March 2016

Navigating Rough Waters

Businesses & Investors Must Adapt for a Water-Stressed Future

TERRA ALPHA
INVESTMENTS

Terra Alpha Investments, LLC is an advocacy investment firm established in 2014.

Our vision is to drive systemic change in our economy, so that it is more aligned with our natural systems.

Our firm's mission is to demonstrate that Environmental Productivity enhances long-term returns as expressed in real investment results and to advocate for the widespread adoption of Environmental Productivity across the global economic system.

At Terra Alpha Investments, LLC, we advocate for the accounting for and disclosure of relevant environmental data from company operations because we see it as material to thorough investment research and understanding corporate efficiency. Using company-reported data (not third-party estimates), we compare the resource intensities of companies to peers in their sub-sector. If a company surpasses a threshold of efficiency relative to its peers, it is eligible for investment consideration based on our fundamental and valuation analysis process.

Authors
Rita Morency, *Research Analyst*
Brendan Corbett, *Research Analyst*
Wynn Tucker, *Environmental Productivity Intern*
Amy Dine, *Director of Advocacy*

Contributors
Jacob Hampton, *Investment Analyst*
Andrew Geller, *Senior Partner and Chief Financial Officer*
Dan Sanborn, CFA, *Director of Investment Data and Research*
Timothy P. Dunn, CFA, *Founder, Managing Member, and Chief Investment Officer*

March 2016

119 The Plains Road, Suite 250 • Middleburg, Virginia 20117
www.terraalphainvestments.com

Introduction

Water is a resource everyone needs, but even in the face of scarcity few companies or investors have adequately valued water or planned for limited access. Limited or no access to water was once a distant concept to businesses; it has now become reality for many and a near-term challenge globally. The impacts of water stresses reach across sectors – all companies may face physical, regulatory, or reputational risks if they operate or rely on operations in any water-stressed area. Yet managed risks can become opportunities.

Preparing for the reality of water stresses can position companies to reduce vulnerabilities and outperform competitors. When companies measure their water footprints and disclose this information, both companies and investors benefit. Companies can benchmark against their peers while providing material information to investors. Investors can make informed decisions that maximize returns by incorporating water risks and opportunities into their valuation methods.

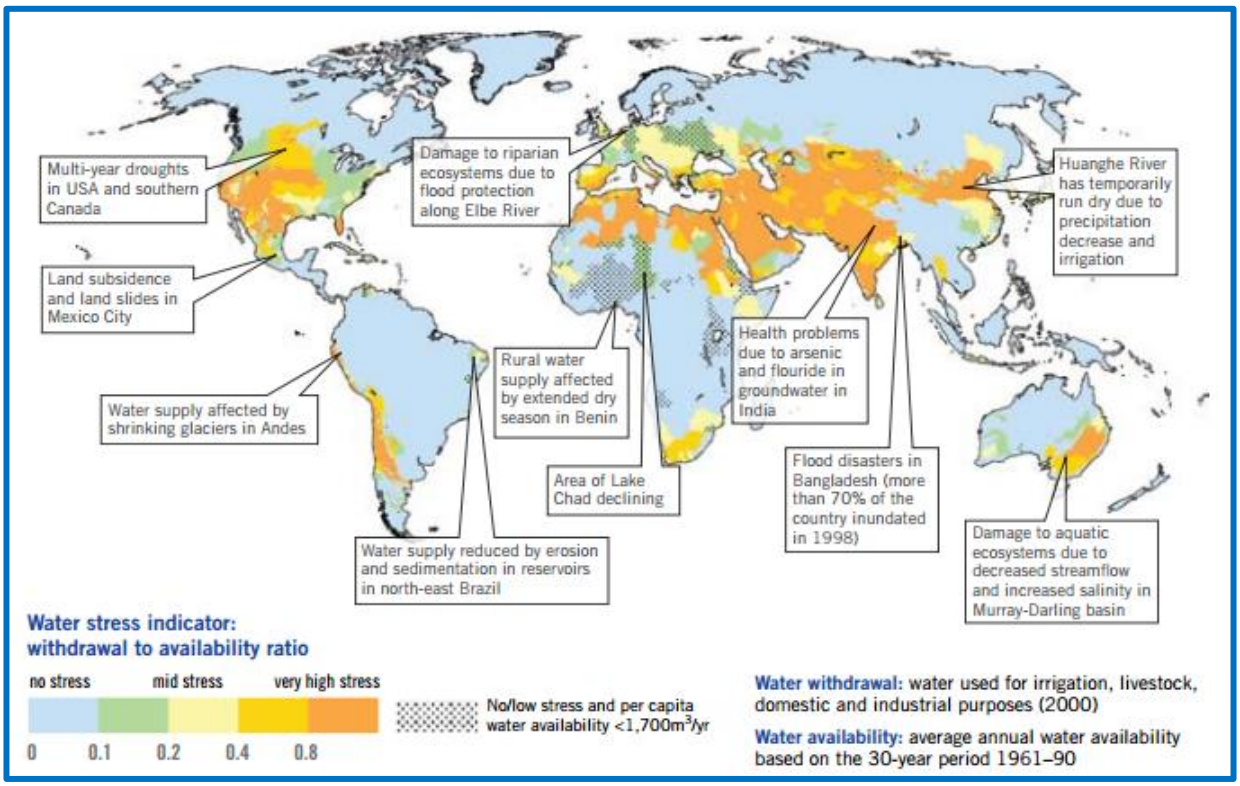
This report is intended to inform both businesses and investors about the reality, risks, and opportunities of water stresses. Many real world examples are included to illustrate how water stresses have affected profits and to show what companies and investors are doing to adapt. We provide solutions for both businesses and investors to turn vulnerabilities into value.

Key takeaways:

I. **Global Backdrop — Global water resources are becoming increasingly stressed due to a variety of factors**. Countries, communities, and companies already are feeling the effect of this stress, which will become progressively more impactful in the future.
II. **Risks — Water risks may be physical, reputational, or regulatory and will have significant financial implications.** Companies are more frequently reporting higher amounts of exposure to these risks. Investors are also exposed.
III. **Opportunities — Water stress also presents operational, strategic, and market opportunities for businesses and investors.** Companies that capture these opportunities better position themselves to outperform their peers.
IV. **Recommended Business Actions — Companies that measure their water use and impact can better manage it.** Many tools for companies to assess risks and opportunities exist today, and they can be used to create long-term value. Companies benefit from disclosing information about water risks and strategy.
V. **Recommended Investor Actions — Investors can reduce risks and improve returns** by incorporating environmental factors, including corporate water usage and water stress exposure, into their investment analysis and portfolio-creation process. Several tools exist for investors to analyze company-specific environmental performance. Importantly, investors need to request that all companies measure and report their water usage and impact information.

I. Global Backdrop

The effects of growing global consumption - compounded by a changing climate - are straining all freshwater supplies. The World Economic Forum called **global water crises "the biggest threat facing the planet over the next decade**."[1] The effects of water stresses are already being felt around the world.



Source: Pacific Institute, "Water Scarcity & Climate Change: Growing Risks for Businesses and Investors," *Ceres*, February 2009. http://pacinst.org/wp-content/uploads/sites/21/2014/04/growing-risk-for-business-investors.pdf.

Global demand for water is increasing rapidly.

- Between 2007 and 2025, water use is predicted to increase 50% in developing countries and 18% in developed countries.[2]
- By 2030, there is projected to be a 40% gap between global supplies of and demand for freshwater.[3]

