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Executive Summary

The earth faces a tremendous challenge when it comes to water due to the supply and demand imbalance, the lack of substitutes, and the United Nation's declaration that drinking water and sanitation are a human right. While historically some have viewed water as a free public good, populations are beginning to recognize the need to innovate and create solutions while also considering attaching prices to water.

Investors are also increasingly focused on water-related challenges, recognizing the market's potential to provide solutions for this expanding global problem while generating competitive financial returns.

This report provides a basic introduction to water-related macroeconomic and investment sectors in which water, as a natural resource, is the primary driver of value. It highlights current trends, detailing several themes and opportunities, while outlining the social and potential return benefits of investing in water.

Find out your water footprint here: WATER FOOTPRINT CALCULATOR

Challenges Impacting the Global Water Sector

Water is critical for our survival. However, resource scarcity, growing population, and economic development are placing increasing pressure on water resources. The World Economic Forum's Global Risks 2015 report ranks the "water crises" as the world's top impact risk. While "water crises" have appeared on the list four times, 2015 was the first time it was at the top of the list for all global crises. The results come as little surprise given the challenges of a

limited supply and increasing demand.

The lack of water supply, sanitation and hygiene exacts an enormous toll on human health and well-being, and includes a significant loss of economic activity. According to the United Nations, investments in water infrastructure are fundamental to unlocking the full potential of economic growth, with such investments in water supply and irrigation producing similar rates of economic return as other infrastructure investments.[1]

Supply issues are also exacerbated by climate change and pollution, unequal distribution and access, and deteriorating water-related infrastructure. Increased usage across agriculture, industries, and residential and municipal consumers is also aggravating the water supply and demand imbalance, set to further increase as global population and consumption continue to grow.

Beyond the environmental ramifications of supply and demand imbalances and human population growth, over 10% of the world's population still lacks access to improved sources of drinking water;[2] and 2.5 billion people lack access to proper sanitations services[2]. By 2050, 2.5 billion people will be added to the world's population, 90% of which will be in Asia and Africa, where many poor communities already lack access to water sources due to poor infrastructure and a lack of finance[3].

SUPPLY: ALREADY SCARCE, AND BECOMING EVEN SCARCER

Freshwater constitutes only 2.5% of the earth's water.[4] Over two thirds of freshwater lies in glaciers, unable to be utilized, and another 30% lies in groundwater.[5] Because groundwater is our main source of drinking water, and demand continues to grow alongside population, a fifth of the world's aquifers are already deemed to be overexploited. Projections are that the pace of extraction will continue to increase over time.[6] We illustrate a breakdown of water distribution and freshwater use in Chart A and B.[7] Agriculture alone consumes 68% of available freshwater.[8] Further, the rate of water supply replenishment lags the rate of global demand growth as nearly two-thirds of rain evaporates back into the atmosphere, unavailable for immediate use.[9]

Chart A: **Breakdown of Water Distribution**[7]

