WATER

AN IMPACT INVESTMENT PRIMER FOR FAMILY OFFICES AND FOUNDATIONS

A JOINT PROJECT OF

The CREO Syndicate is a not-for-profit organization that addresses the need for scaling climate, resource scarcity, and environmental solutions better and faster. Working with family offices and other private investors to mobilize capital, the CREO Syndicate provides tailored education and strategic connectivity between investors, expertise and investment opportunities to develop private investor capacity for successful and impactful investments in clean technology, renewable energy and environmental opportunities.

The ImPact is a membership network of family enterprises (family offices, foundations, and businesses) that are committed to making investments with measurable social impact. The ImPact provides families with the knowledge and network they need to make more impact investments more effectively, and uses sophisticated technology for data aggregation, analysis, and reporting to shift the narrative of impact investing from one of inputs (dollars committed) to outcomes (impact created). Our purpose is to improve the probability and pace of solving social problems by increasing the flow of capital to investments generating measurable social impact.

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Water is a finite natural resource unlike any other. It is required for life itself and sustains almost every natural and industrial process on the planet. Increasing volatility in water quality and quantity present evolving risks for the planet and for humanity. Addressing the local and global challenges that reduced water dependability and declining water quality pose will require trillions of dollars of new investment. Private capital must play a role in developing, implementing, and scaling solutions to water problems. The universe of available water investments is still nascent, creating opportunities for early movers motivated to create impact. Families are uniquely positioned as catalysts and leaders in the water investments market. Families can deploy solutions-oriented, patient capital across asset classes to deliver impact alongside financial return. This primer maps water investment opportunities and provides several inspiring examples of how families are actively investing to address local and global water challenges.

Why Water? Why Now?

Investment opportunities in water are growing in size and number. Several forces intensify the urgency for government, industry, and community leaders to address water insecurity. First, there is a severe shortage of investment in water infrastructure. The McKinsey Global Institute estimates that $7.5 trillion of spending globally on water is needed in the next fifteen years.[1] Every year, the United States wastes a trillion gallons of water due to leaky and broken water mains.[2] Second, water risk—having not enough, or too much, or not the right quality—is a growing concern for cities and towns, large industrial businesses, farmers, and conservationists. Water risk will only increase as the climate changes and the global population grows. Third, water is local and personal. Citizens are applying increasing pressure on their elected officials to solve water problems. Feeling soaked by leaky pipes and rising bills, 88% of Americans believe United States water infrastructure needs reform; elected officials rarely see such overwhelming agreement on any issue.[3] Finally, entrepreneurs and investors who recognize the scale of the problems posed by water risk see a significant opportunity to make money developing solutions for willing payers, whether they be businesses, governments, or consumers.

The Role of Family Investment

Because water is essential to life, governments have historically kept water prices low. At the same time, businesses have not had to pay the cost of the negative water-related externalities they create. Leaders around the globe recognize that this status quo is untenable: water should be accurately priced and water externalities should be incorporated into industrial costs. As water resources become more scarce or unreliable and global demand for water rises, the price of water will naturally rise. Rising prices should motivate high-volume water users such as farms, cities, and large water-intensive industries to willingly invest in water efficiency. And, similarly, where there is an enforced cost to environmental degradation, there is money to be made in conservation.

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Innovators—both in technology and in finance—need patient capital to develop solutions to water challenges. Family offices and foundations are natural providers of patient, long-term, solutions-oriented capital. Families can create significant and direct impact through successful water investments. The example they set, and the learnings they share from their successes and their failures, can catalyze investment from other, larger, less risk-tolerant asset owners and asset managers, whose capital is necessary to meet global need.

The growing challenges in water quality and dependability create a complicated set of interconnected problems. Individually and collectively these problems pose risks to assets and require financeable solutions. There are two basic elements to impact investing strategies in water:

a. Families can identify and minimize water risk across their portfolio.

b. Families can seek to create value by investing in solutions that address problems that water risk create for communities, industries, and the planet.

This primer covers both elements but focuses primarily on opportunities for families to proactively invest in solutions to water problems.

How Motivated Families Can Invest

At first glance, it can be difficult to discern water as a distinct target for investment because water itself is so ubiquitous; water risk presents itself in many ways. Imagine a raindrop that falls in a forest and trickles into a river that flows through a nearby

What is Water Risk?

For the purposes of this primer, we define water risk as the confluence of several mega-trends that threaten the quality and accessibility of water around the world:

- **Climate change means water change.** Warming temperatures alone could cause river flows to decline or fluctuate dramatically worldwide. The Colorado River, for example, which provides water for a large population and agricultural land, is predicted to lose 30 percent of its flows by mid-century and over 50 percent by the end of the century if greenhouse gas emissions continue unabated. Similar trends could hold for water systems in other regions impacted by drought.[4]
- **Population growth and changing consumption patterns threaten freshwater supply.** Over the last 50 years, population growth, changes in lifestyles and eating habits, the production of biofuels, and energy demand have combined to triple the volume of global freshwater use.[5] The United Nations estimates that 1.8 billion people will be living in countries or regions with absolute water scarcity by 2025.[6]
- **Agricultural water use is too high and growing steadily.** Agriculture consumes 70 percent of the world's freshwater resources each year.[7] According to estimates by the United Nations, agricultural water consumption will increase by 19 percent by 2050 to feed the planet's growing population.[8] Water insecurity is a direct threat to food security.
- **Industrial water use and wastewater production is rising.** Industry uses 20 percent of water withdrawals. Industrial businesses dump an estimated 300-400 megatons of polluted waste in waters every year. If water-intensive business do not increase their water efficiency and wastewater management, it diminishes the quality and quantity of wateravailable for human and ecosystem needs.
- **Aging infrastructure will worsen.** The world today needs $7.7 trillion per year over the next 15 years, up from $3 trillion to pay for additional infrastructure.[9] If infrastructure repairs are not made, the quantity and quality of water supplies will be increasingly at risk for cities and towns around the world.

town, where it is used for drinking water or industrial processes. The same droplet, now wastewater, flows into treatment plants and eventually is used for irrigation at a nearby farm, where water flows back into the ground. Water investments can occur at any stage in that lifecycle where a party is willing to pay to improve the quantity, quality, accessibility, or efficiency of water use.

Water investment opportunities vary within multiple dimensions of novelty and seek a range of financial and impact returns. For any given water investment, families should consider the idiosyncrasy of the intervention being funded, the novelty of the investment structure used to fund that intervention, the particularities of the place or market in which the investment occurs, and experience of the investee in managing all of the above. In some cases, families can invest through managers with established track records using familiar investment structures to invest in proven assets with conventional risk and return profiles. Other investments include an element of technology or regulatory risk and demand closer engagement from investors. Certain water problems require innovative interventions financed through innovative financial structures. Families committed to solving a water problem in a particular place may need to custom build cross-asset, cross-industry investment projects that suit the particular water needs and challenges of that place. While their novelty may make these investments inherently risky, they often have the potential to deliver significant problem-solving impact.

For the purposes of mapping the potential investment universe, there are four basic resource challenges that water presents:

- The destruction and degradation of natural water resources
- Aging infrastructure and lack of clean water accessibility in cities and towns
- The vast disproportionality of freshwater resources that are dedicated to agriculture[10]
- The significant amount of water used, and wastewater produced, by water-intensive industries

Each of these challenges creates a distinct opportunity set, outlined below.

Investment Opportunity Set: Protect, Restore, and Conserve Natural Water Resources

Investments that restore and preserve natural water infrastructure, also known as green infrastructure, help ensure a healthy and sustainable supply of water downstream, as well as numerous environmental benefits in the preserved or restored area.