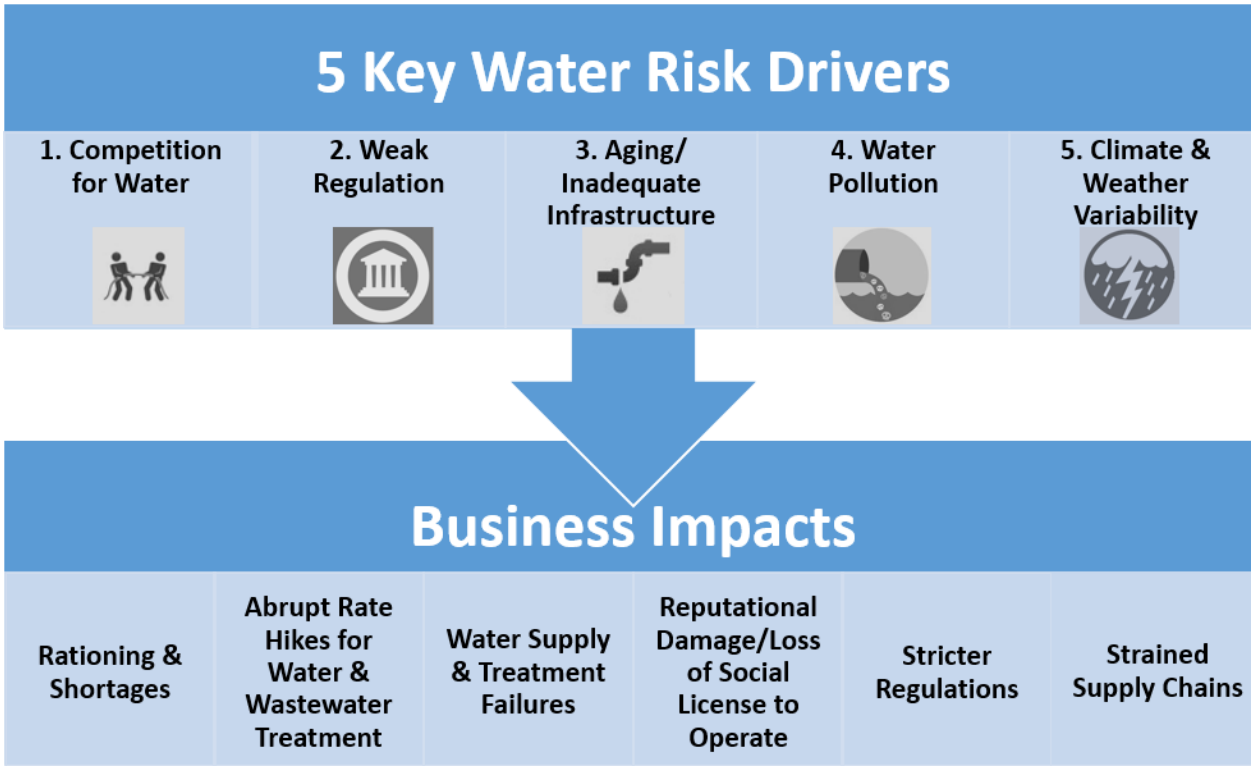
Meanwhile, global supply is becoming more variable and unreliable.

- Only 2.5% of Earth's water is freshwater.[4]
- By 2025, 67% of the world's population is expected to be living in water-scarce regions, versus nearly 20% in 2015.[5]
- 15 of the 16 warmest years on record have occurred since 2000.[6] Rising global temperatures can cause faster glacial melting, more evaporation, and less snowfall, all of which increase the risk of droughts.[7]
- Changes in the climate are leading to shifts in weather patterns; the severity and frequency of both extreme droughts and heavier rainfall are increasing.[8]

- Water infrastructure worldwide is outdated and inefficient. In the U.S. alone, infrastructure losses amount to 7.95 trillion liters of water per year, or 1.6% of total national water usage.[9]

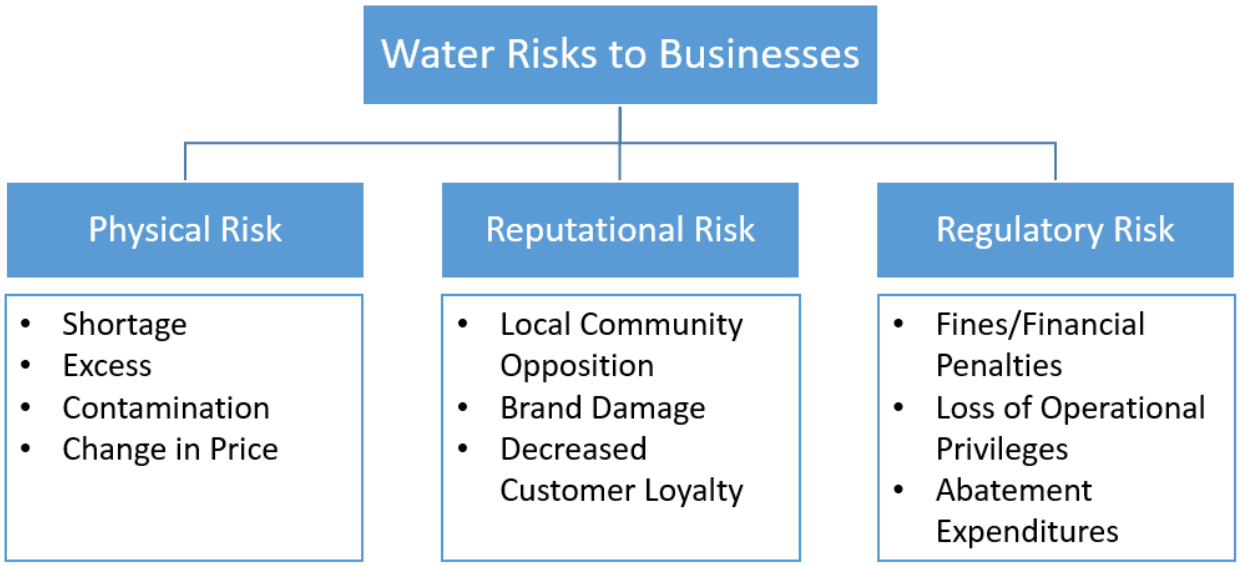
A water-constrained future will undoubtedly affect businesses, and the impacts are already being felt today. **In 2015, 405 global companies reported detrimental water challenges that totaled more than $2.5 billion to CDP (formerly the Carbon Disclosure Project) in their annual water survey.**[10] Understanding water-associated risks is fundamental to mitigating potential losses and creating opportunities.

II. Water Risks to Business

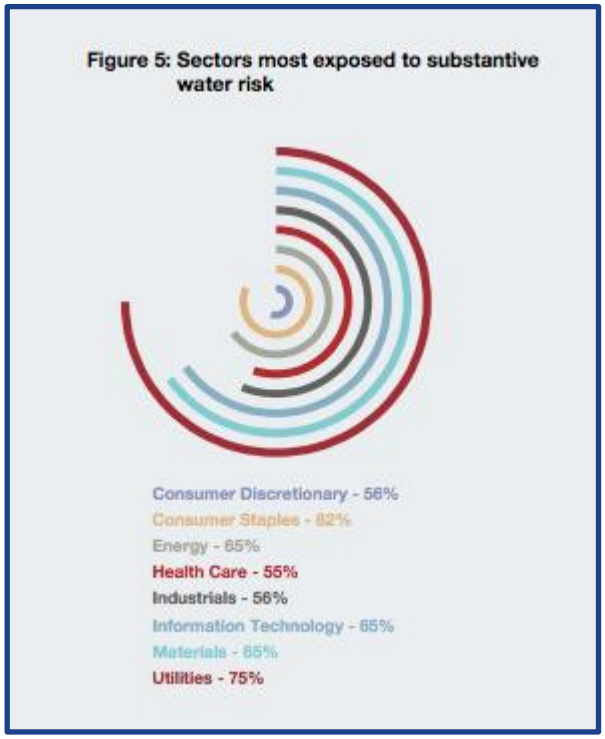


Adapted from "5 Key Water Risk Drivers." Ceres. http://www.ceres.org/issues/water/agriculture/water-risks-food-sector/info-graphics/5-key-water-risk-drivers/view.

Water risks are driven by **competition for water, weak regulation, aging and inadequate infrastructure, water pollution, and changing weather patterns.** These factors combine to create risks that affect businesses throughout their value chains and pose a substantive threat to financial performance. Risks to a company's secure access to water fall into three main categories: **physical, reputational, and regulatory.**



Water risks can have significant financial implications both in terms of direct costs and opportunity costs. **The business impacts of risks associated with water are higher operating costs, an inability to continue production, tarnished product and brand image, and regulations affecting corporate water access.** Companies that fail to regularly assess water risk along their value chains will be exposed to unfavorable business impacts. In data collected by CDP, 65% of companies reported exposure to substantive water risk, and 27% reported seeing negative water risk impacts in the past year.[11] For investors, this translates to a high level of risk exposure in their portfolios.



Percent of companies reporting substantive water risk. From CDP Global Water Report 2015.

Every sector is exposed to water risk. Industry and agriculture combined use 90% of the world's water supply[12]: every company, regardless of sector, is dependent on water at some point along its value chain. These risks come with a price tag. It is becoming increasingly clear that disregarding water-related risks can result in losses, while preparing for and disclosing the steps taken to manage these risks can create opportunities for growth.

Physical Risks

Any change in a company's water supply will hinder operational continuity - water is fundamental to stable business operations.

Global water stress exposes companies to physical risks, which include:

- Too much water (e.g., floods)
- Too little water (e.g., droughts)
- Contaminated water
- Change in price

Physical risks can have large financial implications for corporations and can create downward pressure on the stock price as a result of missed earnings guidance or expectations.