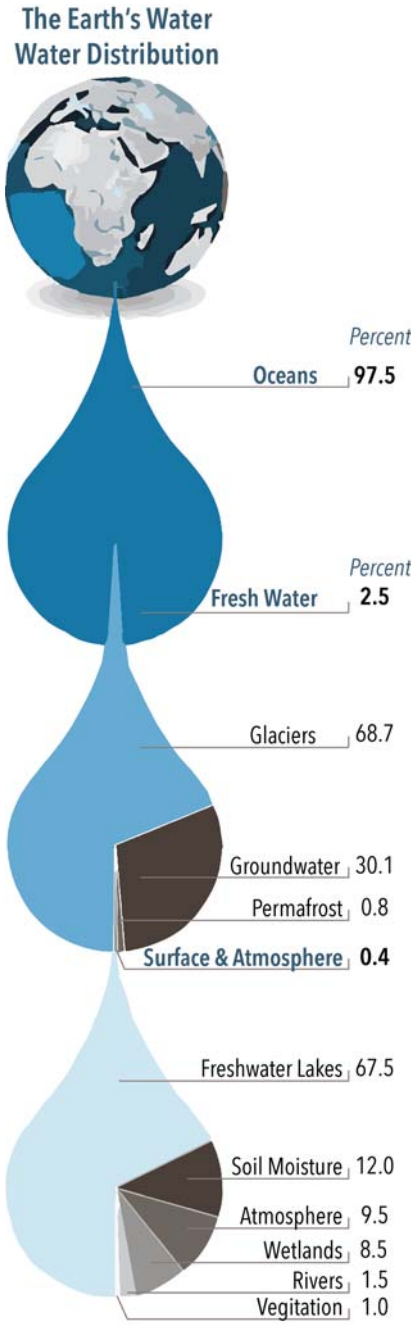
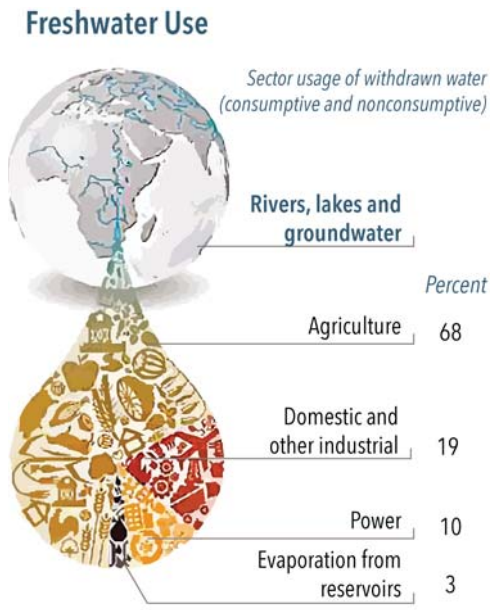


Chart B: Freshwater Use[7]



Significant issues driving water scarcity include:

Uneven Distribution – Fewer than ten countries (Brazil, Russia, China, Canada, Indonesia, United States, India, Colombia and the Democratic Republic of Congo) are water-rich and contain 60% of the world's available freshwater supply.[10] However, water supply is just one side of the equation and such water-rich countries in many instances still face a supply-demand imbalance. For example, while China has 7% of the world's renewable water resources, the country contains 21% of the world's population, creating a significant supply-demand problem.[11] The global water imbalance is expected to worsen and by 2025, it is estimated that nearly two billion people will be living with water scarcity, while two thirds of the world's population could be living with at least water stress.[12]

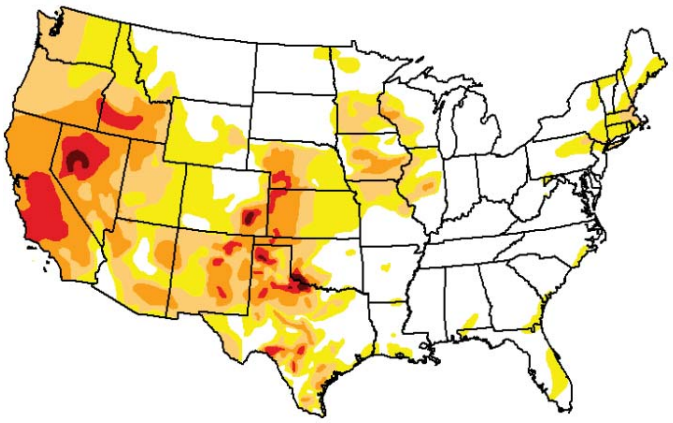
Climate Change – The effects of climate change are expected to become more pronounced over time, threatening water quality, quantity and predictability. A changing climate also threatens wildlife and natural ecosystems, and many believe it will cause more frequent extreme weather events (i.e., storms, droughts, floods, rising seas). Current projections show that critical changes in the temporal and spatial distribution of water resources, and the frequency and intensity of water-related disasters, rise significantly with increasing greenhouse gas emissions.[13]

The United States previously enjoyed a high rate of water resource replenishment. However, the US has the highest annual water footprint per capita of 2,842 m3 versus a global average of 1,385 m3.[14] This, combined with extreme weather worsened by climate change, has resulted in severe drought conditions across much of the country. Chart C illustrates a comparison of drought conditions in the US since the beginning of 2014 through the middle of 2015. Since 2012, at least 95% of California has been in a severe drought.[15] In 2014, California's economy lost an estimated USD 2.2 billion due to the drought.[16] For example, agriculture has suffered as farmers must spend more irrigating land, which, in turn, impacts production and prices. In April 2015, State Governor Brown mandated a 25% reduction in statewide water use in response to the drought.[17] This directive further impacts the agriculture sector which, in many cases, simply cannot access enough water given current water availability.

