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Special thanks to:

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¹Remarks made by Stella Thomas to Wellington Management, 23 February 2020.

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FUTURE THEMES

Water: Priced for imperfection

KEY POINTS

- Water scarcity and water stress, exacerbated by climate change, may lead to a humanitarian crisis
- If water were priced appropriately, the risk of shortages could fall
- Understanding common misconceptions about investing in the water theme could help investors achieve better results

Assets with inflated values are often said to be “priced for perfection,” meaning they must deliver stellar, upwardly mobile performance to justify and sustain those prices. Water, however, an asset that is key to life on Earth and essential for virtually every economic undertaking, has no universally assumed price or cost to extract. In our view, not only is water woefully underpriced today, but its future value is far greater.

Amid increasing water scarcity, a crisis may be looming, but we believe if water were priced appropriately, that risk could fall. Just as private-sector innovation and market-pricing signals have begun to reduce fossil fuel consumption, markets could have a similar effect on water consumption, helping to mitigate the risk of water shortages. In this paper, members of our Future Themes water scarcity team share insights from their research, including common misconceptions about investing in water and how investors can effectively gain exposure to this theme.

Changing the dialogue

Water scarcity will have humanitarian and economic impacts across emerging and developed markets. Seventeen of the world’s fast-growing cities are in emerging markets, where water scarcity is most prevalent. In many developed markets, including the US, water infrastructure is old and in need of modernizing. Substantial capital from public/private partnerships is already being channeled to fund solutions to alleviate water scarcity. This is welcome progress. It should also be a signal for capital markets. Stella Thomas, founder and managing director of the Global Water Fund, describes water investment as having a multiplier effect, telling us recently, “We need to change the dialogue about water from ‘aid’ to ‘investment,’ because one dollar invested in water can return thirty-five dollars in GDP.”¹

Through our research, we have uncovered potential investment opportunities that span equity and debt, global sectors, developed and emerging markets, and the market-cap spectrum. Ceres estimates that 50% of companies in four major global indices will face “mid to high” water-related risk.² The energy, utilities, industrials, mining and materials, consumer goods, health care, and technology sectors are all highly water-dependent. Companies in these sectors will likely need to invest in solutions that optimize water use in their supply chains, operations, and products.

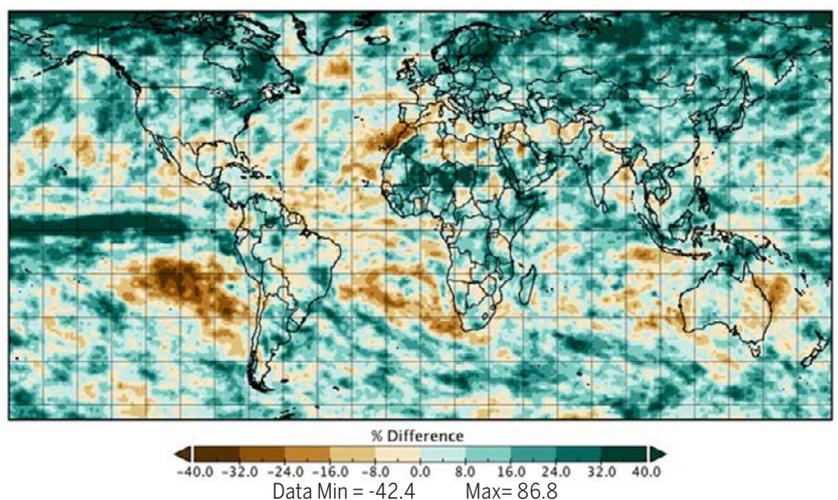
While this may sound like all risk and no reward, we see the mismatch between a costly potential crisis and general underappreciation by markets as a significant opportunity for investors to add value. By providing capital to companies and issuers developing water-related solutions, the investment community can help prioritize and support innovations needed to forestall a global emergency, while potentially generating attractive long-term returns for their clients.

What’s different this time?

Water-related catastrophe has been predicted before, but we believe this time is fundamentally different. First off, we have clear evidence the climate has already begun to change in significant ways. Second, scientific data, scenario analysis, and climate-modeling technology have all improved significantly, allowing scientists to project climate change with greater accuracy than in years past. Localized climate data provides granular views of regions projected to face the greatest physical climate risks.

At the same time, rainfall variability has increased substantially amid worsening climate change. According to scientists at Woodwell Climate Research Center, with whom we study the physical effects of climate change on capital markets, between now and 2050, some regions could see up to a 40% increase in annual rainfall variability (FIGURE 1). Precipitation may come in short, infrequent, untimely, and extremely intense bursts that fail to alleviate drought conditions. Too much or too little water can have devastating consequences.

