

Water Investing in 2018

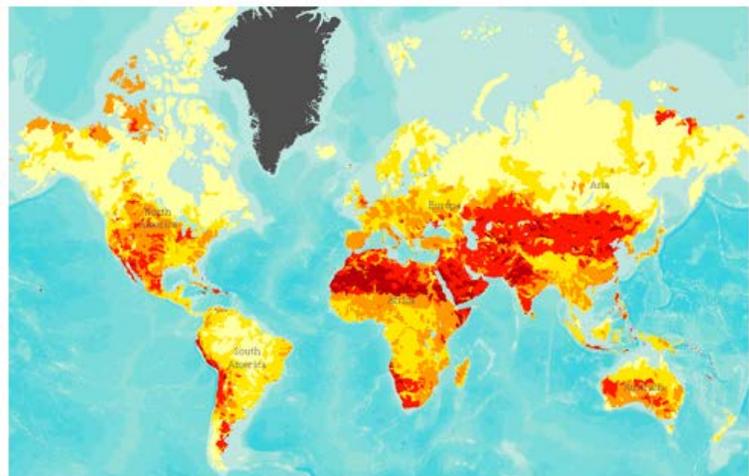
Near term crises and technology for long-term trends



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- In this report, we examine which trends may emerge to catalyze private water investing and how investors gain exposure to opportunities for investing in solutions.
- Water scarcity is an increasing area of concern for society, as crises like Cape Town highlight the fragility of certain regional water systems. Investors continue to be interested in how they can support a solution for increased water availability and quality.
- However, investors should proceed with caution. A bottom-up examination of water financing trends concludes that while private investing activity has grown since the early 2000s, attractive opportunities remain limited and recent interest has been concentrated in the intersection of water and technology.
- In the long term, a confluence of behavioral and demographic shifts, regulatory developments, and technology innovation is positioned to expand market opportunities.
- We provide an overview of potential water investment strategies by asset class. We also suggest engagement questions investors can use to understand how their asset managers are considering investing in water and to gain an understanding of the greater social and environmental impacts of water investing.

Areas with higher exposure to water-related risks



Source: Aqueduct Water Risk Atlas

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Introduction

Water investing is a perennial area of interest for investors, particularly during water crises and when experts release forecasts of a future with increased water scarcity. However, there have been limited opportunities for investors to date.

This report examines short and long-term trends that may catalyze opportunities for water investors and identifies areas of water investing, particularly technology, that are currently the focus of investment. To support investors interested in water, we conclude this report with three sections for investors to engage with their asset managers:

- A discussion of investment vehicle options by asset class;
- Engagement questions to gain insight into fund managers' exposure to water related risks and opportunities; and
- An initial framework to assess environmental and social impact from a water investment.

Water investing time horizon

Short-term crises

In the short term, increases in water stress are high profile but difficult to time for investment purposes

Climate change and water consumption models predict that water stress will increase in most regions in the medium to long term^{1,2}. In the short term, increases in water stress are high profile but difficult to time for investment purposes. The crisis unfolding in Cape Town is a case in point: Long-term climate change predictions have materialized 10 years earlier than politicians and weather service models expected,³ and rainfall was notably lower than normal during 2016 and 2017 (Figure 1). Cape Town is now faced with a water shortage, threats to social order, falling city revenues, and increased city costs⁴.

Investors looking to provide capital for technology and infrastructure solutions for crises such as Cape Town depend heavily on government response, which often excludes private capital. For example, the broad response from the Californian government to the 2014-17 drought⁵ was to invest in groundwater management and wastewater treatment plants, as well as to develop policy that better aligned the forecasted water supply in the state with forecasted demand⁶. Investors seeking to ensure water supply or demand efficiency in California had few options.