The following examples illustrate damaging business impacts from unmonitored exposure to too much water:

- In 2010, flooding of a **Sasol Synfuels** plant caused **Sasol Limited** production losses of approximately $15.6 million.[13]
- **Munich Re** suffered a 38% decline in quarterly profits in 2010 after receiving claims worth more than $350 million due to severe flooding that closed 75% of coal mines in Australia.[14]
- Extreme rainfall in 2011 caused severe disruptions to **Anglo American**'s mining activity in Chile; copper production decreased by 8% as a result of shutdowns.[15]

Flooding In Thailand

In 2011, higher than average rainfall aligned with other factors to cause Thailand's worst floods in 50 years. Nearly 40% of the world's **hard disk drive (HDD) production** and manufacturing facilities were located in the Chao Phraya River valley, **a known floodplain.** The severe floods caused massive evacuations, factory shutdowns, and supply chain disruptions for all industrial processes located in the valley.[16] Hard drive shipments fell 30% below demand.[17]

- **Emerson Electric** saw net income fall 23% after costs rose and sales decreased due to supply chain disruptions.[18] The negative impact also affected the stock price: Emerson shares were down close to 3% relative to the S&P 500 Index on the report date.
- The world's biggest hard drive maker, **Western Digital Corp.**, was forced to close its Thai factories, where it made 60% of its hard disk drives. Its operations and ability to meet customer demand were seriously hindered. Shares dropped 7% in one day.[19]
- The global shortage of HDDs added $5 to $10 to the cost of each hard drive, as reported by **Lenovo Group Ltd.,** the world's second-biggest maker of PCs.[20]

Other industries were also affected.

- **Toyota**, **Honda**, **Nissan**, and **Ford** all felt the effects of the floods on their earnings; the floods caused these companies to close their Thai plants, and the shortages of parts slowed

manufacturing around the world. Honda faced costly repairs to its flood-damaged factory; it was forced to delay model releases, and it reported negative earnings that quarter. In 2011, **Honda's stock was down 28%.** Toyota reported an 18.5% net income drop, a 4.8% decline in revenue, and a 32.4% fall of operating profit. **Toyota's stock was down 22% following the negative earnings report.**[21]

These floods were not hydrologically unprecedented[22]; companies should have been prepared for flood risk losses from operational and supply chain disruption.

Much like floods, droughts can have substantive financial impacts on businesses. With the increasing frequency of severe weather events, companies are exposed to water-stress-related events more than ever.

- The U.S. **agricultural sector** alone lost $2.2 billion due to the 2015 Californian drought.[23]
- Droughts in the US in 2011 halved the production of cotton, causing cotton prices to spike. **Gap Inc.**'s share price fell 17% after cutting its full-year profit forecast by 22% due to the scarcity of cotton.[24]

Crisis in Flint

The 2015-2016 water crisis in Flint, Michigan, is an example of the deleterious effects of lack of preparation against water quality risk. If the city had spent just $100 a day to add an anti-corrosive agent to its new water supply, it could have avoided the $1.5 billion plus in repair costs it faces currently.

This example applies to businesses as well - though new infrastructure or treatment plants may be costly, a company can save significant capital by investing now in preparation for a more water-stressed future.

http://www.cnn.com/2016/01/19/us/flint-water-crisis-whats-next/

The quality of accessible water is essential, yet much of the **remaining sources of clean and usable water around the globe are rapidly becoming polluted**. In many industrial production systems, the quality of process water is critical, but the remedies for contaminated water are limited and costly. Often businesses face **unforeseen capital expenditures and higher costs** to purify contaminated water. Treatment options can be time consuming or in some cases not feasible at all.

Semiconductor production requires large amounts of highly purified water. Were the quality of available water to deteriorate, companies would face increased treatment costs. A J.P. Morgan report estimated that if water costs doubled, it would reduce the earnings per share of Texas Instruments and Intel by almost 5% each (using 2008 data).[25]

If costs are too high or treatment is not feasible, production will be interrupted or require relocation.[26] Contaminated water supplies can also limit opportunities for growth if businesses are looking to expand in an area with poor water quality.

Significant changes in water supply and quality will affect businesses in all sectors in a variety of ways. Disregard for the physical risks from water scarcity exposure can lead to insufficient amounts of water for production, irrigation, processing, cooling, cleaning, or even cause an office building to close its doors.[27] A company is vulnerable if it relies on operations in a water-stressed area at any point along its value chain.

Fukushima Disaster

The worst effects of the 2011 Fukushima nuclear disaster might have been averted if officials had accounted for a statistically infrequent (yet possible) tsunami. Japan's nuclear regulations were developed in a period with relatively few major earthquakes, resulting in a false sense of security and poor preparation. There was no precedent for a tsunami striking a nuclear power plant, though in 1993, a tsunami struck land just over 300 miles from the Fukushima plant, producing waves high enough to breach the plant's walls. Yet the word "tsunami" did not appear in Japan's nuclear guidelines until 2006. Extreme weather scenarios can incur incredible costs should businesses not plan and prepare for them.

http://www.nytimes.com/2011/03/27/world/asia/27nuke.html

Reputational Risks

Reputational risk stems from **public perception of water mismanagement**. According to a study conducted by the World Economic Forum, three-fifths of chief executives said they believed **corporate brand and reputation represented more than 40% of their company's market capitalization**.[28] Strong brand reputational value means higher profits; conversely, reputational damage translates to actualized financial damage. As communities, investors, and consumers become more aware of the physical risks from water scarcity, they are more likely to form **opposition to real or perceived inequalities in water use**. Heightened criticism can have severe implications for business performance and competitiveness.

Reputational risks include:

- Damaged brand value and consumer perception
- Increased difficulty expanding into new markets
- Loss of a company's license to operate
- Alienation of investors and damaged share price

Water scarcity and quality can cause disputes between local communities and companies over water needs.

Examples of local resistance resulting in loss of profits and operational shutdowns:

- Community opposition forced **Nestlé Waters** to cancel its plans to operate the country's largest water bottling plant in California in 2009. Protestors believed that Nestlé was illegally taking water from drought-stricken regions in California.[29] Nestlé also suffered significant reputational damage after citizens in Michigan believed that Nestlé was improperly withdrawing water and competing with the local water supplies, regardless of the fact that authorities ruled in favor of Nestlé.[30]
- In 2014, local officials in northern India ordered **Coca-Cola** to close a bottling plant over its water use. The plant had been the object of local protests for years, as villagers blamed lowering groundwater levels on the bottling plant. In addition to interrupting operations, the episode caused losses on a planned $24 million expansion of the bottling plant.[31]
- The Canadian miner, **Barrick Gold**, faced intense public opposition after proposing to shift glaciers in Chile, which were the local communities' only source of freshwater, in order to mine gold and silver located beneath the glaciers. The project would have resulted in at least $11.5 billion in gold extraction, but the community resistance prevented the project from occurring.[32]

Trouble in Rio

Rio de Janeiro, Brazil, the host of the 2016 Summer Olympics, has come under increasing scrutiny for the water quality of its Olympic waterways. A recent study by the Associated Press determined that athletes who ingest as little as one tablespoon of this water have a 99% chance of being infected by viruses in the water. This poor management of water resources will not only damage Rio's reputation as the world's eyes are fixed on it this summer, but it will also likely impact tourism and subsequent revenues for years into the future.

http://bigstory.ap.org/article/cabd453515244bf2b1063e15f6b680c9/ap-test-rio-olympic-water-badly-polluted-even-far-offshore

Negative attention generated from both perceived and real impacts on local communities can cause significant long-term problems. Damage to reputation, loss of consumer confidence in products, and conflicts with communities can result in material adverse effects on operations and finances.

Regulatory Risks

Businesses thrive in stable regulatory environments. Clean water is progressively being recognized as a finite resource and therefore is attracting greater regulation on its use and impacts. Businesses are exposed to regulatory risk if any part of their value chain operates in a water-stressed region, where **updated regulation may limit water use, tighten wastewater standards, or increase the price of water.**

Regulatory risks often occur as a result of events triggered by physical and reputational risks: water scarcity and public scrutiny puts pressure on authorities to implement more stringent water policies. Businesses are exposed to regulatory risks if they are operating in an area devoid of water-related laws, where **sudden, unexpected changes in regulations can create unanticipated costs or loss of assets.**

Regulatory risks include:

- Increases in the price of water
- Stricter efficiency, reuse, or recycling requirements
- More pollution restrictions or higher wastewater quality standards
- Changes to withdrawal rights
- New process or product standards
- Revocation of license to operate

These risks often have large effects on corporate water use and will likely cause a loss of revenue and/or hinder industrial production.