Conserving and Restoring Ecosystems through Real Asset Investments

The way that land is managed determines if the water on that land is protected or restored, or if the water resources are degraded. A piece of land may contain a freshwater stream; it may contain the source of water for a city or town; or it may contain a wetland that is home to wildlife, flora, and fauna. Almost everywhere in the world, owning land entitles the property-holder to the rights of the water on that land. Landowners can, in turn, be responsible stewards of the water on their land.

Some families are investing for water impact by acquiring sustainably-managed timberland, grassland, and ranchland. Clearcutting timberland practices and overgrazing on ranchland have resulted in the widespread damage of natural water infrastructure and contamination of water sources.[11] Sustainable land management

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practices restore and preserve the natural state of the land for long-term use.

Several families have invested in Beartooth Capital's real asset funds, which acquire large tracts of land in the Western United States where water supplies are diminishing and climate change is altering historic rainfall patterns. Beartooth purchases environmentally important but degraded land from distressed sellers. In one recent investment, Beartooth acquired a 2,600-acre property in California's Sierra Nevada mountains. The property had been poorly managed over more than a century of timber operations, trapping, and ranching. Environmental mismanagement caused a decline in the level of the local water table, the draining of natural wetlands, and the shrinking of a creek system.

In conjunction with local and national conservation partners, Beartooth restored the natural wetlands, ponds, and creek system on the property. As a result, rain and snowmelt are now captured and held by the restored green infrastructure (wetlands, ponds, creeks, and a higher water table), resulting in a slow, steady release of cold, pure water from the natural system. Wildlife, domestic livestock, plants and people all benefit from this ecosystem restoration work. This kind of land management can also amplify the long-term appreciation of the value of the land itself and create opportunity for additional yield from the sale of environmental commodities.

Financing Conservation Through Ecosystem Service Markets

Environmental degradation harms nature's functions and, therefore, destroys economic value. The earth creates real economic value: bees pollinate crops, trees provide clean air, soil filters pollutants. These "ecosystem services" are indispensable to human economies. Historically, that cost has been externalized onto society—communities collectively pay the cost of environmental damage caused by individual actors. Ecosystem service markets are designed to internalize the economic costs of environmental degradation by requiring individual actors to pay a financial price for the damage they cause. A dedicated market channels those payments into financing the conservation or restoration of valuable ecosystem services.

An example: several state governments in the United States require that property developers who wish to build in a particular watershed pay the cost of environmental degradation they harm. Developers do so by purchasing credits from a wetland mitigation bank. The seller of those credits may be a landowner who conserves a number of acres of wetlands in the same watershed. In this marketplace, landowners are incentivized to conserve, because they are able to sell the value of their conservation work in the form of deposited credits. Developers pay the cost of the environmental degradation attributed to their business activity and still get to build. Most importantly, this allows the city downstream to continue to receive the right amount of high-quality

water and the watershed is, on balance, preserved to the standard before the land was developed.

The flow of water through rivers and the supply of fresh groundwater are other valuable ecosystem services. Water rights markets set prices on the right to withdraw a certain amount of water from a stream or from the ground, and enable landowners to sell or lease that right to others as if it was a commodity.

Several Australian families are investing in water rights in the Murray Darling Basin in Southeastern Australia. The Nature Conservancy along with their local partner, the Murray Darling Wetlands Working Group, established an AUD $27 million fund in 2015 to acquire a portfolio of permanent water rights (i.e., the perpetual right to use a certain amount of water) in the Basin. Each year, the fund leases the majority of the annual water allocated to its water rights portfolio to farmers and ranchers in the agricultural community, and the remainder are used to hydrate wetlands of high environmental importance and cultural significance to the local indigenous community.

The Nature Conservancy has a robust set of impact goals and measurements, including the return of natural wildlife, wetland restoration, and employment of indigenous peoples. Some of the Australian families who are invested in the fund had seen the environmental damage in the Basin and were motivated to mitigate it. Others were looking for opportunities to invest for impact, without any particular place-based focus in the Basin.

Ecosystem services markets in water are relatively new and still small. Families can help these markets mature by using them if they own land in a watershed where these markets already exist. Families can also help encourage policymakers to develop ecosystem services markets either through advocacy or by funding nonprofits that work alongside governments to implement the regulation that can establish these marketplaces.

Financing Conservation with Pay-for-Success

Pay-for-success programs, also known as an environmental impact bonds, are novel mechanisms for investing in environmental services. In general, pay-for-success programs use private capital to fund a particular intervention, usually carried out by a non-profit or industry expert. A third-party evaluator verifies the success of the program after a predetermined period of time. If the program succeeds, the government pays the investors using the cost savings that resulted of the intervention. If the intervention fails, the government does not pay the program's investors back. Thus the name "pay-for-success"—the government only pays a return to investors

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Concern of Predatory Water Rights Markets

Several experts interviewed for this primer expressed concern about the negative impact of buying, selling, and leasing water rights. Some worry that private investors may purchase the most valuable water rights in years of plenty, hold them, and sell them for a large profit in years of severe water scarcity; in effect, these investors would profit from others' misery. A related concern is that cities and industry will pay an almost unlimited dollar amount for the water rights historically used by farmers who cannot afford such a high price. The result: farmers are unable to buy water needed to irrigate their fields. This could result in a "buy and dry" scenario for agricultural land and drain natural water ecosystems. Lastly, most water rights trading occurs behind closed doors with limited transparency, preventing effective public oversight. Several early-stage technology companies are building software-based solutions to provide more transparency to the process and opportunity for mission aligned investors to participate. The growing trend of emerging solutions and e-marketplaces being developed for water rights may indicate players in the market wish to address these concerns. Families should take careful note of negative impact risk should they choose to invest in a water rights strategy.

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if the program is proven to succeed. Pay-for-success programs are currently funding social and educational programs and are now being piloted in environmental markets.[12]

One pay-for-success program proposed in California aims to improve the efficiency of forest fire prevention and improve water quantity and quality in the Stanislaus National Forest. Blue Forest Conservation, the would-be implementer of the program, intends to cut down small trees, clear out shrubs, and burn off ground cover in overgrown forests.[13] The thinning of the forest should have two significant results: first, to reduce the risk of widespread forest fires by removing their natural fuel and, second, to increase the flow of water downstream to cities and towns, farms, and reservoirs by removing plants that would otherwise consume the water. The program's potential beneficiaries, which include the U.S. Forest Service and the regional electric and water utilities, would pay back investors based on cost savings created by the intervention.[14] Blue Forest Conservation is still developing this project and is nearing contract with relevant parties including utilities, state governments, and the U.S. Forest Service.

Family foundations are instrumental in funding innovative financial programs such as pay-for-success models. The Rockefeller Foundation, for example, helped catalyze institutional investment in the first pay-for-success program in the United States by providing guarantees to the initial investment made by Goldman Sachs. Jim Sorenson[15] made a program-related investment in a similar pay-for-success program focused on recidivism in New York State. Families can use philanthropic capital, which poses little or no risk to their balance sheet, to catalyze more investment dollars for innovative, impact-oriented financial products.

Investment Opportunity Set: Ensure Cities and Towns have Clean and Sufficient Water

Experts often say, "water is local." Transporting water over long distances is expensive and energy intensive, so water quality and quantity are usually managed at the local level. From stormwater management to wastewater treatment to drinking water transport, cities and towns contain vast water systems, many parts of which are in need of repair and rebuilding. The $7.5 trillion global infrastructure deficit creates a nearly endless supply of local investment opportunities.