¹ Water stress is the ratio of total withdrawals to total renewable supply; a higher level of water stress indicates that more water users are competing for limited water supplies. <http://www.wri.org/resources/charts-graphs/water-stress-country>

² <http://www.wri.org/applications/maps/aqueduct-atlas/#x=8.00&y=0.30&s=ws!20!28!c&t=waterrisk&w=def&g=0&i=BWS-16!WSV-4!SV-2!HFO-4!DRO-4!STOR-8!GW-8!WRI-4!ECOS-2!MC-4!WCG-8!ECOV-2!&tr=ind-1!prj-1&l=3&b=terrain&m=projected>

³ <https://www.ft.com/content/2168dcaa-028a-11e8-9650-9c0ad2d7c5b5>

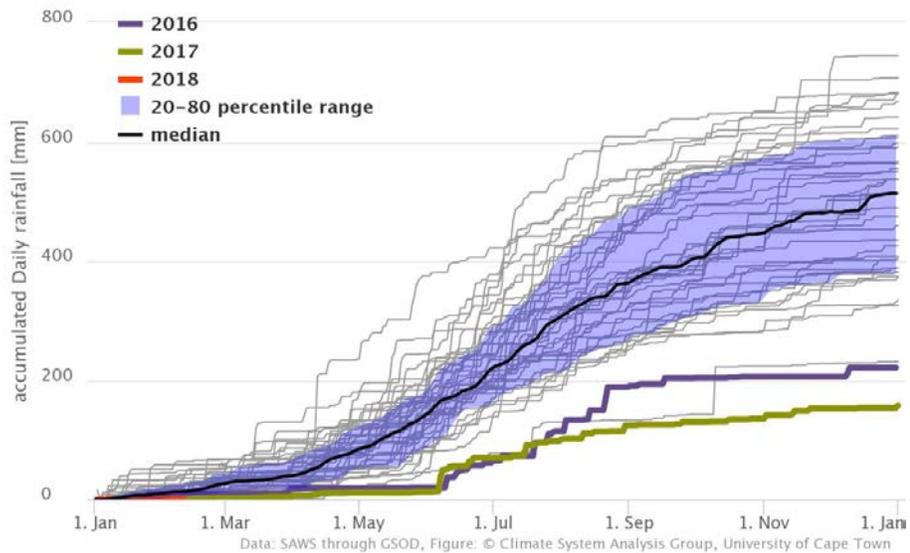
⁴ <https://www.fin24.com/Economy/moodys-raises-red-flags-over-cape-town-water-crisis-20180129>

⁵ <https://ca.water.usgs.gov/data/drought/>

⁶ <http://www.lao.ca.gov/Publications/Report/3343>



Figure 1: Cumulative daily rainfall recorded at Cape Town airport



Source: CSAG, University of Cape Town

However, crises can act as catalysts for corporates, governments, and broader society to focus on building resilient water systems. We continue to watch the Cape Town crisis to understand how this event might create opportunities for water-focused investors in the near term.

Long-term catalysts

Longer term, our research identified three categories of potential catalysts for the water market:

- *Behavioral and demographic*: increased water consumption through shifting consumer preferences and demographic moves to cities, particularly in emerging markets;
- *Regulatory*: growing demand for water technologies and infrastructure from governments; and
- *Technology*: decreasing costs for investors through technology advances.

The confluence of these factors is likely to provide the greatest opportunities for market growth.

Behavioral and demographic shifts

Rising incomes

If historical trends persist, rising incomes in emerging markets such as China, India, and Brazil will correspond with increased water consumption. The IMF expects emerging markets to grow at an annual rate of 5% for the next four years⁷. As Figure 2 shows, higher gross domestic product (GDP) is tied to higher water spending.