- In 2013, **Exelon** was forced to retire one of its nuclear plants 10 years earlier than planned due to the costs required to upgrade it to meet more stringent water permit conditions, which would have amounted to $800 million.[33]
- **Merck** was forced to pay $20 million in "fines, environmental improvements, and cleanup costs," as a consequence of polluting local drinking water supplies with chemical discharge. [34]
- Chilean courts fined **Barrick Gold** $16 million in 2014 after the company failed to put in place legally required wastewater discharge treatment systems in its new Pascua-Lama mine. Barrick Gold did not have a viable system for treating contaminated water or preventing rainwater contamination. Construction of the mining project was suspended while the company was stuck in legal proceedings with the Chilean government. The stock fell 15% that year.[35]

California Drought

In 2015, California passed a bill that imposed water restrictions due to the severe drought affecting the state. The goal of the bill was to reduce water usage by 25% statewide; noncompliance would result in punitive measures. In September, Starbucks' water supplier Sugar Pine Spring Water was fined by California for "making the state's drought worse", allegedly tapping into dry springs in one of California's worst drought regions.

http://www.nytimes.com/2015/04/02/us/california-imposes-first-ever-water-restrictions-to-deal-with-drought.html

If left unaddressed, water scarcity and declining water quality present companies with a range of risks that will result in lost economic opportunity. A lack of acknowledgement and preparation for these risks will be expensive at best, in the form of higher operating costs, unexpected capital expenditures and asset risk,[36] but can threaten operational continuity at worst.

III. Water Opportunity: Higher Efficiency Can Lead to Higher Returns

While the risks to companies and investors posed by water stress are undeniable, these same stresses also create opportunities for outperformance. In CDP's 2015 Global Water Report, **73% of respondent companies stated that water offers "operational, strategic, or market opportunities."** Nearly 77% of that subgroup stated that these opportunities will be realized in the next three years. All of these opportunities can add significant value for both businesses and investors. Those who fail to capitalize on these trends will be left behind.

Opportunities can be sorted into three categories: operational, strategic and market. In many cases, companies that reduce their water intensity will often capture one or more of these opportunities.

[37]

Operational Opportunities

Improving operational efficiency has traditionally been a core strategy for many businesses to realize significant and long-term financial savings. Improving the water efficiency of a company's operations is no different.

There are substantial opportunities for companies to reduce operational water intensity while saving money. In California today, about 20% of the state's electricity is used to transport and treat water and wastewater. Nationally, approximately 2% ($24.1 billion)[38] of total energy consumption is used for drinking water and wastewater treatment services.[39] Reducing water usage or increasing the efficiency of these systems can lead to immediate cost reductions. **Xylem, Inc.** estimates that carbon emissions from wastewater management **could be cut nearly in half by installing high-efficiency wastewater treatment technologies that exist today, at $0 or negative cost.**[40]

Operational opportunities can include financial benefits from costs savings as well as increased sales.

- **SABMiller** undertook a water-risk assessment of their facilities in 2010 worldwide and have since implemented actions to reduce water use, helping them to realize cost savings of $300 million over five years.[41]
- **AB InBev reduced overall water use by 5.4%** in 2013 and saved the company $2.5 million - the equivalent of the water needed to make more than six billion cans of its products. **Water**

reduction efforts saved the company $5 million the following year and more than $12 million since 2012.[42]

- More than 70% of **Anglo American** mining group's operations are located in water-stressed basins. To address this issue, they launched the "Water Efficiency Target Tool" in 2011 and achieved their 2020 corporate water reduction target by 2014. This reduction resulted in annual **cost savings of $3.6 million.**[43]

Among the companies in CDP's 2015 Water Report, **Pfizer Inc., Johnson Controls,** and **Lockheed Martin Corporation** all reported increased sales from more effective water management, while **Assa Abloy, Biogen Inc.** and **Marriott International, Inc**. all cited increased cost savings from their efforts to reduce water usage.

There is growing evidence showing the financial benefits of reducing water use. A 2013 UK Environment Agency report on FTSE 100 companies found that the most profitable companies in the Oil & Gas, Basic Resources, Construction & Materials, and Insurance sectors had the lowest average water intensities in their sector.[44]

As the consistency of reported water data improves, and as water becomes more accurately priced, the relationship between operational water efficiency and profitability will become increasingly evident.

Levi Strauss & Co. - Gains from Water Reduction

Context: 70% of the earth's accessible fresh water goes toward agriculture production, with 3% of this amount used directly for growing cotton. According to The World Wildlife Fund, **it takes more than 20,000 liters of water to produce just one kilogram (2.2 pounds) of cotton** - roughly equal to one T-shirt and pair of jeans.[45]

In 2007, **Levi Strauss & Co.** became the first apparel company to conduct a lifecycle assessment, measuring the overall environmental impact of their jeans. Sustainable water management has been a major priority for Levi's, especially after floods in Pakistan and droughts in China in 2011 hurt crop yields and drastically increased cotton prices.

- Levi's plans to source 75% of its cotton from Better Cotton Initiative by 2020, which trains cotton farmers to use significantly less water.
- Levi Strauss's Water<Less™ program, resulted in over one billion liters of water saved from 2011-2014.
- Recently, the company produced 100,000 pairs of women's jeans at a plant in China using recycled water. They are in the process of implementing this standard around the world.

By taking proactive steps to assess its water footprint, Levi Strauss & Co. has begun to reduce the water consumption from its direct operations. These actions will not only help to **reduce the cost of their operations, but also help to mitigate the physical risks of water scarcity along their supply chain and increase their brand value to customers.** Levi Strauss' position as an industry leader in responsible water usage has allowed it to capture both operational and strategic opportunities in the near term.[46]

Strategic Opportunities

Water risks can pose serious hazards to companies' long-term plans. However, those that reduce their water intensity will place themselves at a competitive advantage relative to their peers. Evaluating and reducing supply chain operations' vulnerability to water stress will help protect operational continuity, improve supply chain resiliency, and boost investor confidence. Strategic opportunities also include the benefits of increased brand value and community goodwill stemming from reduced environmental impact.

Companies across sectors are already moving to capture these opportunities and improve their market position in doing so.

- **Ford** determined that 24% of its operations are in regions considered to be at risk for water scarcity now. In order to strategically reduce water consumption, before significant price increases, they have **implemented new technologies to decrease water use per vehicle by 30% from 2009-2015.** More specifically, from 2000-2013, **Ford** decreased water use per vehicle by 58% at its Cuautitlán, Mexico facility, located in a water-scarce region.[47]
- **Holmen Paper** has developed advanced technology to use treated municipal wastewater in their mills and became the first mill in Europe to manufacture paper operating entirely on "recovered water." This not only bolstered their operational security against future water stress, but also increased their goodwill within the community.[48]
- In the beverage industry as of 2008, it took 12 liters of water to prepare one liter of drinkable beverage. Building on innovations from another bottler, **Pepsi** was able to **reduce this ratio to 2.2 liters of water per liter of beverage.** This innovation has cut Pepsi's operating expenses, reduced their impact on the surrounding community, and increased their resilience to water scarcity.[49]
- In 2006, **Rio Tinto** expanded its facility in Western Australia and took the opportunity to overhaul the site's water management structures. The result was a **96% reduction in water abstraction** from a nearby lake, a reduced cost of pumping water, and the ability to **recycle 40% of the site's water**. These improvements drastically decreased Rio Tinto's demand on local water resources and helped to fortify their operations against future droughts and community backlash.[50]

Even companies who have experienced the detrimental effects of water risk firsthand can still turn this risk into an opportunity.

PepsiCo India - Goes Full Circle

Many areas of India suffer from water scarcity; more than 130 million Indians live in areas with poor water quality.[51] While **PepsiCo** only accounts for ~0.04% of India's industrial water use, it has still received criticism over its water use.[52]

Protests over PepsiCo's water footprint occurred in areas with depleted groundwater, resulting in reputational damage, interruptions to operations, and fewer sales. In response, PepsiCo sought to

offset the water footprint of its Indian operations. In 2009, **it achieved a "Positive Water Balance", replenishing and recharging water through a variety of projects around the country.**

PepsiCo's efforts have included rainwater harvesting, dam building, and a number of agricultural interventions. PepsiCo has maintained a "Positive Water Balance" since 2009, and offsetting its water footprint remains a major priority.[53]

PepsiCo India provides both a cautionary tale on water-related risks, as well as an example of how a company can strategically reposition itself through increased water responsibility.

Companies addressing specific risks are already capturing benefits. However, in order to maximize potential opportunity gain, companies must assess their entire supply chain.

General Mills - Assesses All Risk

General Mills measures the water footprint of its entire supply chain and, in partnership with The Nature Conservancy, assessed the health of the 60+ watersheds worldwide critical to its operations. This resulted in the identification of eight key, at-risk watersheds.[54]

In the El Bajio watershed in northern Mexico, General Mills determined that due to human use and climate change, the watershed could potentially be unsuitable for large-scale agriculture by 2035. With this knowledge, General Mills facilitated multi-stakeholder collaboration between companies, government agencies, and NGOs to develop a conservation plan for the watershed. General Mills has begun issuing interest-free loans to local broccoli and cauliflower farmers to expedite the adoption of drip irrigation practices. **So far, these practices are estimated to be saving 4.16 billion liters of water a year in the region.[55]**

General Mills is also pursuing conservation plans in the other seven at-risk watersheds. With its extensive information on water risk exposure and open dialogues with local stakeholders in at-risk watersheds, General Mills is better positioned to withstand (or avoid) future impacts of water stress.