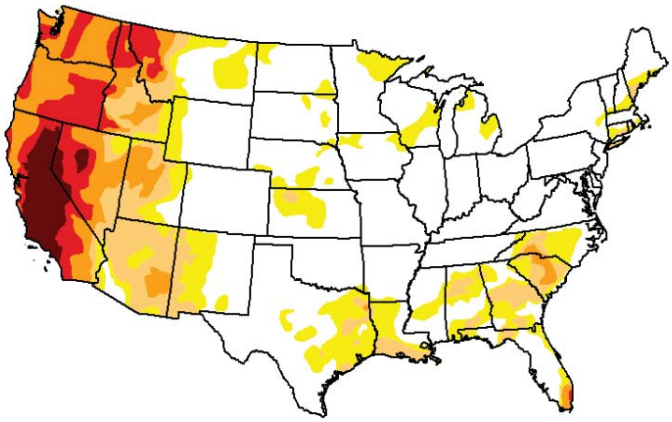
The impact of water scarcity is not limited to the US. For example, São Paolo's primary reservoir, Cantareira, has been operating below 17% of capacity since August 2015.[18] The continued drought could cause government to implement formal rationing measures and has already impacted power prices in Brazil, where much of the country's electricity comes from hydroelectric sources.[18] In addition, the Intergovernmental Panel on Climate Change estimates that at the current rate of climate change, the Himalayan glaciers, a source of water for 1.3 billion people, could disappear entirely in the next twenty years.[19] Climate change will accelerate

Chart C: **Drought Conditions in the US from January 2014 versus August 2015 via US Drought Monitor**[15]

JANUARY 2014



AUGUST 2015



the rate of water scarcity by impacting the already limited water supply.

Pollution – Up to 90% of wastewater in developing countries remains untreated and is dumped directly into rivers, lakes and oceans.[20] One billion individuals currently lack access to safe drinking water and 2.4 billion individuals worldwide lack access to proper sanitation.[21] It is estimated that contaminated water causes five million deaths per year[21] Pollution, as a result of human-related activities, further impacts the water supply by limiting the volume of usable water.

Deteriorating Water Infrastructure and Inefficiencies **–** The American Water Works Association believes that in order to maintain current levels of water service in America, given increasing population, we will have to invest at least USD 1 trillion in water infrastructure projects over the next 20 years.[22] Much of our water infrastructure was installed over 100 years ago, exceeding the recommended 60 to 80 year life.[23] In fact, leaking pipes lead to losses of 17% of treated water in the US,[24] while some parts of Europe lose over half of treated water.[25] As a result, much of the available water supply that could be used is lost during the distribution process, worsening water stress.

DEMAND: INCREASING

By 2050, global water demand is expected to increase by over half as world population increases from seven billion to over nine billion people.[26] As a result, we can expect to see significant stress in areas such as agriculture, industries such as energy, and for residential and municipal consumers.

Agriculture: For the last five years, agriculture has comprised nearly 70% of global water consumption (and over 90% of total water consumption in the least developed economies).[27] To keep up with population growth, food production needs to increase by at least 60%.[28] However, in developing countries demand will double due to higher incomes, which are driving demand for higher protein diets[29], and increasingly water required as an agricultural input is higher for livestock and lower for farms.