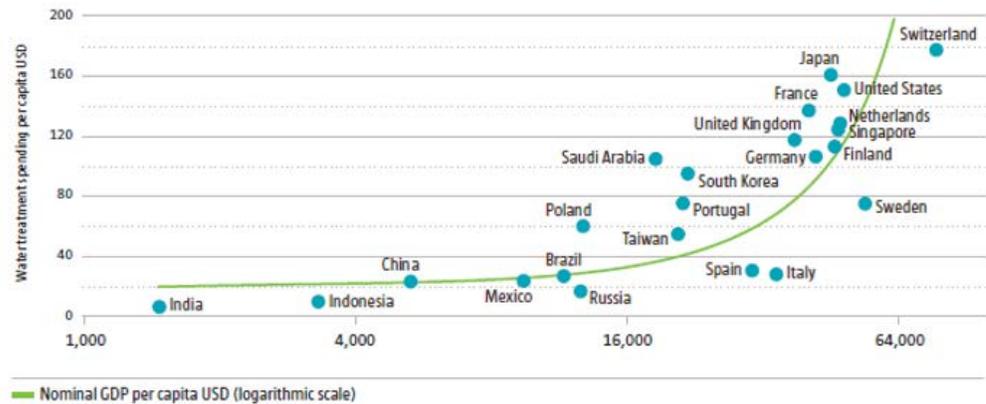
Higher gross domestic product is tied to higher water spending

⁷ http://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD



This relationship is partly a result of both changing tastes (e.g., more expensive and water-intensive products like red meat) and increased production and industrialization, which can involve significant amounts of water.

Figure 2: GDP per capita and water treatment spending



Source: RobecoSAM, GWI, and The World Bank, 2014

Demographic shifts

Water demand is increasing in coastal areas courtesy of urbanization. Middle-income countries face the highest increase in urban populations. The UN forecasts that the percentage of the population residing in urban areas in less developed countries will increase from 31% to 50% in 2050⁸. Analysis of water use associated with urbanization suggests that domestic per capita water use is significantly higher in urban areas. A 2007 survey of young Chinese shows that urban populations consume 195 liters per capita per day versus 101 liters for young rural Chinese⁹.

Population influxes into cities should also increase the demand for water and wastewater technology and infrastructure. While Cape Town is a relatively small city, its population has grown 79% since 1995 to 2017, with only 15% increase in period dam storage¹⁰.

Regulatory implications

Most water and wastewater services are provided by governments. Regulation therefore has implications for market growth and technological research and development. Regulations can relate to water and wastewater quality standards, infrastructure investment, and water pricing.

Water and wastewater quality standards

Several developing countries have raised their quality standards, which is likely to increase the demand for water quality technology:

Water demand is increasing in coastal areas courtesy of urbanization

⁸ <https://esa.un.org/unpd/wup/CD-ROM/>

⁹ http://www.sustainalytics.com/sites/default/files/water_in_china_-_issues_for_responsible_investors_feb2010.pdf

¹⁰ <https://www.groundup.org.za/article/whats-causing-cape-towns-water-crisis/>



- China - Regulation was enacted under the 2015 Water Ten Plan, with targets for pollution, drinking water availability, and environmental performance. In addition, coal-to-chemical (CTX) projects located in the arid northwest are now required to meet zero liquid discharge (ZLD) standards. Finally, the 13th Five-Year Plan includes an ambitious target that 90% of wastewater sludge should be treated to meet a pre-defined standard by 2020. Currently, 70-80% of the wastewater sludge produced in the country is not treated.
- India - The national government is committing INR200 billion (\$3.1 billion) between 2015 and 2020 to ensure no untreated wastewater is discharged into the Ganges River. The government has also committed to a mission of improving urban water infrastructure through the AMRUT (Atal Mission for Rejuvenation and Urban Transformation) and Smart Cities: India plans. Of the \$2.9 billion budget for AMRUT projects in 2016, 90% was to be spent on water supply, sewerage systems and sludge management. The total financing available to 100 Smart Cities until 2020 is \$15 billion.

Infrastructure renewal and water pricing

Developed countries such as the US have expressed the need to update dilapidated infrastructure, while developing countries are increasing infrastructure spending to account for rising populations and incomes.