While the cost of infrastructure projects can be a barrier to family investment, the long term cost of not fixing water infrastructure will be even more expensive. In the United States, there are an estimated 240,000 water main breaks each year costing utilities approximately $2.6 billion per year in leaks.[16] According to the *Financial Times*, the United Kingdom's water system lost 22 percent of its water due to leakage at the end of 2013.[17] Old, leaking infrastructure loses water, draining utilities of previous revenues; utilities cannot charge users for water that does not reach their homes. Deteriorating infrastructure can also endanger the public as aging pipes contaminate freshwater sources or impair wastewater processes.

Families have a diverse set of opportunities to invest in ways that help ensure clean and sufficient water to cities and towns.

Investing in Best-in-Class Water Utilities
Families can invest in municipal water supply through thematic, impact-oriented public equity funds. Investor-owned utilities provide seven percent of water services worldwide and many of these companies are publicly traded. Some experienced fund managers with deep industry knowledge such as Water Asset Management, Pictet, RobecoSam, and Summit Water have actively-managed funds composed

of publicly-traded private water utilities that demonstrate best practices in sustainability, as well as companies that work in related industries adjacent to water utilities.

Financing Water Infrastructure Through Green Bonds

Families can invest in water infrastructure by purchasing green bonds that are specifically earmarked for sustainable water projects. Green bonds, like any bond, offer investors the opportunity to earn a return by lending money to an entity and earning interest over many years. Companies, states, or cities that issue green bonds must invest the funds raised in projects that benefit the environment.

The state of California, for example, announced $450 million in green bonds to go on sale on March 1, 2017, earmarked for the California Infrastructure and Development Bank Clean Water State Revolving Fund (CWSRF Program).[18] According to California State documentation, the CWSRF Program, "provides low-cost financing to local governments and other eligible applicants for projects typically including planning, design, construction, and implementation of critical wastewater management systems, stormwater management systems, non-point source pollution management systems and estuary conservation and management throughout the State."[19]

The Arison Family and Direct Utility Ownership

One family has taken the business of developing sustainable, community-focused water utilities into their own hands. In 2007, Shari Arison was inspired to to explore opportunities to create water abundance around the world. Arison gathered industry experts in her home country of Israel—a leader in water innovation—and established a think-tank to determine where in the supply chain she could have the largest impact. The answer: improving the efficiency of water utilities. Municipal water utilities lose a significant portion of their water every day; utilities in the United States are estimated to lose 5.9 billion gallons per day thanks to leakage, poor accounting, and unbilled consumption.[20] With a clear target, Arison has located and recruited experts in the field and acquired three small water engineering and related companies with good track records in Brazil, South Africa, and Canada. Together with her own team of experts, Arison founded Miya.

Today Miya has two business lines: a project-based practice and a water utility operation practice. The project-based practice works with existing public utilities that lose 60-70 percent of their daily water supply. A utility hires Miya to manage its operations for a period of 5-10 years. Miya makes system-wide improvements in leak protection, pressure management and metering, extends service to previously unserved populations, and builds capacity among the employees of the utility. Two years into Miya's project in the Bahamas, they had saved 1 billion gallons of water. Miya and its local partner, the Water Sewerage Corporation, expect to save 10 billion gallons over the course of the 10-year project.[21]

In 2016, Miya began owning and operating water utilities directly. Miya currently owns and operates seven water utilities in Portugal through which they supply more than 600,000 people with water and wastewater services. Municipal governments entitle Miya to own and operate utilities in exchange for significant investment in the infrastructure and yearly concession payments. Miya's leadership, which was up until recently Shari's son David, sees this as an opportunity to connect directly with a community of people; they are taking that responsibility seriously. Miya also works to expand the public conception of a water utility and its role in promoting sustainable practices. For example, Miya is working with restaurants within their jurisdiction to replace plastic bottled water with Miya water in reusable glass bottles. Miya values this direct point of contact with its clients. The work Miya does with local restaurants helps build community trust in Miya and in the water they provide.

Private Investments in Municipal Water Technology Companies

Current events such as the water crisis in Flint, Michigan and drought and flooding in places as diverse as California and Chile, have brought renewed attention to municipal water utilities' ability to deliver sufficient high-quality water to residents. Old, degraded, inefficient water systems cause cities to lose water, money, and public trust. Entrepreneurs are stepping up to develop new hardware and software that can enable cities to better measure and manage their water systems.

Water hardware technologies such as high efficiency osmosis membranes and improved pipe systems can produce cleaner, more reliable, higher volume municipal water flows. New water management software can identify the location and volume of water leaks and the presence of contaminants. Smart metering technologies can precisely identify how much water end users consume and bill them accordingly, encouraging conservation by individual users.

The process of developing and selling water hardware to municipal utilities differ significantly from the process of developing and selling water software. Two key challenges shape the water hardware market: market fragmentation and the hesitancy of water utilities to adopt new technology. There are over 50,000 water utilities in the United States, alone. Water hardware is expensive and its failure can threaten public health and safety, so governments are loath to take any technology risk; they only purchase technologies that have a long proven track record. These purchasing constraints tend to dampen research and development on new hardware. Companies that do develop innovative systems must persevere through long, challenging sales cycles. But the reward for companies that endure can be enormous—a highly defensible position in a market filled with large, captive buyers.

Water software shows promise as a more easily navigable market for families looking to invest in early-stage water technology. The growth patterns of water software companies can more closely resemble the growth patterns of software companies in other industries. Water software is typically less capital intensive than hardware and its applications scale more readily. One such company is WaterSmart, which provides water usage data and leak detection, among other data points, to the utility and also to the end user or customer. WaterSmart has received both family office and traditional venture capital investment. The company currently has 60 customers in the United States and abroad.[22]

The municipal water technology market needs long-term investors, and there is evidence that companies reward their investors' patience. One recent study compared the time to profitability of water technology companies to those of technology companies in other sectors. The study found that fewer water companies are profitable within their first five years than in other sectors. But at the 10-year mark, water companies surpass their peers in other sectors. By year 15, 50 percent of water technology companies are profitable compared to 42 percent in other sectors.[23]

Family offices committed to investing in the water technology market will find limited competition from conventional venture capital fund managers. From 2010 through 2014, venture capital firms invested $1.4 billion worldwide in 405 companies working in the area of water technology—a tiny fraction of the total venture market.[24] XPV Water Partners is one of the very few private funds investing exclusively in water technology and services companies, and have been doing so for over 10 years. Several funds that broadly focus on environmental technologies, including MissionPoint Partners, True North Venture Partners, and Emerald Technology Ventures also have water investments in their portfolios.

Using Program-Related Investments to Expand Clean Water Access Worldwide

There are 663 million people worldwide who do not have access to clean water. The United Nations set as its sixth Sustainable Development Goal to "ensure availability and sustainable management of water and sanitation for all." Several leading family foundations including the Hilton Foundation and the Stone Family Foundation have already established ambitious philanthropic projects to increase clean water access around the world. Both foundations are funding market-based enterprises that may provide financially sustainable and operationally scalable solutions to clean water access problems. Some of these investments may prove capable of generating financial returns to investors, but few are yet capable of providing risk-adjusted returns. Providing a life-sustaining service to the world's poorest people tends to be a low profit endeavour. Families may have an opportunity for life-changing impact by funding clean water access initiatives using program-related investments that seek low, or no, financial return beyond a return of capital.