The Food and Agriculture Organization estimates that the production of 1 kilogram of protein requires five to twenty times more water than the amount needed to produce the same amount of grain.[30] Further, inefficiencies across the food production supply chain result in food waste, estimated to be a third (1.3 billion tons) of global food production and costing nearly USD 1 trillion

per year.[31] These inefficiencies tend to occur earlier in the food production chain for developing economies due to issues related to farming techniques and storage, and later on in the chain for developed economies due to overproduction and consumer behavior, such as discarding uneaten food.[32]

Industry: The energy sector accounts for three fourths of industrial water usage[33], and 15% of total water consumption.[34] Nearly all power generation is water-intensive, given the need for water in hydropower and thermal power generation,[35] as well as in extraction and production processes. While 2.5 billion individuals currently have limited or no access to electricity, the World Bank estimates that by 2035 energy consumption will increase by over a third.[36]

Energy companies are feeling the impact of water scarcity as unpredictable weather can lead to operational problems and higher costs. In manufacturing, increasing water demand will continue to be driven by the BRICS and other developing countries (with increases in demand forecast by as much as 7x and 4x, respectively) as they become increasingly industrialized.[37] As a result, manufacturing, which currently comprises of 7% of water demand, is expected to comprise 22% of water demand by 2050.[38]

Residential/Municipal: While a much smaller component of water consumption, residential and municipal use is still expected to grow as developing countries transition towards higher standards of living. Additionally, urbanization has further exacerbated local resource constraints as people become concentrated in relatively small urban areas. Over 50% of individuals, or 3.9 billion people, now live in cities, with the shift expected to continue for the foreseeable future.[39]

Developing economies currently consume far less water than developed countries. For example, the US annual water consumption per capita for residential/municipal use is 215 cubic meters, versus 32 cubic meters in China and just 4 cubic meters in Mali, West Africa.[40] However, living standards and water access are expected to rise in developing economies, and we expect water consumption per capita to increase in these areas, leading to further water stress.

Important Definitions

Aquifer: *an underground layer of permeable rock, sediment, or soil that holds groundwater that can be extracted with a water well*

Desalination: *the process of removing minerals from saline water and converting it to usable water*

Freshwater: *in this report, refers to water available to use for its intended purpose*

Groundwater: *water that is underground within openings in the soil, sand and rock*

Permafrost: *thick layer of permanently frozen soil that occurs at high latitudes (and high altitudes)*

Surface Water: *water that flows within streams, rivers, natural lakes, wetlands and reservoirs*

Water footprint: *the amount of freshwater directly or indirectly used (via production or supply) by an individual or particular group*

Water scarcity: *lack of available water to meet the water demand in a specific region (annual water drops below 1,000 cubic meters per person)*

Water stress: *limited available water to meet the water demand in a specific region (annual water drops below 1,700 cubic meters per person)*

Water tariffs: *charge based on the amount of water that is consumed that covers costs incurred during the water production process*

Themes Along the Water Supply Chain

This section takes a closer look at investment themes, opportunities and relevant activities across the water supply chain. As a consequence of the supply and demand imbalance, climate change, and population and income growth, we see opportunities to deploy private capital to contribute to impactful solutions. These investment opportunities can fund solutions to address the global water challenges previously described. The perception of water as simply a free public good is fading away, and society is beginning to understand the limited nature of the resource and the amount of capital expenditure necessary to meet global demand. Corporations are paying increasing attention to water-related risks, given potential impacts on their supply chains. For example, as a result of the effect of water scarcity on business operations, Coca Cola halted expansion plans in northern India and Barrick Gold suspended the Pascua-Lama project in Chile.[41] Importantly, awareness about water scarcity is also promoting positive corporate efforts. For example, companies such as Adidas and Nike are experimenting with waterless dying technologies. In fact, in 2014, Adidas conserved 50 million liters of water by utilizing this methodology.[42]

There are multiple ways to segment the landscape; Chart D provides one perspective for organizing the water-related investment landscape.