An assessment of the current state of US infrastructure by the American Society of Civil Engineers estimates that water and wastewater infrastructure requires an additional \$152 billion of investment by 2040¹¹. President Trump's US infrastructure plan focuses on reducing regulatory assessment time for water projects and provides a \$20 billion plan for a Transformative Projects Program for high-risk infrastructure projects across the 'transportation, clean water, drinking water, energy, commercial space, and broadband sectors'¹².

US water and wastewater infrastructure requires an additional \$152 billion of investment by 2040

Water pricing is linked to infrastructure investment, as appropriate water pricing enables the financing of new and replacement infrastructure. In the past few years, water prices have increased in most countries as governments seek to finance infrastructure and send price signals to reduce demand. Globally, the price of water¹³ rose 4.3% between 2014 and 2015, with higher increases in Latin America (9.7%) and North America (6.2%), while Asia only increased 2.0%.

However, it is not clear that water infrastructure financing will be able to rely on significant water price increases. There are reasons for water to be priced lower than market demand would warrant, including community expectations and water's traditional subsidization. Investing in technologies that rely on increased water pricing has been risky historically and water pricing remains a politically sensitive topic.

¹¹ <http://www.infrastructurereportcard.org/wp-content/uploads/2016/10/ASCE-Failure-to-Act-2016-FINAL.pdf>

¹² <https://www.whitehouse.gov/wp-content/uploads/2018/02/INFRASTRUCTURE-211.pdf>

¹³ GWI 2017



Technology

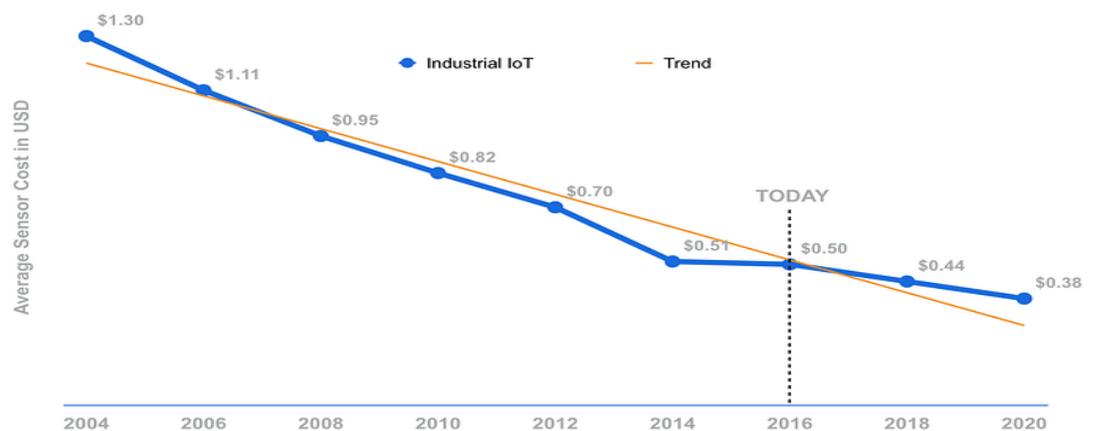
Broad technological innovation trends present opportunities for investors who can identify water technologies that leverage these trends. We have identified the Internet of Things (IoT) and industrial 3D printing as two innovations that intersect with water technology.

Internet of things (IoT)

The IoT refers to the network of physical objects embedded with electronics, software, sensors, and network connectivity that enable these objects to collect and exchange data.¹⁴ An IoT-empowered water system allows automated data collection and analysis, continuous monitoring, remote real-time accessibility, and digital record-keeping.

Advanced sensors help to enable the IoT in water. These devices are a prominent source of big data and are used in data collection, monitoring, decision-making, and optimization. Sensor costs are declining as mobile device demand (i.e., smartphones and tablets) drives production efficiencies and economies of scale. The cost of sensors has more than halved since 2004 and is forecast to drop by an additional 25% by 2020 (Figure 3).