Market Opportunities

With water stresses increasing over the coming decades, companies who can minimize water risk and/or help customers to minimize their risk, will be better positioned to succeed. Due to the localized nature of water scarcity, companies who reduce the water impacts of their direct operations will be the least limited in their physical locations. More directly apparent are the market opportunities created by water security and efficiency solutions.

The global water sector is estimated to be a $450 to $500 billion global market, with growing demand across the globe.[56] In the U.S alone, leaks from old/faulty infrastructure cause roughly $10 billion a year in private property damage, highlighting the tremendous need for new investment.[57] In China, the market for current membrane technology used to clean wastewater will grow more than 30% annually over the next two decades.[58]

McKinsey & Company estimates that over the next two decades between **$50 and $60 billion will need to be invested annually in deploying water productivity improvements across the globe** to "close the gap between water supply and demand." The private sector is expected to make up as much as half of this spending, with many of these investments yielding positive returns in three to four years.[59] This tremendous demand for capital provides a large opportunity for companies and investors to get ahead of this curve as well as participate in/offer solutions for others.

Some companies are already beginning to anticipate strategic opportunities and offer these solutions.

- **COOPERNIC** (a sourcing alliance of major European retailers) funded the adoption of more efficient irrigation systems at farms in India, Guatemala and Madagascar. These systems helped farmers **reduce water abstraction by 69% and increase agricultural productivity by 41%**. This increased productivity translated into greater surpluses, which farmers could sell not only to suppliers, but also at their local market. [60]
- **Advansa** implemented a pilot program at its chemical plant in Adana, Turkey, which reduced cooling water use by over 150,000m^3/year. The project payback period was less than six months and now returns cost savings of over $100,000 a year. Most importantly, these improvements comply with stricter EU water regulations, giving **Advansa access to the neighboring EU market**.[61]
- **Jain Irrigation Systems** has developed micro-irrigation and drip irrigation systems that use only 30% as much water as traditional systems and has deployed these technologies to farmers in India. The technology aims to reduce agricultural water use and to improve the efficiency of smallholder farmers, who account for 75% of all agricultural producers in India. Over the past five years, Jain's investment in this new market has led to their growth at an annual rate of 72%.[62]

Unilever - Maps a New Landscape

Context: Unilever's product categories involve the consumption of more than 90% of the water used in the home. In areas under water stress, a limit on household water use means a limit on Unilever's growth.

In 2002, **Unilever** established the Unilever Centre for Environmental Water Quality (UCEWQ) at Rhodes University in South Africa. The UCEWQ sponsors research and provides input on policy development in the country. Through this academic partnership, Unilever **gains expert insight into local water issues critical to business operations, while also influencing water policy-making.**[63]The UCEWQ will help Unilever identify market opportunities for current and new products as water regulation in South Africa changes and home products need to be less water intensive. **Unilever's goal is to halve the water impact per consumer use by 2020 (relative to 2010 baseline)**.[64] Being a leader in identifying these market shifts can have significant long-term financial payoff for both Unilever and its investors.

IV. Recommended Business Actions

Every company needs to measure its water footprint and evaluate its exposure to potential risks. **Through the use of existing measurement and reporting tools, managed risks can become opportunities, yet only 16% of companies reported their water risks in 2014.**[65]

Evaluation

First and foremost, **a company must evaluate**. A full water risk analysis includes measuring direct water usage, waste, value chain footprint, and assessing local conditions in areas of both current and future operation. All potential physical (quantity and quality), reputational, and regulatory risks must be acknowledged and assessed.

A water footprint analysis can be complex, as water dependency is location and time specific. Physical, regulatory, and reputational risks vary depending on financial and operational exposure to different regions, and new risks can arise at any time.[66] A company's water footprint **is not static**. Companies must regularly monitor their exposure to water risk, as water-related events can appear suddenly and have severe ramifications.

Evaluation Tools

How can a company perform a water audit and evaluate water risk? There are a number of **consulting companies** (both well-known, full-service strategy firms and lesser-known, water-specific experts) that offer sustainable water management services. There are also **several different tools offered by non-profits** that companies can use to measure their water use and impact. Other organizations provide sector research and suggest standards and frameworks for disclosing. Some tools are targeted more at investors, some are more for companies' internal use. Other tools are more focused on disclosure, an essential step once companies have collected data on their water footprint. **See Appendix A.**

1,025 Companies Worldwide Reported Water Metrics in 2013 (listed by industry)

Oil & Gas	55
Basic Materials	155
Industrials	224
Consumer Goods	148
Health Care	55
Consumer Services	74
Telecommunications	27
Utillities	77
Financials	153
Technology	57

Source: Trucost

Disclose

Once measured, it is **critical to disclose** water data. Investors look for transparency of material information. Water is a material factor that aids investors in their company analysis, and gives companies the ability to optimize water efficiency and minimize water risk. More and more companies are recognizing the importance of water disclosure (1,025 companies disclosed their water metrics in 2013).[67] As disclosure rates continue to increase, a company can more accurately benchmark performance against that of their peers.

V. Recommended Investor Actions

Investors who incorporate water and natural resource impacts into their investment analysis and portfolio creation process can reduce risks and improve returns. In order to have the data to evaluate, shareholders can and should play a significant role in requesting that all companies, regardless of sector, measure and report their water usage and impact information.

There is **growing recognition of the materiality of water and natural resource impact, broadly.** For example:

- In their 2014 survey, **PwC found 82% of investors said they considered resource scarcity** and climate change in the past twelve months, and 87% expected to in the next three years - this includes corporate water usage and impact.[68]
- In 2010, the **SEC issued guidance on climate change risk disclosure**, warning that "changes in the availability or quality of water" could have "material effects on companies."[69]
- In addition to Terra Alpha Investments, LLC, some institutional equity investors are integrating water risks into their portfolio-creation processes. Norges Bank Investment Management and CalPERS have publicly stated they consider the water risks of their portfolio holdings.[70]
- Leading private equity firms, including **Carlyle Group and KKR, already expect** their portfolio companies to assess and manage their water risks and seek to improve water-related efficiencies.[71]

Material Risks and Opportunities

The reality of water stresses will result in price increases and supply shocks. Investors should have the ability to assess the related risks and opportunities for any company. No one ever disputes that water is essential to human life; yet we have historically failed to recognize that our economic livelihood - every business - cannot operate without consistent, reliable access to clean water. Access to what has traditionally been treated as a freely and endlessly supplied resource is being challenged by physical, reputational and regulatory risks. Companies that are prepared will be able to best manage the risks.

Resources and Data

Resources/organizations that focus on investor perspective regarding water risks and opportunities are **included in Appendix A** with company measurement tools, as well. In addition, business/non-profit coalitions like CERES highlight the significance of water-related risks for investors (e.g. CERES Value Every Drop initiative). Moreover, the Sustainability Accounting Standards Board (SASB) is in the process of developing sustainability accounting standards to assist public corporations with disclosing material, decision-useful information, including water-related data, to investors.

Where does an investor look for information about a company's water measurements? Currently, over 1,000 public companies provide some level of corporate-wide information about their water usage and exposures. The number of companies reporting this information has been increasing each year.

For companies that are disclosing data, it is commonly found through a few channels:

- Company's own public reports - annual report, sustainability report
- Third party data repositories such as Trucost, CDP, GRI, Bloomberg's ESG section, and Thomson Reuters.

Examples of Good Practices in Water Management and Disclosure

Arca Continental – Thorough Measurement Leads to Positive Returns

Arca Continental is a manufacturer and distributor of beverages in Mexico and various countries throughout South America. The company has been publishing a social responsibility report since 2007. As part of the report, the company addresses environmental wellbeing, including its water footprint. Arca notes that "Water is not merely one of our main raw materials; it's an indispensable part of our operation."[72]

Below is a snapshot of data from their 2014 Social Responsibility and Sustainability Report:

	2012	2013	2014
ENVIRONMENTAL WELLBEING			
WATER			
WATER USAGE RATE (L WATER/L BEVERAGE)	1.77	1.71	**1.68**
PERCENTAGE OF RECYCLED WATER	10.5%	10.8%	**14.2%**
RESIDUAL WATER DRAINAGE (MILLION m³)	5.66	5.27	**4.96**

In addition, below is a snapshot of the company's water-related data shown in the ESG section of Bloomberg Professional:

Arca Continental SAB de CV — Periods 10 Annuals — Currency MXN

1) Key Stats | 2) I/S | 3) B/S | 4) C/F | 5) Ratios | 6) Segments | 7) Addl | 8) ESG | 9) Custom

11) Overview | 12) Environmental | 13) Social | 14) Governance | 15) ESG Ratios | 16) CDP

In Millions of MXN except Per Share	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
12 Months Ending	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014
Total Water Use	13,240.5	14,513.5	15,411.3	14,423.4	14,013.7	13,989.5
Total Water Withdrawal	–	13,075.3	13,343.1	13,041.0	12,647.7	12,250.0
% Water Recycled	–	11.00	15.50	10.60	10.80	14.20
Water/Unit of Prod (in Liters)	2.02	1.96	1.85	1.77	1.71	1.68

Overall, Arca has seen its total water withdrawal, water discharge, and water use trend downward despite several acquisitions and a growing business. The improved efficiency in their use of natural resources (energy, water, and raw materials) are very likely contributing to Arca's wider margins relative to peers as shown below.