SUPPLY

Water Collection – Water collection sites can include reservoirs, aqueducts, surface water intakes and groundwater wells that collect the natural water supply for future consumer use. However, we believe there are limited direct investment opportunities in actual water collection sites and instead, there are more capital-intensive opportunities to acquire, protect and restore lands/watersheds and ecosystems. Research indicates that every dollar invested in watershed protection results in savings between $7.5 and $200 in costs for new water treatment and filtration facilities.[43]

Chart D: Water Supply Chain

Impact Outcome	Definition
SUPPLY	› Water collection › Water rights › Wastewater
TREATMENT	› Water cleansing and rescue › Desalination
DISTRIBUTION	› Water infrastructure (utilities) › Water services (i.e. engineering & construction) › Technologies (i.e. smart meters)
CONSUMPTION	› Retail (i.e. bottled water)

Water Rights – A water right provides holders with the right to control, consume, generate income from, or sell the water right, although the holders technically do not "own" the water.[44] Investments in water rights help markets become more efficient and rationally price scarce economic resources while promoting higher value activities. Generally speaking, we have a positive view on markets that better value water resources, particularly as it relates to the economic activity around water rights.

Wastewater – Wastewater in its raw form cannot be used directly but can be treated for reuse in order to maximize use of the available water supply. We believe that there are opportunities to invest in wastewater treatment technologies as detailed in the following section.

TREATMENT

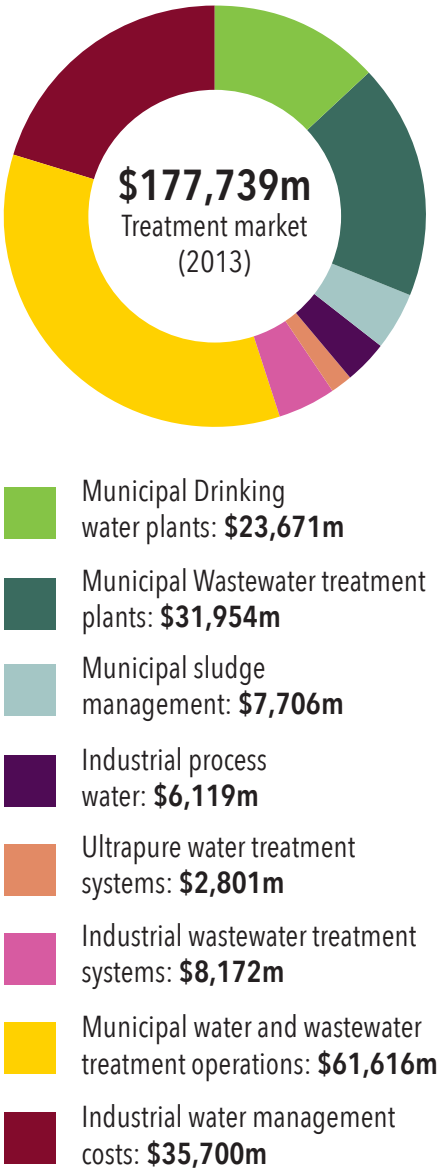
Water Cleansing and Reuse – Treating water for the end user enables water-constrained regions to increase water supply by turning unusable water into usable water by ensuring quality standards are met prior to consumption and distribution. Less than 3% of water used by humans is recycled[45], leaving a significant opportunity to target treatment technologies that facilitate greater adoption of water re-use practices. Global Water Intelligence estimates that the water treatment market is USD $178 billion[46] as illustrated in Chart E.

Wastewater reuse promotes water and environmental conservation and reduces groundwater depletion. Untreated water that is cycled back into the environment often harms ecosystems. Reports state that nearly 70% of China's rivers and lakes are heavily polluted, in part due to untreated water. [47]

Wastewater reuse can apply to both potable and non-potable uses and represents a significant potential water source. Direct reuse distributes treated wastewater directly to the end user. Benefits include cost savings associated with shorter transportation and a reduced carbon footprint.[48] Disadvantages include additional resources necessary to set up proper processes, safety concerns associated with consuming wastewater (even if treated), and public perceptions related to those concerns.[49]

Indirect reuse refers to the distribution of treated water back into the environment before drawing the water again for use. Benefits include allowing the environment to purify the treated wastewater to ensure that all contaminants have been removed, avoiding the stigma related to direct reuse, and confidence in the methodology given frequency and history of use.[50] For poverty stricken areas, proper sanitation and safe water access can provide a whole host of economic benefits such as healthcare savings, higher productivity due to time savings, higher education and longer life. In addition to the municipal water treatment market from Chart E, we closely monitor compelling public and private companies directly addressing these issues.