Figure 3: Cost of IoT sensors



Source: IoTOne, 2016

Industrial 3D printing

Industrial 3D printing is considered an interesting technology to help drive advanced manufacturing. A 2016 survey by PWC¹⁵ found that two-thirds of US manufacturers are currently adopting 3D printing in some way, with 51% using it for prototyping and final products. Cost was the highest concern, with quality and time (3D printing is currently highly time intensive) also prompting concern among investors.

¹⁴ https://en.wikipedia.org/wiki/Internet_of_Things

¹⁵ <http://www.pwc.com/us/en/industrial-products/publications/assets/pwc-next-manufacturing-3d-printing-comes-of-age.pdf>



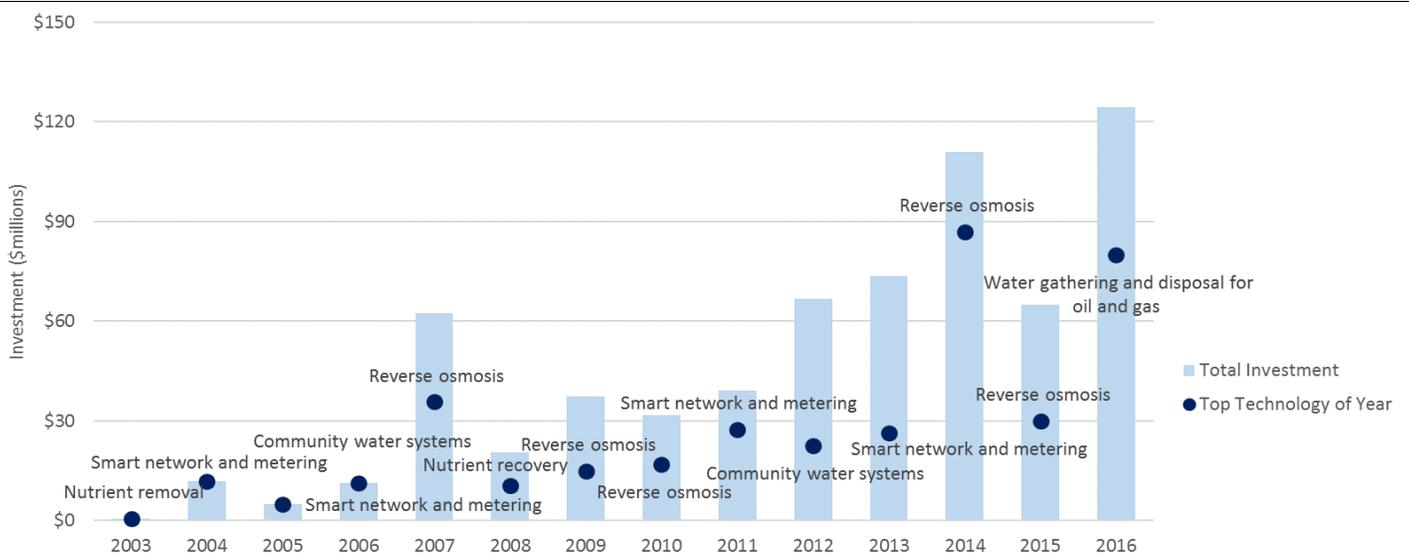
The likely application for 3D printing in the water sector is in the prototyping and manufacturing of membranes for water filtration. Analysis by the University of Bath¹⁶ on the application of 3D printing for reverse osmosis membranes concluded that the current version of 3D printers show promise due to their ability to print complex structures. However, the current printers are unable to accurately print at the scale and within the time required to beat existing membrane manufacturing technologies.

Private financing trends an indicator of future water investing

Our assessment of short-term and long-term trends finds that the investment opportunities in water will not change rapidly. To understand potential future water investment opportunities, we assessed trends in the private financing of water technology companies since the early 2000s.

We collected available data on public and private investments from Bloomberg and CrunchBase. Given that these sources are not exhaustive, our analysis therefore offers an *indication* of the water financing field based on the limited data publicly available. As shown in Figure 4, private investment in water technology increased approximately 180% between 2003 and 2016.