Name	Sales Growth (%)	EBITDA Growth (%)	EBITDA Margin	Operating Income Margin	Net Profit Margin	Return on Invested Capital	Return on Assets	Return on
Average	5.51%	10.54%	15.80%	11.11%	5.88%	8.90%	4.93%	19.19%
ARCA CONTINENTAL SAB DE	23.40%	21.31%	21.31%	16.68%	9.48%	9.32%	6.84%	14.93%
COCA-COLA FEMSA SAB-SER	-7.53%	-4.31%	19.36%	14.57%	6.68%	8.45%	4.72%	9.47%
COCA-COLA ENTERPRISES	-15.16%	-14.16%	16.26%	12.35%	8.50%	12.94%	7.38%	49.92%
COCA-COLA ICECEK AS	12.34%	12.10%	15.56%	10.18%	1.74%	7.46%	1.45%	3.53%
COCA-COLA BOTTLING CO C	25.13%	29.81%	8.08%	4.56%	2.71%	7.60%	3.74%	25.61%
COCA-COLA AMATIL LTD	2.95%	20.29%	18.07%	12.82%	7.64%	9.60%	6.19%	20.89%
COCA-COLA HBC AG-DI	-2.52%	8.73%	11.96%	6.59%	4.42%	6.91%	4.18%	10.00%

Ford Motor – Water Disclosure Leader

Ford Motor has been completing the CDP Water Disclosure Survey since 2010. In 2015, the company was recognized as a leader in water stewardship by receiving one of only eight 'A' ratings and becoming a member of CDP's Water A List.

Within their response, Ford provided their current water withdrawals as shown below.

Source	Quantity (megaliters/year)	How does total water withdrawals for this source compare to the last reporting year?
Fresh surface water	770	About the same
Brackish surface water/seawater	0	Not applicable
Rainwater	0	Not applicable
Groundwater - renewable	545	Much lower
Groundwater - non-renewable	4388	Higher
Produced/process water	0	Not applicable
Municipal supply	18289	Lower
Wastewater from another organization	152	Higher
Total	24144	About the same

(section W1.2a)

Within the Water Risk section of their response, Ford clearly identified inherent water risks that could generate a substantive change in their business, operations, revenues, and costs. Below is a snapshot of the potential impacts:

Country	River basin	Risk driver	Potential impact	Description of impact	Timeframe	Likelihood	Magnitude of potential financial impact
Mexico	Bravo	Physical-Increased water stress	Higher operating costs	In Chihuahua City, most of the local residents are only able to receive water in their homes at certain times during the day. The industrial park where the Ford Chihuahua Engine Plant (ChEP) is located has its own wells and its own water supply lines; however, the underground wells pump water from the same underground reservoirs that supply fresh water to local residents.	Current-up to 1 year	Highly probable	Medium
Turkey	Sakarya	Physical-Increased water stress	Higher operating costs	The Sakarya basin has a high baseline water stress according to Ford's internal review using Global Water Tool. High water stress can lead to availability issues as well as conflicting basin stakeholder interests.	Current-up to 1 year	Probable	Low-medium
India	Other: Palar	Physical-Increased water stress	Higher operating costs	Some Ford facilities in India are shown as having a high baseline water stress according to Ford's internal review using Global Water Tool. High water stress can lead to availability issues as well as conflicting basin stakeholder interests.	Current-up to 1 year	Probable	Low-medium

(section W3.2c)

The CDP Water Disclosure Survey addresses: current state, risk assessment, implications, opportunities, facility-level assessment, response strategies, and targets and initiatives. Ford Motor is an example of a company that provided a thorough response across all categories, and, therefore, earned recognition on CDP's Water A List.

Integrating Water Awareness into Investment Processes

Investors need to consider a variety of fundamental factors related to water as they construct their portfolios. The most basic issues are:

- Identify material amounts of potentially stranded assets due to water risks. Has the company provided locations of their largest assets and are any exposed to negative changes in weather patterns or sea level rise?
- Identify operational risks due to availability of water or changing weather patterns that could disrupt production facilities and supply chains.
- Identify operational opportunities of a company versus its peers and/or in terms of improvements in operations to lower costs related to water.
- Incorporate efficiency factors into earnings forecasts.
- Incorporate balance sheet and operational risks into valuation process.

Once a company has collected data on its water usage, risks, and opportunities, it can take initiative to optimize water efficiency and minimize water risk. Any investor can and should use this information to make better investment decisions. Investors who incorporate water and natural resource impacts into their investment analysis and portfolio creation process can reduce risks and improve returns.

Conclusion: Businesses and Investors Must Adapt for a Water-Stressed Future

- Global water resources are undeniably becoming more stressed. Across the world, **companies and investors alike have already felt the impacts of these stresses**.
- Water stresses pose a variety of financial risks to both companies and investors, ranging from the **more palpable physical risks to more intangible regulatory and reputational risks that have serious financial consequences**.
- Dynamic water challenges also present opportunities. By proactively adapting their operations, supply chains, product mixes and investment strategies, both companies and investors can better position themselves to compete and succeed in a changing and constricted environment.
- **In order to capture these opportunities, companies must first measure their water footprint.**
- **Companies that measure will invariably be better able to manage their risk** and position their business for success.
- Organizations and processes for measuring, managing and reporting on water are already available and can help companies identify risk areas and develop management strategies.
- **Investors need to demand this information from companies and incorporate it into their investment processes to gain better insight.**
- Many of the same organizations that offer disclosure, measuring and management **tools for businesses also offer tools for investors to measure the water risks in their portfolios.**

Companies benefit from knowing water-associated risks, developing and integrating a water use and impact strategy, and disclosing this information to investors.
Investors maximize returns when they are able to analyze and incorporate water-related risks and opportunities into their valuation methods; this ability to understand water issues relies on corporate awareness and disclosure of water security.

Appendix A - Tools for Measuring and Evaluating Water Metrics

Targeted Towards Companies	Targeted Towards Investors	Measuring Tool	Disclosure Tool
	[Bloomberg]		Bloomberg
Bloomberg, accessible on their business information terminals, has a robust ESG category of information for each company that discloses environmental, social, and governance information.			
	[CDP - Water Initiative]		CDP DRIVING SUSTAINABLE ECONOMIES
CDP's annual water questionnaire collects company data on water stewardship (and emissions and waste). It touches on all areas that would be of concern or reflect an opportunity for efficiency with water, as a tool for companies and investors. CDP's Water Program also has formed water consultancy partnerships with six consulting companies offering sustainable water management expertise.			
	[CERES Aqua Gauge]		
CERES Aqua Gauge gives companies and investors a framework through a flexible Excel-based tool. It provides companies and investors a comprehensive picture of a company's performance and progress, as well as giving a framework of leading water management practices around measurement, governance and management, stakeholder engagement, and disclosure.			
	[Climate Disclosure Standards Board]		CDSB Climate Disclosure Standards Board
The Climate Disclosure Standards Board (CDSB) is an international consortium of business and environmental NGOs. They offer companies a framework for reporting environmental information with the same rigor as financial information. This helps them to provide investors with decision-useful environmental information via the mainstream corporate report, enhancing the efficient allocation of capital.			
	[EDF-GEMI Water Management Application (WaterMAPP)]		The EDF-GEMI WaterMAPP A Water Management Application Efficiency Toolkit

The EDF-Gemi Water Management Application is a spreadsheet-based tool designed to help companies improve water efficiency. The tool includes a Score Card that provides clear metrics for measuring water usage at facilities. Once data has been collected, the tool can identify the greatest opportunities for water efficiency improvements.

Global Reporting Initiative (GRI)

GRI is an international independent organization aimed at empowering decision makers to create a more sustainable economy. GRI's Sustainability Reporting Standards are one of the world's most widely used standards on sustainability reporting and disclosure.

Sustainability Accounting Standards Board (SASB)

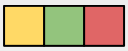
SASB provides industry-specific insight on which sustainability factors are most important to companies and most material for investors. Through these industry standards, companies can tailor sustainability initiatives to maximize value, while also disclosing information more effectively to investors.

Task Force on Climate-Related Financial Disclosures

The Task Force on Climate-Related Financial Disclosures helps companies disclose their climate risk information in a clear and consistent way. It aims to highlight the financial exposure of companies to the risk of climate change. It is supported by the Financial Stability Board (FSB).