FIGURE 1
Annual rainfall will vary greatly
 Annual variance (2021 – 2050) vs (1981 – 2010)



Source: Woodwell Climate Research Center

²Ceres.org, Investor Water Toolkit. Indices are S&P 500, Russell 3000, MSCI EM, and MSCI World. Data sourced and interpreted from SASB materiality indicators.

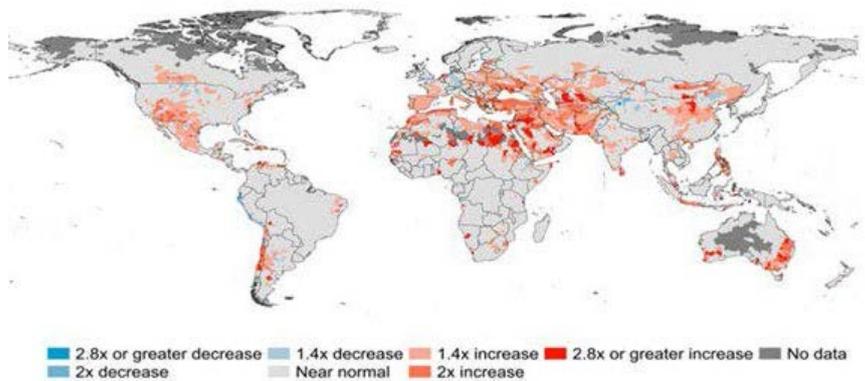
Water stress

Worsening climate change plus accelerating population growth often equals water stress, a measure of the imbalance between water supply and demand. In places where population and economic growth are driving water demand just as climate change is curtailing water supplies, water stress could cause a raft of problems. Food insecurity, energy disruptions, health care crises, and even domestic conflict and national security concerns are possible because of water scarcity. Data from the World Resources Institute indicates that many regions, including major agricultural breadbaskets and manufacturing centers, could be severely water stressed as early as the end of this decade (FIGURE 2).

FIGURE 2

Many parts of the world will be water stressed by 2030

Projected change in water stress from baseline (1980) to 2030 under scenario RCP 8.5¹



¹Representative Concentration Pathway | Sources: Woodwell Climate Research Center, World Resources Institute

A number of challenges contribute to water stress. Many arid countries have ample water supply accessible from lakes and rivers, but lack of water storage infrastructure is a problem. In India, brief, heavy bouts of rainfall during increasingly unpredictable monsoon season result in massive water loss from runoff. In countries heavily reliant on groundwater, unsustainable pumping rates may parch aquifers, depriving these regions of in-ground water supplies for hundreds of years. Poor water quality and insufficient treatment can also contribute to water stress. Some countries, including Brazil and India, have plenty of water, but contamination from industrial, mining, and agricultural activities is widespread.

What if water were market priced?

The low cost of water has long benefited many industries, most notably agriculture. If water were repriced to reflect its rising scarcity-driven value, those higher input costs could create enormous challenges.

Here is a theoretical, but illustrative, example. In the US, the per-acre production cost of corn is approximately US\$600, excluding water costs. Revenue for corn — which is predominantly grown in the US Midwest, is about US\$800 – \$900 per acre. One acre of corn requires approximately 600,000 gallons, or two acre-feet of water, annually.

Since 2015, the Veles water index has sought to price water in the state of California, which grows several high-value, water-rich crops. The California index's contract price for water is approximately US\$500 per acre-foot of water, or less than 1 cent per gallon. If midwestern US corn producers had to pay that market rate to supplement even some of their water needs, the cost of water alone would quickly erode much, if not all, of their profits.

Common misconceptions about water investing

While pure plays are an obvious way to invest in water, we have uncovered misconceptions through our research that may help investors broaden their understanding of the theme and see new ways to capture opportunities — and avoid risk. Charlie Munger, famed business partner of Warren Buffett, reminds us to “invert, always invert.” As with any investment theme, we want to think about what may not work in addition to what may.

Misconception 1: Water will always be free and, therefore, immaterial as a risk factor

Wellington's investment analysts cover thousands of companies around the world. Working with them, we could not find a single issuer in our coverage universe that discloses an assumed or actual cost of water. This may be because companies — like the rest of society — assume water to be a de minimis cost at best. We believe that “free” water is highly unlikely to continue, however, given the growing risks of climate change.

Changing regulations and activist consumerism are two forces that could catalyze a corporate response to water. Administrative water pricing in the form of tariffs is possible, for example. Just as companies are increasingly expected (or required) to disclose their carbon emissions and proactively lower their carbon footprint, we believe the same will happen with water usage and water waste. One scholar has described the “paradox” of water pricing this way: “The price of water almost never equals its value and rarely covers its cost.”³

“Water shaming,” or avoiding companies whose heavy water usage is perceived as harmful or wasteful, may become the norm. As a result, companies in a range of sectors may be compelled to spend capital to reduce their “water footprint” and use water more efficiently. The food and beverage, chemical, energy, and mining sectors are the most obvious, but pharmaceuticals, hotels, and technology, especially semiconductors, are also known for heavy water use and could come under consumer or regulatory scrutiny. At the same time, companies that disclose and reduce their water usage may accrue cost or reputational advantages.