Investment Opportunity Set: Improve the Efficiency of Agricultural Water Use and Handling

Agriculture consumes 70 percent of the world's freshwater resources each year.[28] According to estimates by the United

Financing Stormwater Green Infrastructure in Washington, D.C.

Washington, D.C., has a stormwater management problem. The city has a combined sewer system, meaning wastewater and stormwater flow into the same sewers. When that system overflows with stormwater, the mixed refuse water dumps into D.C. waterways such as the Anacostia and Potomac rivers.

Green infrastructure can be an effective way to manage stormwater runoff. Consider a garden that absorbs rainwater, filters it through soil, and provides a slow, constant flow of water into the city's water system.[25] Green infrastructure mimics nature's water cycle to capture significant amounts of precipitation before it can overflow the sewer system. A comparative piece of grey infrastructure—e.g., sewer drains—rush stormwater into the sewer system which eventually overflow into rivers and lakes, carrying pollutants, heavy metals, and other harmful substances. Green infrastructure can improve water quality, air quality, climate resiliency, wildlife habitats, and community health.[26] In many cases, green infrastructure provides the same core function as grey infrastructure, but at a lower cost.[27]

Two groups, using two different investment vehicles, are financing green stormwater infrastructure in Washington, D.C.

In 2013, the city passed an ordinance that requires real estate developers to offset stormwater runoff caused by their developments. Alongside this new regulation, the city developed the country's first stormwater credit trading scheme that enables real estate developers to purchase stormwater retention credits from green infrastructure developers rather than building green infrastructure themselves. In 2015, Encourage Capital and NatureVest formed District Stormwater to fund, develop, and manage green infrastructure projects in the city. While Prudential was the anchor investor in this project, families may be able to invest in strategies like this one as the market grows or the model is adopted in other cities across the country. If the model succeeds, Encourage Capital anticipates launching a fund composed of stormwater credit trading investments.

In 2016, the Washington, D.C., Water and Sewer Authority (DC Water), Goldman Sachs, and the Calvert Foundation launched a $25 million environmental pay-for-success program in the city--the first in the United States. The proceeds of the program will fund green infrastructure development in Washington, D.C. Project engineers estimate that the green infrastructure will reduce runoff by between 18.6 percent and 41.3 percent. DC Water will pay an agreed-upon 3.43 percent return to the program's investors if proven runoff reductions fall in this range. If runoff reductions exceed 41.3 percent, D.C. Water will pay out an additional $3.3 million to the program's investors. If runoff reductions fall short of 18.6 percent, investors will pay an additional $3.3 million to the water authority. Thus, DC Water pays investors related to the success of the environmental outcome of the program.

Nations, agricultural water consumption must increase by 19 percent by 2050 to feed the planet's growing population.[29] In addition to consuming the majority of the world's fresh water, agricultural water runoff is a leading cause of water contamination. Agricultural pollution comes from a wide range of sources, including pesticides or animal waste.[30] Crops need the phosphorus and nitrogen contained in fertilizer to grow, but these necessary nutrients pollute water sources if they are washed away by rainfall and snowmelt in large amounts and deposited in freshwater sources. In years of drought, or when land has been overgrazed, impaired soil cannot properly absorb fertilizers and nutrient pollution can be even more dangerous to the lakes and rivers in the surrounding area, as well as those located downstream.

Addressing the inefficiencies of agricultural water use is essential to addressing the broader issue of water scarcity. Many families who already own farmland or who have a real asset allocation are uniquely positioned to participate in a growing marketplace of investments that can save and enhance the cleanliness of tons of water (literally!).

Improving the Efficiency of Agricultural Water Use Through Real Asset Investment
Investments in sustainably-managed farmland and ranchland can reduce water and fertilizer inputs as well as improve the quality of water outputs. Holistic

The Stone Family Foundation: Funding Market-Based Solutions for Clean Drinking Water

A few pioneering families are funding market-based approaches to help bring clean drinking water to those who lack access. The Stone Family Foundation, based in the United Kingdom, has committed to using grant capital alongside concessionary investment capital to fund market-based solutions for access to clean water in emerging markets. John Stone, the founder of the foundation, recognizes that when populations lack access to clean water, interventions in any other area, such as education or housing, cannot succeed. The Stone Family Foundation now dedicates 80 percent of its philanthropic capital towards safe drinking water and sanitation initiatives. Foundation staff determine whether a grant or a program-related investment (PRI) is the most effective tool for funding any given enterprise. PRIs are made from the grant capital of a foundation and count toward a foundation's required annual distribution of charitable dollars. PRIs must be used to advance the philanthropic mission of the foundation. PRIs are, in effect, made with riskless capital and typically used for high-impact opportunities that are high-risk financially or that expect a low return.

The Stone Family Foundation invests at the earliest stages of an enterprise's lifecycle to help build their track record, management experience, and value proposition. The foundation's ambition is for these enterprises to become financially sustainable or even profitable over time. The Foundation recognizes, though, that because of the geography in which they operate and the populations they serve, some enterprises depend on subsidies either from the government or an international finance institution for certain costs (e.g., large, capital-intensive purchases such as setting up a water purification plant). Many of the enterprises in which the foundation invests, however, generate earned revenue sufficient to cover their basic operating and maintenance expenses. The Stone Family Foundation invests capital that can help build the business to a place where it can attract other kinds of commercial capital.

The Stone Family Foundation has made a PRI in Dispensers for Safe Water (DSW), a program of Evidence Action. DSW installs chlorine dispensers next to rural water points and trains local advocates to promote the use and benefits of chlorine as a proven, low-cost water treatment solution. Households can then use the chlorine for free when they come to collect water. The cost of the dispensers and the chlorine refills is covered through carbon credits, generated because households no longer have to boil their water to ensure the water is safe. Dispensers for Safe Water has installed 27,000 dispensers across Kenya, Uganda, and Rwanda. All together, the dispensers provide safe water to 4.7 million people. The Stone Family Foundation has provided Evidence Action with a $2 million, no-interest loan—alongside some grant support—to use as working capital to cover upfront costs of installation and operation until the carbon revenues are realized.

farm and ranch management can improve soil quality, increase water absorption, and make the land more resilient to high rainfall or drought. Partners in Sustainable Land Management (SLM Partners), for example, is a real asset fund manager developing a sustainable land investment for sheep pastures in the Patagonian zone of Chile, similar to the holistic ranchland they already manage in Australia. The Nature Conservancy estimates that 90 percent of soils in Patagonia are degraded; SLM sees that as an opportunity to restore and revive the land for better ranching outcomes.

SLM Partners purchases land when its natural resources are severely depleted because of overgrazing or other unsustainable practices. Through sustainable water, land, and grazing practices, SLM restores the productivity of the land as well as the natural ecosystem. In the past, part of SLM's strategy has included building an efficient water distribution system for livestock. For a previous investment in Australia, SLM installed a cap and pump system that draws water from underground and pumps it to the troughs where the herds are grazing. SLM's cap and pump system delivers water to a herd more efficiently than commonplace open troughs and aquifers which suffer significant evaporation.

Renewable Resource Group (RRG) also takes a deal-by-deal approach to address water scarcity. RRG applies a real assets strategy that combines the use of water efficient solutions for agricultural land with water infrastructure, water storage, water conveyance and water rights. Place-based investment projects provide an opportunity for families to co-invest directly into a water real asset opportunity. Another firm, Vision Ridge, a single family backed investment firm, established the Sustainable Asset Fund (SAF). Vision Ridge includes agriculture and water as part of a broader real asset strategy to scale solutions that address climate and resource scarcity more generally.