Thomson Reuters

Thomson Reuters offers a comprehensive ESG database containing information on 4,000+ global companies and over 500+ data points, including all exclusion (ethical screening) criteria and all aspects of sustainability performance.



Trucost

Trucost is a third party data aggregator that combines environmental data disclosure from other disclosure sources as well as individual company reports. Trucost also provides companies and investors with environmental data estimates for companies who do not, or only partially, disclose their information.

	Water Footprint Network - Water Footprint Assessment Tool	water footprint network
The Water Footprint Network partners with companies to assess water dependencies and risks along the whole value chain. Using the Water Footprint Assessment Tool, companies can measure the water footprint of a specific product or facility, or their entire business operations. Once water risks have been assessed, the Water Footprint Network also provides strategic insight to increase water efficiency and minimize water risks.		
	Water Risk Monetizer	WATER RISK MONETIZER
The Water Risk Monetizer helps companies calculate the financial impacts of water risk to their business. After a company has gathered data on its water risk, it can use this tool to turn it into actionable information. The tool can estimate risk-adjusted water cost at a facility level and identify potential revenue losses from water scarcity.		
	World Business Council for Sustainable Development - Global Water Tool	Global watertool©
The World Business Council for Sustainable Development's Global Water Tool includes a workbook for data input and inventory by site, key reporting indicators and metrics calculations, as well as a mapping function to plot sites and their datasets, and it uses Google earth for spatial viewing. It allows understanding of water quantity used, where water is sourced from, where water is returned and its impact through this reporting process.		
	WRI Aqueduct - Measuring and Mapping Water Risk	AQUEDUCT
WRI's Aqueduct is an interactive global map showing where different types of water risk and opportunity are worldwide. The future projector capability shows maps at 2020, 2030 and 2040. It can take an address or map coordinates and drill down to specific areas. The tool addresses physical risks as well as regulatory risks. It also includes a specific flood analyzer as well as a tool to show the overlap of Shale Oil and Gas resources with water resources.		
	WWF Water Risk Filter/Assessment Tool	WWF
WWF's Water Risk Filter/Assessment Tool assesses a company facility specifically as well as the basin risk where it operates. The tool articulates physical risk of scarcity, pollution, impact on ecosystem, suppliers' water risks, regulatory and reputation risks. It can aggregate a collection of facilities (portfolio) and basins risks.		

End Notes

[1] "Global Risks 2015 - 10th Edition," *World Economic Forum*, January 2015. http://www3.weforum.org/docs/WEF_Global_Risks_2015_Report15.pdf.

[2] Deborah Zabarenko, "Water use rising faster than world population," *Reuters*, October 25, 2015. http://www.reuters.com/article/us-population-water-idUSTRE79O3WO20111025.

[3] Anders Berntell, "How can we save water and avoid a crisis?" *World Economic Forum*, March 21, 2014. https://www.weforum.org/agenda/2014/03/water-growth-challenge-minding-demand-supply-gap-2/.

[4] "Where is Earth's water?" *USGS*, Last modified: February 26, 2016. http://water.usgs.gov/edu/earthwherewater.html.

[5] "Making every drop count," *UN FAO*, February 14, 2007. http://www.fao.org/Newsroom/en/news/2007/1000494/index.html; "Water for Life Decade - Water Scarcity," *United Nations Department of Economic and Social Affairs*, Last Updated November 24, 2014. http://www.un.org/waterforlifedecade/scarcity.shtml.

[6] Brandon Miller, "2015 is warmest year on record, NOAA and NASA say," *CNN*, January 20, 2016. http://www.cnn.com/2016/01/20/us/noaa-2015-warmest-year/.

[7] More information at: http://climate.nasa.gov/effects/.

[8] Susan Solomon et al., "Climate Change 2007: The Physical Science Basis. Contribution of Working Group to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change," *IPCC*, Cambridge University Press, 2007. Cambridge, United Kingdom and New York, NY, USA.

[9] David Schaper, "As Infrastructure Crumbles, Trillions Of Gallons Of Water Lost," *NPR*, October 29, 2014. http://www.npr.org/2014/10/29/359875321/as-infrastructure-crumbles-trillions-of-gallons-of-water-lost.; M.A. Maupin et al., "Estimated use of water in the United States in 2010," *U.S. Geological Survey,* Circular 1405, 2014. http://pubs.usgs.gov/circ/1405/.

[10] "CDP Global Water Report 2015," *CDP*, October 2015. https://www.cdp.net/CDPResults/CDP-Global-Water-Report-2015.pdf.

[11] "CDP Global Water Report 2015," *CDP*.

[12] "Water for People, Water for Life," *United Nations World Water Development Report*, *UNESCO*. 2003 http://www.un.org/esa/sustdev/publications/WWDR_english_129556e.pdf.

[13] Deloitte, "CDP Global Water Report 2012." *CDP*. October 2012. https://www.cdp.net/cdpresults/cdp-water-disclosure-global-report-2012.pdf

[14] "Flood facts: The biggest floods 2005–2015," *Munich Re*, 2015. https://www.munichre.com/australia/australia-natural-hazards/australia-flood/economic-impacts/biggest-floods/index.html; Janet Peace et al., "Weathering the Storm: Building Business Resilience to Climate Change," *Center for Climate and Energy Solutions*, July 2013. http://www.c2es.org/docUploads/business-resilience-report-07-2013-final.pdf.

[15] Ibid.

[16] "Thai flooding impact on tech companies, suppliers," *Yahoo News*, April 30, 2012. http://news.yahoo.com/thai-flooding-impact-tech-companies-suppliers-004001255.html.

[17] Lucas Mearian, "Impact of hard drive shortage to linger through 2013." *Computer World*. December 9, 2011. http://www.computerworld.com/article/2500090/data-center/impact-of-hard-drive-shortage-to-linger-through-2013.html?page=2.

[18] James Van de Voorde, "Emerson Sales Delayed Due to Flooding," *Osher Van de Voorde*, February 7, 2012. http://www.oshervandevoorde.com/blog/500-emerson-sales-delayed-due-to-flooding.html.

[19] Shara Tibken, "Thai Floods Hit PC Supply Chain," *Wall Street Journal*, October 18, 2011. http://www.wsj.com/articles/SB10001424052970203658804576636951367373290.

[20] "Thai flooding impact on tech companies, suppliers," *Yahoo News*.

[21] Lindsay Whipp, "Thai floods erode Toyota's profits," *Financial Times*, November 8, 2011. http://www.ft.com/cms/s/0/74941cfa-09e4-11e1-85ca-00144feabdc0.html.

[22] Richard Meehan, "Thailand Floods 2011: Causes and Prospects from an Insurance Perspective," March 26, 2012. http://web.stanford.edu/~meehan/floodthai2011/FloodNotes17.pdf.

[23] Richard Howitt et al., "Economic Analysis of the 2014 Drought for California Agriculture," *Center for Watershed Sciences,* University of California, Davis, 2014. https://watershed.ucdavis.edu/files/biblio/Economic_Impact_of_the_2014_California_Water_Drought_1.pdf.

[24] Debarati Roy, "Texas Cotton Farmers May Abandon Record Acres Because of Drought," *Bloomberg*, June 30, 2011. http://www.bloomberg.com/news/articles/2011-06-30/texas-cotton-farmers-may-abandon-record-acres-because-of-drought.

[25] "Watching water: A guide to evaluating corporate risks in a thirsty world," *JPMorgan* and *World Resources Institute*, March 31, 2008. http://pdf.wri.org/jpmorgan_watching_water.pdf

[26] "Water Scarcity & Climate Change: Growing Risks for Businesses and Investors," *Ceres and Pacific Institute.*

[27] "Physical Risks," *The CEO Water Mandate*, Accessed February 2016. http://lucasx.webfactional.com/business-case/water-related-business-risks/physical-risks/.

[28] Alexander F. Brigham and Stefan Linssen, "Your Brand Reputational Value Is Irreplaceable. Protect It!" *Forbes*, February 1, 2010. http://www.forbes.com/2010/02/01/brand-reputation-value-leadership-managing-ethisphere.html.

[29] "Murky Waters? Corporate Reporting on Water Risk," *Ceres*, February 2010. http://www.ceres.org/resources/reports/corporate-reporting-on-water-risk-2010.

[30] "Water Scarcity & Climate Change: Growing Risks for Businesses and Investors," *Ceres and Pacific Institute.*

[31] AFP, "Indian officials order Coca-Cola plant to close for using too much water," *The Guardian*, June 18, 2014. http://www.theguardian.com/environment/2014/jun/18/indian-officals-coca-cola-plant-water-mehdiganj; Archana Chaudhary, "Farmers Fight Coca-Cola as India's Groundwater Dries Up," *Bloomberg*, October 8, 2014. http://www.bloomberg.com/news/articles/2014-10-08/farmers-fight-coca-cola-as-india-s-groundwater-dries-up.