Figure 4: Private investing in water technology



Source: Crunchbase; Cornerstone Capital Group

The later years with high levels of investment reflect a few relatively large investments concentrated in certain water technologies. Investments in smart metering since 2011 have been a source of investment returns as these companies have been subsequently bought out by larger

¹⁶ <http://www.sciencedirect.com/science/article/pii/S0376738816304215>



engineering and technology companies. Presently, reverse osmosis technology funded in 2014 and 2015 have not reached maturity.

In addition, we assessed exits from water investments to provide an indication of financial returns:

Acquisition multiples have declined since the early 2000s

■ **Acquisitions:** Acquisition multiples have declined since the early 2000s in the water technology sector. A report by Impax Asset Management found that the average acquisition multiple between 2002 and 2012 stood at 14.8x trailing EV/EBITDA¹⁷. The publicly available data for 2016 shows an average multiple of 10.9x. The trend of acquisition multiples is important to watch in the next few years to determine if decline is secular or cyclical.

Few water tech companies have listed on public stock exchanges

■ **Public listings:** We find that few water technology companies have listed on public stock exchanges. Two examples of note are Xylem, which went public in October 2011 from a spinoff of ITT Corporation, and Evoqua, which went public in November 2017 through an IPO. The limited number of public pure play water companies suggests that public listings are an unlikely avenue for shareholders in private companies to expect financial returns.

From our perspective, barriers to increased investment in water stem from the lack of opportunities, rather than muted investor interest.

What's an investor to do?

Three areas of assessment: asset class, questions for asset managers, impact measurement framework

Investors interested in water face dual challenges of unclear long-term catalysts and limited opportunities. Given the uncertainty, we provide three areas of assessment to assist investors in understanding different vehicles and approaches for water investing: categories of investment by asset class; questions to engage managers; and an initial framework to assess environmental and social impact.

Asset classes

Alternatives

Alternative investments in the water space take several forms:

■ **Dedicated funds** that invest exclusively in privately held water-related companies. Such pure play investment vehicles remain rare, although several new ones have come to market in the past six months. These funds tend to have a multi-year lock-up and follow a General Partner (GP) / Limited Partner (LP) structure.

■ **A fund focused on sustainability-related technologies and products** which includes a sleeve dedicated to water. The managers of these strategies tend to have broad expertise in clean tech investing, but the depth of knowledge within the water sector can be lower than in other

¹⁷ <https://www.impaxam.com/sites/default/files/FINAL-%20Investing%20Water%20Global%20Opportunities%20in%20a%20growth%20sector.pdf>



areas of clean tech infrastructure. Like the funds discussed above, these managers tend to have long lock-ups and a GP/LP structure.

- There is a small group of hedge funds focused on the water sector. As the sector grows, these products may proliferate, but to date we have focused on exposure to water through other structures.

Although we have identified several promising investable technologies and themes related to water, our research has also uncovered some reasons to be conservative in approaching the space. Traditional venture managers, particularly those in technology, have consistently expressed a disconnect between the relatively slow spending cycles for typical water technology customers, such as municipal governments, and the high returns and short holding periods typical of venture investing.

Public equities

The opportunity set for investing in public equity markets within the water theme is growing, although it remains far from robust. We outline three broad categories:

- *Thematically focused funds* anchored around the concept of water investment, which remain the easiest method of investing in this area. How managers define their water themes and the revenue threshold they apply to qualify companies for the portfolio is key to comparing one investment product to another and determining the likely risk/return profile of the strategy.
- *Active public equity strategies* focused on technology related to sustainability and clean tech. As with private equity investments, water will be a component of the broader investment universe, and the manager can tactically allocate between energy, water, transport, etc. depending on their long- and short-term market views.
- *Clean tech and renewables ETFs*. There are several water ETFs available to investors. With ETFs it is also important to know how the underlying companies are screened for exposure and other elements that determine the portfolio.