Chart E: Water and wastewater treatment: The industrial and municipal market (2013)[46]



Desalination – One growing treatment technique is desalination, the conversion of seawater into usable water. Over 150 countries currently use desalination techniques, and over 21.1 billion gallons of US water are desalinated on a daily basis.[51] There are over 17,000 desalination plants globally, with the Middle East – a water-constrained region – housing 70% of the world's plants.[52]

While desalination plants provide clean water access, the process can be environmentally damaging as well as energy and cost intensive. For example, critics point out that desalination increases the release of greenhouse gas emissions as well as harmful byproducts such as brine, whose salinity is detrimental to wildlife. Additionally, Carlsbad, California opened a USD 1 billion desalination plant that aims to provide 7% of Orange County residents with water but costs twice as much (USD $2000/acre) as treated water.[53] Some of this environmental impact could be mitigated by using renewable energy to power plants. As a result, we believe there is a high impact opportunity in desalination operations powered by renewables.

DISTRIBUTION

Water Infrastructure (utilities) – Water utilities, the critical link between water services and consumers, recognize the need to improve aging and leaking infrastructure and build new infrastructure where necessary. Such infrastructure includes groundwater wells, surface water intakes, dams, reservoirs, aqueducts, storage tanks, treatment facilities and pipes. With climate change threatening water supply, infrastructure used for water treatment, distribution and storage will be increasingly critical to sustain population growth. Across developing countries, building quality infrastructure will also provide safe water access and safe sanitation. Such infrastructure investments in these geographies are fundamental to reducing poverty and creating more economic opportunity for vulnerable populations.

Water Services – Engineering & Construction (E&C) companies focus on the design, project management and construction of infrastructure assets. Many of these companies manage large-scale infrastructure projects such as dams, hydroelectric projects, drainage systems, aqueducts, and water treatment plants. Investing in E&C companies focused on increasing efficiency would also contribute to water conservation efforts without compromising quality.

Technologies – Water related technologies, from consumer to industrial use, provide multiple opportunities to increase the efficiency of water use. Smart meters, for example, record data about water consumption, allowing customers and utilities to analyze usage patterns and any abnormal usage behaviors. Measuring usage is the first step towards awareness about usage patterns and can help promote conservation habits in the future. The global smart meter industry is estimated to grow to USD 18 billion by 2019, with an annual growth rate of 10%.[54] This growth is driven by usage in North America, given mandatory smart meter requirements in certain states, and in Asia-Pacific, given government investment in large-scale smart meter implementation.[55] We see significant opportunity in quality technology focused on increasing water efficiency.

CONSUMPTION

Retail – While there is a retail market for bottled water, the production process is extremely energy intensive and produces an environmentally unfriendly product. As a result, we do not view the retail market as an investment subtheme with positive financial and social returns. However, investing with a sensibility toward water efficiency is possible for investors given the availability of water-usage data from publicly traded companies. Even for portfolios with little or no direct

relationship with the water industry as it is described in this primer, investors can still target companies that embody best-in-class practices with respect to water consumption and increased water efficiency across supply chains such as Sempra Energy and Eaton Corp.

Investable Sectors within Water Themes

Within the themes across the water supply chain, we have identified four investable sectors: technology, utilities/infrastructure, industrial and commodities. Chart F outlines water-related strategies in each of the sectors. By assessing both the market opportunity and impact theses, we prioritize future investment themes and sectors that we believe have the potential to provide double- or triple-bottom line returns. Below are examples of companies in sectors we believe exhibit characteristics as good stewards of water.

Technology: Fathom is a software-as-a-service, cloud-based data integration platform that integrates various software, platforms and databases utilized by utilities to generate analytical insights that help utilities operate more efficiently while offering customer service enhancements and promoting a decrease in water consumption.