[32] Ibid; Ramona Wadi, "Chilean Farmers and Foreign Mining Firms Face Off Over Andes Gold," *Mintpress News,* December 1, 2014. http://www.mintpressnews.com/chilean-farmers-and-foreign-mining-firms-face-off-over-andes-gold/199434/.

[33] "CDP Global Water Report 2012," *CDP*.

[34] "Water Scarcity & Climate Change: Growing Risks for Businesses and Investors," *Ceres and Pacific Institute.*

[35] Joe Castaldo, "Barrick Gold Makes Big Changes to Become a Smaller Company," *Canadian Business,* July 3, 2015. http://www.canadianbusiness.com/lists-and-rankings/best-stocks/investor-500-2015-barrick/; "Chile Fines Barrick Gold $16m for Pascua-Lama Mine," *BBC*, May 24, 2013. http://www.bbc.com/news/world-latin-america-22663432; "Chilean Farmers and Foreign Mining Firms Face Off Over Andes Gold," *Mintpress News*.

[36] Eliza Roberts and Brooke Barton, "Feeding Ourselves Thirsty: How the Food Sector is Managing Global Water Risks," *Ceres*, May 2015. http://www.ceres.org/resources/reports/feeding-ourselves-thirsty-how-the-food-sector-is-managing-global-water-risks.

[37] From "CDP Global Water Report 2015," *CDP*.

[38] "Consumer Expenditure Estimates for Energy by Source, 19701-2010," Annual Energy Review, *U.S. Energy Information Administration*, 2011. http://www.eia.gov/totalenergy/data/annual/pdf/sec3_11.pdf.

[39] "Electricity Use and Management in the Municipal Water Supply and Wastewater Industries," *Electric Power Research Institute* and *Water Research Foundation*, November 2013. http://www.waterrf.org/PublicReportLibrary/4454.pdf.

[40] "Powering the Wastewater Renaissance: Energy Efficiency and Emissions Reduction in Wastewater Management," *Xylem Inc.*, June 2015. http://poweringwastewater.xyleminc.com/images/Xylem_Wastewater_Renaissance_2015_Report.pdf.

[41] "Water Consumer Staples Summary 2015," *CDP*, Accessed February 2016. https://www.cdp.net/Documents/water/sector-summaries-2015/water-consumer-staples-summary-2015.pdf.

[42] "2013 Global Citizenship Report – Environment," *AB InBev*. http://www.ab-inbev.com/content/dam/universaltemplate/abinbev/pdf/sr/download-center/2013_GSR_REPORT_Environment.pdf.

[43] "Corporate Water Efficiency Targets in the Mining Industry," *Water Scarcity Solutions*, 2030 Water Resources Group, Accessed February 2016. http://www.waterscarcitysolutions.org/corporate-water-efficiency-targets-in-the-mining-industry/.

[44] "Environmental Disclosures: The fourth major review of environmental reporting in the annual report & annual accounts of the FTSE All-Share Companies," *Environment Agency*, 2013. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290052/Disclosures_full_report_04c911.pdf.

[45] "The Impact of a Cotton T-Shirt," *World Wildlife Fund*, January 16, 2013. http://www.worldwildlife.org/stories/the-impact-of-a-cotton-t-shirt.

[46] "Sustainability – Planet – Lifecycle Assessment," *Levi Strauss & Co*, Accessed February 2016. http://www.levistrauss.com/sustainability/planet/#water.

[47] "Operating in Water-Scarce Regions," *Ford*, Accessed February 2016. http://corporate.ford.com/microsites/sustainability-report-2013-14/water-scarce.html.

[48] "Sustainability – Raw Materials – Water," *The Holmen Group,* Last Updated March 26, 2015. https://www.holmen.com/en/Sustainability/Raw-materials/Water/.

[49] Kayla Matthews, "Balancing Profitability and Sustainability," *Triple Pundit*, February 24, 2016. http://www.triplepundit.com/2016/02/balancing-profitability-sustainability/.

[50] "Mine Water Recycling," *Water Scarcity Solutions*, 2030 Water Resources Group, Accessed February 2016. http://www.waterscarcitysolutions.org/mine-water-recycling/.

[51] Tien Shiao, "3 Maps Explain India's Growing Water Risks," *World Resources Institute*, February 26, 2015. http://www.wri.org/blog/2015/02/3-maps-explain-india%E2%80%99s-growing-water-risks.

[52] Diane Brady, "Pepsi: Repairing a Poisoned Reputation in India," *Bloomberg*, May 31, 2007. http://www.bloomberg.com/bw/stories/2007-05-31/pepsi-repairing-a-poisoned-reputation-in-indiabusinessweek-business-news-stock-market-and-financial-advice.

[53] "Replenishing Water," *PepsiCo India*, Accessed February 2016. http://www.pepsicoindia.co.in/purpose/environmental-sustainability/replenishing-water.html

[54] *The Nature Conservancy,* "Irapuato Water Stewardship Assessment," *General Mills*, December 14, 2012. http://www.nature.org/about-us/working-with-companies/companies-we-work-with/irapuato-water-stewardship-assessment.pdf.

[55] "General Mills: Environmental Sustainability," *General Mills*, Accessed February 2016.

[56] Deane Dray, "Investing in the Global Water Sector," *Citigroup Global Markets*, September 26, 2011. http://www.waterinnovations.org/PDF/presentations/Dray-0927p.pdf.

[57] Tamin Pechet, "Turning Water Problems into Business Opportunities," *TechCrunch*, June 22, 2015. http://techcrunch.com/2015/06/22/turning-water-problems-into-business-opportunities/.

[58] Giulio Boccaletti et al., "The Business Opportunity in Water Conservation," *McKinsey & Company,* December 2009. http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/the-business-opportunity-in-water-conservation.

[59] Ibid.

[60] "Micro-Irrigation for Food Security," *Water Scarcity Solutions*, 2030 Water Resources Group, Accessed February 2016. http://www.waterscarcitysolutions.org/new-micro-irrigation-for-food-security/.

[61]"Reducing Water and Energy Consumption in a Chemical Plant," *Water Scarcity Solutions*, 2030 Water Resources Group, Accessed February 2016. http://www.waterscarcitysolutions.org/wp-content/uploads/2016/02/A-Reducing-Water-and-Energy-Consumption.pdf.

[62] "Jain Irrigation Saves Water, Increases Efficiency for Smallholder Farmers," *Shared Value Initiative,* Accessed February 2016. https://sharedvalue.org/examples/drip-irrigation-practices-smallholder-farmers.

[63] "Institute for Water Research Objective," *Unilever Centre for Environmental Water Quality*, Last Modified August 21, 2015. https://www.ru.ac.za/iwr/ucewq/; "Sustainable Development Report 2007: Environmental Sustainability," *Unilever*, 2007. https://www.unilever.com/Images/es_environmental_tcm13-387381_tcm244-409733_en.pdf.

[64] "Water Use," *The Unilever Sustainable Living Plan*, Unilever, Accessed February 2016. https://www.unilever.com/sustainable-living/the-sustainable-living-plan/reducing-environmental-impact/water-use/.

[65] Joel Makower et al., "State of Green Business 2016," *GreenBiz* and *Trucost*, February 2, 2016.
[66] "Murky Waters? Corporate Reporting on Water Risk," *Ceres*.

[67] This number is taken from our data feed with Trucost, a company that collects reported environmental data (and estimates unreported data).

[68] "Sustainability Goes Mainstream: Insights into Investor Views," *PwC*, May 2014. http://www.pwc.com/us/en/governance-insights-center/publications/assets/pwc-sustainability-goes-mainstream-investor-views.pdf.

[69] "Commission Guidance Regarding Disclosure Related to Climate Change," *Securities and Exchange Commission*, February 8, 2010. https://www.sec.gov/rules/interp/2010/33-9106.pdf.

[70] "Murky Waters: Corporate Reporting on Water Risk," *Ceres*. ; "Towards Sustainable Investment & Operations: Making Progress," *CalPERS*, 2014. https://www.calpers.ca.gov/docs/forms-publications/esg-report-2014.pdf.

[71] "Guidelines for Responsible Investment," *The Carlyle Group*, Accessed February 2016. https://www.carlyle.com/sites/default/files/imports/Guidelines_for_Responsible_Investment.pdf. ; "Creating Sustainable Value: Progress Through Partnership," *KKR*, 2012 ESG and Citizenship Report. http://www.kkr.com/ar/downloads/KKR_ESG-Report_2012.pdf.

[72] "Social Responsibility – Environmental Wellbeing – Water," *Arca Continental*, Accessed February 2016. http://www.arcacontal.com/social-responsibility/environmental-wellbeing/water.aspx.