Others still, such as Encourage Capital, are exploring the opportunity to create pioneering financial vehicles that consider strategies such as regenerative farm and ranchland management practices that include replacing low-value, water-intensive staple crops like alfalfa with higher-value, less water-intensive agricultural products with the aim of generating high impact and high returns. With crop changes and precision agriculture technology, the land can provide more income from higher yield and higher value crops; the landowner can then lease or sell surplus water to other users downstream as additional source of revenue. The improved soil quality causes better water absorption and greater drought tolerance. This form of sustainable farmland management is unproven but could generate strong risk-adjusted returns and significant environmental impact.

Nutrient Trading Markets to Incentivize Sustainable Agricultural Practices

Nutrient trading markets are a new mechanism to manage the costs of watershed pollution and incentivize efficient waste and water management. The Chesapeake Bay, the largest estuary in the United States, is highly polluted by phosphorous and nitrogen runoff from farms, wastewater treatment plants, and stormwater systems. Between 2006 and 2009, the states of Virginia, Pennsylvania, and Maryland established nutrient trading markets that incentivize agricultural businesses, wastewater treatment plants and other large-scale polluters to reduce their nutrient runoff into the bay. Farmers, landowners, or businesses receive tradeable credits in the market when they use conservation practices that reduces nutrient runoff below a designated baseline. Housing developers, farmers, or businesses that generate runoff above the

In addition to consuming the majority of the world's fresh water, agricultural water runoff is a leading cause of water contamination.

Family Coalitions

Families are creating impact beyond their own investment dollar by establishing or joining like-minded families in affinity groups that can share best practices, educate others, engage in advocacy, or co-invest.

A coalition of family foundations established the Water Funders Initiative (WFI), working to "advance sustainable water management at a scale never before attempted in the water field."[30] The family foundations within the coalition pool their resources and industry expertise to amplify their influence and impact. In March of 2016, WFI published its inaugural report, "Toward Water Sustainability: A Blueprint for Philanthropy." WFI's blueprint includes two main goals: to bring basins into balance for people and nature, and to strengthen the resilience of water systems. WFI proposes six funding action plans that feed into six priority strategies. Looking ahead, WFI may prove to play an important role as a center of gravity for philanthropic work on water balance and resilience.

A different group of families with deep expertise and interest in regenerative agriculture joined together to form The Herd. The Herd addresses the systemic impediments facing the emergence and growth of supply chains and markets for regenerative agricultural products. It does this by educating funders on issues related to regenerative agriculture, and by convening influential, multi-stakeholder conversations to address shared challenges and instigate collaborative problem solving. For example, The Herd has been helping to build a coalition made up of the major certifiers of grassfed beef products, a number of meat and dairy brands, and outside influencers, to help define a well-established set of baseline criteria for grassfed labeling. Regenerative agricultural practices can result in significant improvements for water quality and quantity through building soil health. Healthy soil can absorb and store more water, decrease polluted runoff, make the land more drought resistant, and help refill natural underground water sources. It can also hold water longer, providing a longer growing season or reduced irrigation requirements for agricultural goods and grass for grazing.

permitted level must purchase nutrient credits to offset their pollution, providing a financial return to the landowners who generate credits through sustainable management or conservation.

Venture Investments in Water-Saving Agriculture Technology

Farmers will need new technology to dramatically reduce their water use and pollution. The timeline for new technology adoption in agriculture resembles the timeline for municipal water technology—typically longer than in other sectors. Agricultural technology innovators need patient, solutions-oriented capital to develop effective technologies, bring them to market, and build market share. Companies that succeed can generate significant measurable impact and strong financial returns to their investors.

One promising field of agricultural technology enables "precision farming," or management systems in which farmers use data to precisely and efficiently apply water, fertilizer, and other production inputs to their crops. Ceres Imaging, for example, is an early-stage precision-farming water technology company that has received early-stage investment from one or more families. Ceres Imaging takes an aerial photo of a plot of farmland that reveals the precise location of water leaks, water shortages, over watering, and the similar detail for nutrient distribution. Farmers can use Ceres technology to optimize their water and fertilizer use and improve crop yields.[32]

Other companies are trying to entirely replace resource-intensive agricultural production systems. Meat production, for example, is an extremely water intensive enterprise. It takes 1,799 gallons of water to produce one pound of beef. Industrial feedlots and slaughterhouses can also be major polluters. With global demand for meat growing dramatically, meat

substitutes offer significant water-saving impact and the potential for strong financial performance.[33] Several families are seizing the opportunity to reduce agricultural water consumption through investments in companies creating plant-based or lab-grown meat products. Beyond Meat, Impossible Foods, and Modern Meadow are three such companies that have received family office investment.[34]

Investment Opportunity Set: Improve Industrial Processes to Use Less Water and Reduce Wastewater

Industrial businesses dump an estimated 300-400 megatons of polluted waste in waters every year and account for approximately 19 percent of all water withdrawals.[35] Families can use both their investment capital and their influence as shareholders to accelerate efficient water use and wastewater management across large, water-intensive industries such as oil and gas, textile manufacturing, and food production. Families can invest to influence and improve industrial practices in several ways. First, families can incorporate a water assessment throughout their portfolio(s) to better understand their investments' exposure to water risk. Second, families can advocate that portfolio companies measure their water risk and disclose their water risk management practices. Third, families can invest in technologies that can improve the efficiency of water use at an industrial scale.

Mitigating Water Risk in Public Equity Portfolios

Families, like all investors, should care about material risks to the companies in which they are invested. Water risks are material to water-intensive industries and to companies operating in geographic regions with low or erratic water supply. According to the 2016 Annual Report of Corporate Water Disclosure published by CDP (formerly Carbon Disclosure Project), "Over a quarter of companies have experienced detrimental impacts from water this year, and companies expect over half of the 4,416 water risks they identified to materialize within the next six years."[36] Companies in the CDP report disclosed $14 billion in water-related spending this year—a significant increase from $2.9 billion in 2015.[37]

Families can mitigate their investments' exposure to water risk by incorporating a water assessment throughout their portfolio(s). The CDP's "Water A-List" highlights businesses in several sectors that are planning for a water scarce future and managing water risk most effectively. Families may benefit in the long term from investing in companies that actively plan for water scarcity or lack of dependability as those businesses will be better prepared than their peers to succeed in the face of volatile water supply.

Families can influence the behavior of large, water intensive corporations through shareholder activism, advocating for more robust disclosure by industrial companies regarding their water risk management practices. Some families are already taking action in particular areas where their family foundation has deep expertise. The Park Foundation, for example, has created a separate investment account dedicated to shareholder activism. The foundation uses this account to hold corporate stock that they would not otherwise hold because it contradicts their philanthropic mission. The foundation files shareholder resolutions that advocate for safer, more efficient water policies in large industrial companies in the energy sector.[38] This shareholder activism strategy is part of a larger water investing strategy that the Park Foundation employs throughout its portfolio. Families that do not wish to engage directly in shareholder campaigns can also encourage their wealth

managers to vote proxies on resolutions related to water quality and efficiency.

Better corporate disclosure helps families and other investors—as well as companies themselves—make better decisions to mitigate the risks of water scarcity and volatility. And good measurement begets good management—companies that rigorously measure their water risk manage their water resources more efficiently.[39]

Beyond their investment capital, families can use their influence, convening power, and grant dollars to support nonprofit organizations working to raise water risk awareness and encourage responsible water use.