Fixed income

This is the most challenging asset class to invest in for exposure to water, because there is a lack of clearly thematic managers organized around the sector. However, we provide three categories for investors to consider:

- Specific corporate bonds in companies whose business lines include types of water technology such as metering, or in industrial companies that are active in the water segment.
- Green bond strategies provide a second investment option to gain exposure to the water theme. While these strategies are not exclusively focused on water, water investments, often those related to infrastructure upgrades, will usually account for some percentage of the fund.

- Municipal bond portfolio that have exposure to upgrading water, wastewater, and sewage treatment facilities at the municipal or state level.

Engagement with managers

Understanding managers’ theses of the water market is key for investors placing capital within a fund, given the uncertainty of the water sector and likely long investment timeframes. Investors can question managers on their views of the market and governance to begin to differentiate between approaches. Below are four questions for investors to ask to gain better insight:

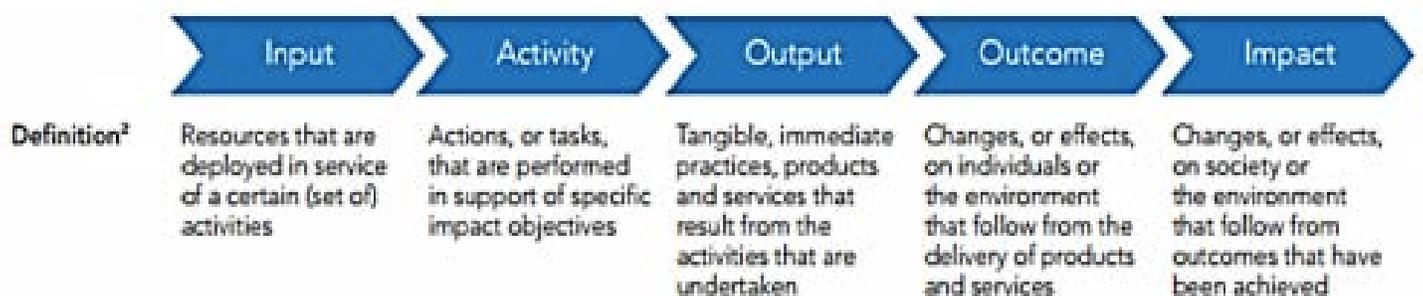
- Given the different technologies in the space, which do you see as having the most potential to address the long-term water trends?
- Many water investments are associated with long sales cycles to municipalities. Do these types of investments have a place in your portfolio, what role do they play in your investment thesis, and why? What is your typical time line for achieving a return on these types of investments?
- Many “water” investments are part of larger industrial or conglomerate companies. Are these types of companies included in the portfolio, or are you only considering water pure plays? What is the revenue threshold or other parameters that determine inclusion vs. exclusion?
- Other than pure-play water investments, what are the other types of investments being considered for this portfolio? How do these tie into the water investment thesis?

We believe that purposeful investors can find skilled managers that are best positioned in the long term for both risk-adjusted and impact returns.

Measuring impact

Impact measurement can provide investors with insight into the environmental and societal changes that occur because of their capital. The measurement of impact is based on a widely used model referred to as the Impact Value Chain. This model explains the link between activities that are undertaken by an investment and its outcomes and impact (Figure 5).

Figure 5: Impact value chain



Source: Social Impact Investment Taskforce

We outline an example value chain for water investment:

- Input: investor capital that catalyzes the cascading levels of changes;
- Activity: development of clean water technology;
- Output: more sources of quality drinking water in local communities located in developing countries with low water provision;
- Outcome: girls spend less time gathering water and school attendance levels rise;
- Impact: economic productivity increases with a more educated workforce.

Investors can work with managers and advisors to appropriately define and measure the impact of their capital.



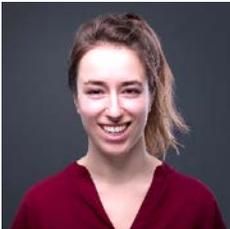
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