Industries and municipalities will invest in alternative sources of freshwater, such as wastewater recycling, desalination, and atmospheric water generation.
- Water will become an increasingly important part of ESG portfolios, as investors seek to create positive impacts on water infrastructure and drive continued innovation in water efficiency.
- According to Fortune Business Insights and others, the outlook for the water and wastewater treatment market remains positive moving forward.

These developments, along with continued innovation in this sector, create unique opportunities for investing in water. The ISE Clean Edge Water Index (HHO) provides access to U.S.-listed companies that are active in the global water market. Investors can gain exposure to the index through the First Trust Water ETF (FIW).

Resources

1. https://www.usgs.gov/special-topic/water-science-school/science/how-much-water-there-earth?qt-science_center_objects=0#qt-science_center_objects
2. https://www.pewresearch.org/fact-tank/2019/06/17/worlds-population-is-projected-to-nearly-stop-growing-by-the-end-of-the-century/
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