Private Equity Investments in Industrial Water Technologies

The market for industrial water treatment technologies is set to expand by more than 50 percent over the next five years, from around $7 billion to more than $11 billion in 2020.[40] Large industrial businesses have the financial capability and interest in acquiring water efficiency technologies; if successful, those technologies can result in significant cost savings and long-term risk mitigation. But, much like municipal utilities, large industrial companies are cautious about incorporating new, capital intensive water technology into their operations. A water technology malfunction could jeopardize their business, especially if water is critical to their operations. As in the municipal market, entrepreneurs must prove their concept anew for each industry in which they want to apply their technology. The technology a textile plant in Bangladesh needs to halve its water use demands something different than the technology an oil and gas company in Texas needs recycle its wastewater.

But there is upside to these market barriers: water technology companies that succeed in driving adoption of their industrial systems can defend their market share. Presently, a handful of big companies dominate the water technology market. New companies that develop more efficient technologies and grab market share from incumbents can turn into strong acquisition targets for those major players. Large corporates may see acquiring young, fast-growing competitors as an easier path to innovation than investing in their own research and development. In recent years, several water technology startup companies have had successful exits in through acquisition for these

The Role of Government and how Families Can be Advocates

Water investment experts across a diverse set of regions, approaches, and sectors stress the importance of public policy and regulation to the growth of the water investment marketplace. Many of the ecosystem service markets, e.g., water rights, mitigation banking, and nutrient trading, exist because of local, state, or federal regulation. Families with influence in their local, state, or federal level of government can use their time, energy, and philanthropic dollars alongside their investments to push governments to incentivize responsible water use through market-based approaches.

The Walton Family Foundation, for example, has been instrumental in supporting NGOs and governments in the development of a water bank for the lower Colorado Basin. The water bank helps the surrounding states improve efficiency in their water use and incentivizes water-saving behavior. The Walton Family Foundation has also helped fund NGOs that have developed a similar water banking agreement between the United States and Mexico. The U.S.-Mexico agreement was signed for the first time in 2012 and is set to expire later in 2017. The Walton Family Foundation is actively supporting the renewal of the agreement; if it is renewed, it may provide a market for the buying and selling of water-related ecosystem services.[43]

reasons. Recent examples include the acquisition of NanoH2O's by LG Chemical and of Aqaucue by Badger Metter.

Industrial water technology companies can, and have, succeeded. Their success usually requires a longer timeline than conventional venture capital and private equity investments in other sectors. Mindful of the extended time horizons in the market, one water-focused growth-equity fund manager, XPV Water Partners, is considering investment structures that include longer timelines and an adjusted fee structure for their LPs, many of which are families. Their goal is to match the value of long-term investment capital with the long development and application process of building a valuable water technology for widespread industrial use.[41]

Other Family "Tools": Influence and Philanthropy

Beyond their investment capital, families can use their influence, convening power, and grant dollars to support nonprofit organizations working to raise water risk awareness and encourage responsible water use. Ceres, a national coalition of investors, environmental organizations, and other public interest groups, built a working group of investors who are developing methods to better integrate water into their investment decision making. In 2016, the working group published an "Investor Handbook for Water Risk Integration".[42] Later in 2017, Ceres plans to publish an online toolkit that compiles information on industry-specific strategies for incorporating water issues into investment decisions. Some family offices with particular interest and knowledge in water-intensive industries have participated in the development of this toolkit and are members of the working group.

Impact and Return Considerations of Impact Investments in Water

The growing challenges in water supply, dependability, and quality form a complex set of interrelated problems which individually and collectively pose risks to assets and require financeable solutions. There are, then, two basic components to water-related impact investing strategies:

1. Families can identify and minimize water risk across their portfolio.

2. Families can proactively invest in solutions to water problems that communities, industries, and ecosystems face.

Families who consider water risk in their investment decisions may see a positive correlation between measurable impact and financial returns. For public companies, disciplined attention to material environmental and social risks can reduce volatility and generate long-term outperformance.[44] Water risk is material to companies in water-intensive industries and water-stressed geographies.[45] Better measurement, more efficient resource management, and opportunistic corporate investment in water solutions can reduce companies' environmental harm, create positive environmental outcomes, and produce better risk-adjusted returns in the long term.

But managing risk is not the same as solving a problem.

Families that wish to proactively invest in solutions to water problems must identify the appropriate technical intervention to address a given problem and the best investment vehicle to fund that intervention. The relationship between the financial performance and measurable impact of solutions-oriented water investments depends on the nature of the target problem, the kind of intervention selected, and the financial vehicle used to finance that intervention.

Some water problems need technology solutions. Hardware and software can best address leaking pipes, contaminated water, and inefficient irrigation. Technology investments may, by their nature, feature a strong correlation—and even causation—between impact and financial return. The more effectively a technology solves the problem at hand, the more it should sell; and the more it sells, the more of the problem it can solve. Investments in compelling water technologies, however, often require long and sometimes turbulent holding times in illiquid investment structures. The reward for families who are patient enough to sustain a long-term and illiquid investment, can be outsized impact and financial return.

But not all water problems take technological solutions. The restoration and preservation of natural water sources and the development of green infrastructure require non-technological interventions which must be funded through appropriate financial structures. Investments that fund proven interventions through proven vehicles managed by capable managers can produce good impact and strong risk-adjusted returns. There are several real asset funds with proven market-rate returns that are generating measurable impact. They tend to focus on conservation and resource management in mature markets. These are proven strategies, but they too will only solve a limited range of problems.

Many specific water problems require innovative interventions financed through novel investment structures. Conservation financiers must continue to create models to incentivize the preservation of the ecosystem services that keep water supplies clean and reliable. Farmers need a combination of water-saving technologies and markets that incentivize water reduction and reuse. Investors will need to employ creative financial structures to fund untested interventions to address these problems. Though certain investors in these markets will seek both high impact and high

financial returns, the characteristic novelty of these investments makes them inherently risky. Other problem-solving investors in water seek high impact but intentionally target concessionary financial returns. It remains to be seen which strategies will yield their intended results.

Families have a diverse set of opportunities to make impact investments in water. The more committed a family is to solving a large-scale water problem in a particular place, the more creative and risk tolerant they may need to be in order to generate the impact that they seek. In many cases, high impact water investments are "made, not found." In other words, the interconnectedness and local nature of water may mean that the most impactful opportunities for investment are idiosyncratic, place-based, cross-industry projects custom built to address the particular problems of a particular place. Pioneering families must play an active role in building and piloting these investment structures.

Conclusion

Though there are myriad ways to invest in water that span intersecting axes of risk and return, some common threads tie together all potential investments in water. First, the twin challenges of managing reduced water dependability and declining quality are inescapable. As water prices rise every person on the planet will be forced to consider water in their decisions even if it has not been a consideration before. As companies and consumers change their consumption patterns, investment will flow to enterprises that enable efficient use throughout the water cycle. Second, water investments can be very complex. This complexity can manifest itself in complicated financial instruments, difficult-to-quantify measures of impact, careful multi-stakeholder engagement, or any number of other ways.

Motivated families can be catalysts and leaders in the nascent water market, helping create a playbook for the larger-scale water investment the world needs. But investment capital alone cannot solve all of the water problems facing communities, industries, and ecosystems. Families who are working to protect or provide clean, dependable water in a particular place may consider weaving together several interventions, funded through a variety of financial structures. Alongside a variety of investments across a spectrum of impact and return outcomes, families can, and may need to, deploy philanthropic capital to fund the research and advocacy work to create the marketplaces that can eventually accommodate impact investments. Beyond deploying their dollars, families can join together to share their experiences, influence policy-makers, and raise public awareness about critical water challenges. The opportunities and importance of working together via well-vetted networks are rich; solving water problems requires creative collaboration.