Utilities/Infrastructure: United Water is a water utility that provides sustainable water and wastewater management solutions that promote public, economic and environmental health by ensuring high quality, accessible, and low-cost products.

Industrial: KSB AG is a publicly-listed company that manufactures and sells pumps, valves, and related systems for process engineering, building services, water treatment, water transport, energy conversion, and solids transport applications. The company focuses on products that contribute to energy efficiency and environmental protection.

Commodities: Blue Sky Water Fund, based in Australia, actively trades water rights within the Murray-Darling Basin, a A$25 billion market for the precious resource. Water rights are regulated by the federal government and traded on the open market, rendering long-term conservation outcomes and water pricing that more accurately reflects the value of the resource itself.

Conclusion

The challenges and trends surrounding the current state of water are creating investment opportunities across the water supply chain spectrum that supply and demand not only offers the opportunity for positive social and environmental impact, but also financially competitive returns. For more detail about how Sonen views impact in water as a thematic area, refer to Sonen's report "Investing in Water – Impact Investment Framework" (May 2015).

Multiple stakeholders – across government, corporate, industry and residential users – are beginning to prioritize water conservation and continued collaboration and education around water-related issues which will allow us to make a tangible impact in the world. While practicing water conservation in personal day to day activities, catalyzing further change through investment stands to amplify the impact we all hope to see in improving our freshwater environment for future generations.

LEARN MORE ABOUT SONEN CAPITAL

Sonen regularly publishes information on impact investing in both public and private markets, including theme-specific "impact frameworks" that identify how we prioritize investments among specific impact themes such as water, energy, sustainable agriculture and green real estate. Sonen also keeps readers informed of our growing impact measurement and evaluation methodologies, as well as regular publications on the financial performance of impact investment portfolios. Please visit www.sonencapital.com for more information.

Chart F: Summary of Water Investment Sectors

IMPACT OUTCOME	TECHNOLOGY	UTILITIES/ INFRASTRUCTURE	INDUSTRIAL	COMMODITIES
DESCRIPTION	› Investing in water-related technologies across the water supply chain	› Water utilities maintain the infrastructure that provides water and wastewater services for the public	› Companies that manufacture or provide services for public utilities or water-intensive industries	› Gaining exposure to water as a commodity
TYPES OF INVESTMENTS	› Equipment › Water treatment › Chemicals › Smart Meters	› Regulated utilities › Non-regulated utilities › Emerging market utilities	› Pipes and plumbing › Pumps and fluid control › Irrigation equipment › Construction › Engineering and Consulting	› Water rights › Water allocations
ASSET CLASSES	› Venture Capital › Public Equity	› Municipal Bonds › Corporate Debt › Public Equity › Private Infrastructure	› Corporate Debt › Public Equity	› Water rights (specialized investment fund)
INVESTMENT CHARACTERISTICS	› Growth-oriented	› Tangible assets › Predictable cash flow	› Economically sensitive	› Dependent on weather patterns
IMPACT THESIS	› Improve water system management, water conservation, promote re-use or enhance water quality through treatment, remediation or delivery while also increasing access through lower cost or distribution in underserve areas.	› Promote water efficiency and conservation by updating infrastructure for distribution, recycling and wastewater treatment as well as providing access to real, reliable water and sanitation systems to growing populations.	› The design of or consulting for the design of energy and water efficiency projects can promote the most cost-effective and productive use of water.	› Promote more efficient markets and rationally pricing of scarce resources from lower-value activities to higher-value activities.
INVESTMENT STRATEGIES	› Target technologies that increase water efficiency in agriculture and other industries; provide low-cost solutions to purification and treatment, and that measure water use to identify opportunities and to reduce resource use.	› Promote water efficiency and conservation by updating infrastructure for distribution, recycling and wastewater treatment as well as providing access to real, reliable water and sanitation systems to growing populations.	› Invest in companies that are reducing and/or reusing water use, increasing water efficiency in operations; providing products or services to companies that encourage water conservation and increase water access; innovating designs that promote low-flow, more efficient use of water.	› Invest in market-based mechanisms of water rights and trading schemes that can increase water conservation at scale.

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