APPENDIX A

Example Investments

PICTET WATER

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	Place-Based	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	USA & Canada	**ESG-Screened**	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	**Global**		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Pictet Asset Management launched an actively-managed public equities water strategy in January, 2000. The strategy includes 60 stocks from a universe of 360 water companies. The strategy is geographically diverse with holdings in developed and emerging markets. The strategy has a particular focus on water supply, water technology, and environmental services. The fund has consistently met or outperformed global indices such as the MSCI World or the MSCI ACWI. Currently the strategy integrates ESG consideration but does not report the social or environmental impact of its holdings.

WAM GLOBAL EQUITY LONG

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	**Product-Based**	**Market-Rate**
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	Place-Based	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	**Process-Based**	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	USA & Canada	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	**Global**		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Water Asset Management (WAM), founded in 2006, is an investment management firm focused exclusively on strategies to invest in water. WAM's long-only global equity portfolio includes investments in investor owned utilities and related companies that work to repair and expand essential water and wastewater treatment, transmission, and water supply infrastructure. Water Asset Management's long-only public equity fund has beaten the market every year since inception. Water Asset Management actively tracks and measures the social and environmental impact of each fund. In addition to their own measurement, the leadership of WAM works with nonprofits such as Ceres and the Sustainability Accounting Standards Board (SASB) in helping develop standardized sustainability accounting metrics for water investments.

CALIFORNIA GREEN BOND

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	**Product-Based**	**Market-Rate**
Fixed Income	**Environmental Conservation**	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

The state of California announced $450 million in green bonds to go on sale on March 1, 2017, earmarked for the California Infrastructure and Development Bank Clean Water State Revolving Fund (CWSRF Program).[46] According to California State documentation, the CWSRF Program "provides low-cost financing to local governments and other eligible applicants for projects typically including planning, design, construction, and implementation of critical wastewater management systems, stormwater management systems, non-point source pollution management systems and estuary conservation and management throughout the State."[47]

DISPENSERS FOR SAFE WATER

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	**Sub-Saharan Africa**	Product-Based	Market-Rate
Fixed Income	Environmental Conservation	Middle East & North Africa	**People-Based**	**Concessionary**
Private Equity	Sustainable Consumer Products	Central & South America	Place-Based	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	Agriculture & Food	Eastern Europe & Russia	**Behavior-Based**	
Real Assets	**Energy & Resource Efficiency**	Western Europe	**Model-Based**	
Hedge Funds	**Safety & Security**	USA & Canada	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

The Stone Family Foundation has made a PRI in Dispensers for Safe Water (DSW), a program of Evidence Action. DSW installs chlorine dispensers next to rural water points and trains local advocates to promote the use and benefits of chlorine as a proven, low-cost water treatment solution. Households can then use the chlorine for free when they come to collect water. The cost of the dispensers and the chlorine refills is covered through carbon credits, generated because households no longer have to boil their water to ensure the water is safe. Dispensers for Safe Water has installed 27,000 dispensers across Kenya, Uganda, and Rwanda. All together, the dispensers provide safe water to 4.7 million people. The Stone Family Foundation has provided Evidence Action with a $2 million, no-interest loan—alongside some grant support—for them to use as working capital to cover upfront costs of installation and operation until the carbon revenues are realized.

DISTRICT STORMWATER LLC—ENCOURAGE CAPITAL AND NATUREVEST (The Nature Conservancy)

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	**Environmental Conservation**	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	**Model-Based**	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Encourage Capital, an impact focused private equity fund, launched a joint venture with The Nature Conservancy's NatureVest called District Stormwater to build green infrastructure in Washington, D.C. Green infrastructure, such as bioswales, rain gardens, and rehabilitated marshlands, treat rainwater runoff by filtering out pollution and infiltrating water that would otherwise go to traditional grey infrastructure, which can overflow. This green infrastructure generates Stormwater Retention Credits in Washington, D.C.'s innovative credit trading market, which can be sold to regulated real estate developers. Developers who purchase these credits realize cost savings by avoiding fines and not having to restore the environment themselves. And investors in the green infrastructure developer earn a return on their investment. While Prudential was the anchor investor in this project, families may be able to invest in strategies like this one as the Washington, D.C. market grows or the model is adopted in other cities across the country.

SMARTCOVER SYSTEMS

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	Place-Based	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	**Process-Based**	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Porgram	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

SmartCover Systems is a remote monitoring and data management company that helps utilities track and manage the level of water flow, both wastewater and stormwater. The real-time, continuous sensing helps prevent stormwater overflows, reduce the cost of sewer maintenance, and improve capital planning.[45] SmartCover Systems can help utilities identify precisely when and where problems occur so that they can more efficiently and effectively maintain the water infrastructure. Several family offices invested in SmartCover Systems through XPV Water Partners' growth equity fund.

WATERSMART SOFTWARE

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	Agriculture & Food	Eastern Europe & Russia	**Behavior-Based**	
Real Assets	**Energy & Resource Efficiency**	Western Europe	Model-Based	
Hedge Funds	Safety & Security	USA & Canada	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	**Global**		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

WaterSmart software can provide water usage data and leak detection, among other data points, to water utilities and as well as end users. WaterSmart currently has sixty customers both in the United States and abroad.[46] WaterSmart software launched its most recent pilot project with Hawaii's Board of Water Supply in February, 2017. 38,000 customers across six cities on the island of Oahu will receive data about water use from WaterSmart software. WaterSmart and the Board of Water Supply expect that the WaterSmart technology will empower customers to take better control of water use and reduce overall consumption. The pilot with WaterSmart is part of a larger initiative in Hawaii to manage water resources in a climate-resilient way; Hawaii depends largely on regular rainfall for water supply, which is increasingly unpredictable. The Board of Water Supply will evaluate the effectiveness of the program and determine whether or not to extend it to the rest of its customers. At least one family office has made an investment in WaterSmart software.

CERES IMAGING

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	Place-Based	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	**Process-Based**	
Private Debt	**Agriculture & Food**	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Ceres Imaging is an early-stage precision-farming water technology company that provides aerial photography and spectral image processing to farmers; one or more family offices have made investments in Ceres Imaging. Ceres Imaging takes an aerial photo of a plot of farmland and can provide data at the level of an individual plant about water and nutrients. The x-ray like photo reveals the precise location of water leaks, water shortages, over watering, and the same for nutrients. Farmers can optimize their water and fertilizer use using Ceres imaging and better understand field distribution uniformity for better crop outcomes.[47]

BEYOND MEAT

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	**Product-Based**	**Market-Rate**
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	Place-Based	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	**Process-Based**	
Private Debt	**Agriculture & Food**	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Beyond Meat makes plant-based meats that taste, look, and feel just like the real thing. Beyond Meat recently made it to Whole Foods after releasing a ready-to-cook Beyond Burger in the spring of 2016.[48] In a world where one pound of beef requires 1,799 gallons of water to produce (including irrigation of the grasses and grains in feed in addition to water for drinking and processing), and one pound of soybeans requires 216 gallons of water, meat substitutes propose significant water-saving impact.[49] Several family offices have made investments in Beyond Meat.

BEARTOOTH CAPITAL III, LP

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	**Environmental Conservation**	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	**Agriculture & Food**	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Beartooth Group's mission is to connect people to the American West for the long-term benefit of communities, plants and wildlife. In addition to providing exclusive buyer representation brokerage, Beartooth's principal investment arm, Beartooth Capital, runs a series of private equity funds that invest in ranch real estate using conservation tools to create value and mitigate risk. Beartooth purchases environmentally distressed land in the Western United States and restores the land to its natural state. While Beartooth does not focus exclusively on natural water infrastructure and water ecosystem restoration, it is a core element of their strategy. In past investments, water-focused conservation efforts have included stream restoration, hazardous chemical cleanup, mine tailing pile cleanup, sustainable timber harvesting, wetland restoration, and more.

VISION RIDGE SUSTAINABLE ASSET FUND

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	**Agriculture & Food**	Eastern Europe & Russia	Behavior-Based	
Real Assets	**Energy & Resource Efficiency**	Western Europe	**Model-Based**	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Vision Ridge Partners, the investment firm of Reuben Munger, recently created the Sustainable Asset Fund (SAF) in partnership with Capricorn Investment Group, Jeff Skoll's investment firm, and a broad base of investors committed to doing equally well for themselves and the planet. SAF will invest more than $430 million in Real Assets across varied sustainable sectors, including water, using a combination of instruments including equity and debt. An example of one such investment, focuses on buying and selling physical water throughout California. The investment is enabled by a portfolio of investments in land, water infrastructure, water storage, water conveyance and water rights. This investment platform was built incrementally over many years of deep engagement in the water market.

MURRAY-DARLING BASIN BALANCED WATER FUND—NATUREVEST

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	Market-Rate
Fixed Income	**Environmental Conservation**	Middle East & North Africa	People-Based	**Concessionary**
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	Off-Market
Venture Capital	Housing & Community Development	**Asia & Oceania**	Process-Based	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	USA & Canada	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

The Nature Conservancy along with their local partner, the Murray Darling Wetlands Working Group, established the AUD $27 million fund in 2015 to acquire a portfolio of permanent water rights (i.e. the perpetual right to use a certain amount of water) in the Basin. Each year, the fund leases a majority of the annual water allocated to the water rights portfolio to farmers and ranchers in the agricultural community, while using the remainder to water wetlands of high environmental importance and cultural significance to the local indigenous community. The Nature Conservancy has a robust set of impact goals and measurements, including the return of natural wildlife, wetland restoration, and employment of indigenous peoples. Some of the Australian families who are invested in the fund were motivated by their agricultural past; they had seen the environmental damage occurring in the Basin. Others were looking for opportunities to invest for impact, without any particular place-based focus in the Basin. Currently, the fund is open only to Australian investors, but may be open to families from other geographies in the future.

WATER PROPERTY INVESTOR II, LP

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	**Energy & Resource Efficiency**	Western Europe	**Model-Based**	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Water Asset Management's real asset fund aims to bring greater efficiency and transparency to the agricultural consumption and utilization market in the Western United States. Water Asset Management purchases land that has senior water rights and sells or leases a fraction of those rights to willing buyers such as nearby cities and towns, industrial companies, or environmental consumers that are facing water quality or quantity problems.

OVINO CHILE—SLM

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	**Market-Rate**
Fixed Income	**Environmental Conservation**	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	**Central & South America**	**Place-Based**	Off-Market
Venture Capital	Housing & Community Development	Asia & Oceania	**Process-Based**	
Private Debt	**Agriculture & Food**	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	USA & Canada	ESG-Screened	
Pay-for-Sucess Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Partners in Sustainable Land Management (SLM Partners) is developing a sustainable land investment for sheep pastures in the Patagonian zone of Chile, similar to the holistic ranchland they already manage in Australia. The Nature Conservancy estimates that 90 percent of soils in Patagonia are degraded; SLM sees that as an opportunity to restore and revive the land for better ranching and natural ecosystem outcomes. SLM Partners purchases land when its natural resources are severely depleted because of overgrazing or other unsustainable practices. Through sustainable water, land, and grazing practices, SLM plans to restores the productivity of the land as well as the natural ecosystem. Holistic ranching and land management can increase the number of sheep grazing on that parcel of land, increasing revenue for the ranch, and restore significant value to the land itself so that SLM will be able to sell it at a premium when the term of the investment ends.

D.C. WATER ENVIRONMENTAL IMPACT BOND

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	Market-Rate
Fixed Income	Environmental Conservation	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	**Off-Market**
Venture Capital	Housing & Community Development	Asia & Oceania	**Process-Based**	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

In 2016, the Washington, D.C., Water and Sewer Authority (DC Water) issued a $25 million pay-for-success program the first in the United States. Goldman Sachs and Calvert Foundation are the investors. The proceeds of the bond will pay for green infrastructure in the city of Washington, D.C. Green infrastructure, which mimics the natural absorbent characteristics of nature, is designed to slow stormwater runoff during periods of heavy precipitation. Washington, D.C. has a combined sewer overflow system, meaning wastewater and stormwater flow into the same sewer system. When that system gets overwhelmed with stormwater, the mixed refuse water overflows into D.C. waterways such as the Anacostia ad Potomac rivers. The green infrastructure will help prevent wastewater mix from rushing into waterways by absorbing much of the rain and snowfall before it overflows the sewers. DC Water will pay back investors the agreed-upon rate of 3.43 percent if runoff reduction from green infrastructure is between 18.6 percent and 41.3 percent. If runoff reduction exceeds 41.3 percent, DC Water will pay investors an additional $3.3 million. If runoff reduction is less than 18.6 percent, investors will pay an additional $3.3 million. Thus the D.C. Water Authority pay back investors in accordance with the successful environmental outcome of the project.

STANISLAUS NATIONAL FOREST ENVIRONMENTAL IMPACT BOND (in development)

ASSET CLASS	SECTOR	GEOGRAPHY	IMPACT STRATEGY	RETURN PROFILE
Public Equity	Education	Sub-Saharan Africa	Product-Based	Market-Rate
Fixed Income	**Environmental Conservation**	Middle East & North Africa	People-Based	Concessionary
Private Equity	Sustainable Consumer Products	Central & South America	**Place-Based**	**Off-Market**
Venture Capital	Housing & Community Development	Asia & Oceania	Process-Based	
Private Debt	Agriculture & Food	Eastern Europe & Russia	Behavior-Based	
Real Assets	Energy & Resource Efficiency	Western Europe	Model-Based	
Hedge Funds	Safety & Security	**USA & Canada**	ESG-Screened	
Pay-for-Success Program	Healthcare & Wellness	Emerging Markets	SRI-Screened	
Cash	Access to Finance	Developed Markets		
	Employment & Empowerment	Global		
	Base of Pyramid Services			
	Sustainable Infrastructure			
	Diversified			

Blue Forest Conservation is working to build a pay-for-success program in California's Stanislaus National Forest. Blue Forest Conservation is proposing to cut down small trees, clear out shrubs, and burn off ground cover in overgrown forests. The thinning of the forest would, if it succeeds, have two main results: first, to reduce the risk of widespread, large-scale forest fires by removing the natural fuel, i.e., overgrown shrubs, trees, and groundcover, and second, to increase the flow of water downstream to cities and towns, farms, and reservoirs instead of being soaked up by plants. The beneficiaries, including the U.S. Forest Service, the electric utility, and the water utility pay back the investors with the cost savings created by the intervention.

APPENDIX B

Experts Consulted

The information in this primer was gleaned in large part through expert interviews. The ImPact and CREO Syndicate wholeheartedly thank the following people for their time and expertise that contributed to the content in this primer.

Ricardo Bayon, Encourage Capital

Genevieve Bennett, Forest Trends

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THE IMPACT


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