Misconception 2: Water utilities provide positive exposure to this theme

Investors often assume that water utilities are the most direct and positive pure-play investment in this theme. But water scarcity can be a significant challenge for utilities in water-stressed regions.

From a fundamental perspective, we believe a utility should have the following qualities:

1. Its interests should align with those of regulators and local elected officials.
2. It should have a growing asset base that supports earnings.
3. It should be able to provide quality service to customers.
4. It should be able to keep customer bills low.

Virtually all water utilities display qualities 1 and 2. Companies and regulators both want to provide clean, uninterrupted water service to local constituents, and it is in their best interests to prepare for and avoid problems caused by water scarcity. Similarly, investing in better infrastructure and technology can help any water utility drive asset-base growth, which may lead to higher earnings.

³Grafton, R Quentin., “The paradox of water pricing: dichotomies, dilemmas, and decisions,” Oxford Review of Economic Policy, Vol. 36, Issue 1, Spring 2020.

This is where the generalizations end, however. Water utilities located in regions facing water scarcity face several challenges — and something of a double-edged sword. If water shortages result in service disruptions, the company is likely to be blamed for poor service. On the other hand, utilities that proactively invest in infrastructure or technology aimed at preventing such service disruptions may be forced to raise water rates, prompting customers to complain about wasteful spending and higher bills. In either situation, unhappy customers may complain to regulators, prompting them to intervene or create an even more restrictive policy environment, leading to lower returns on equity.

Misconception 3: Hydropower will be a reliable source of renewable energy

Hydropower is traditionally considered a stable renewable-energy source and a clean, low-carbon alternative to fossil fuels. Hydropower is widely used across emerging markets, with many countries generating at least 50% of their electricity from hydro. Some of these same countries are in the crosshairs of climate change and face water scarcity challenges, notably from the rising probability of long droughts (FIGURE 3).

During periods of severe or prolonged water shortages, hydropower becomes less reliable. Falling reservoir levels can reduce output from hydroelectric plants, and below certain pressure levels, water supplies can shut off completely. In countries heavily reliant on hydro, particularly those that lack access to backup baseload power, the downtimes could result in widespread electricity outages.

FIGURE 3
Reliant on hydro, susceptible to power disruption

| Sample country | % electricity from hydro | Additional 3 mos droughts during 2020s ¹ | Additional 3 mos droughts during 2040s ¹ |
|----------------|--------------------------|---|---|
| Albania | 100.0 | 4.1 | 5.8 |
| Paraguay | 100.0 | 1.8 | 5.6 |
| Mozambique | 86.4 | 3.6 | 6.3 |
| Georgia | 78.0 | 5.8 | 9.3 |
| Costa Rica | 74.6 | 2.9 | 2.9 |
| Venezuela | 63.7 | 2.9 | 8.4 |
| Brazil | 61.8 | 2.5 | 9.8 |
| Austria | 60.0 | 3.4 | 2.5 |
| Switzerland | 57.9 | 3.2 | 7.2 |
| Zimbabwe | 51.4 | 4.5 | 8.1 |

¹As compared to baseline 1975 – 2004 period | Sources: Woodwell Climate Research Center, Wellington Management

Misconception 4: Companies with the most exposure to water scarcity should be avoided

To the contrary, we believe companies with the most to lose because of water scarcity will be the most incentivized to innovate and develop potentially market-leading solutions. For example, no sector is arguably more exposed to water risk than agriculture. Nearly 85% of the world’s planting acreage is rain fed. Water scarcity projections indicate that certain grain markets, including the US, are two to three times more likely to incur a greater than 10% decrease in yields in any given year by 2050.⁴ Such

⁴Woodwell Climate Research Center



“Another water-intensive industry that we believe could face risk in the form of consumer activism is semiconductors. The typical semiconductor factory uses between two and four million gallons of water every day...”

variability in crop yields can lead to higher grain prices and higher price volatility.

Agricultural companies have long understood the need to innovate to remain productive in the face of challenging seasonal conditions related to heat and precipitation. In the US, corn and soybean producers have been able to increase production by 2% a year for the last two decades thanks in large part to yield improvements from more resilient seeds, irrigation technologies, and storage solutions. But more severe and unpredictable seasonal variation will likely compel agriculture-dependent industries including corn-based ethanol, livestock farming, or food and beverage to innovate to improve water efficiency.

Another water-intensive industry that we believe could face risk in the form of consumer activism is semiconductors. The typical semiconductor factory uses between two and four million gallons of water every day; larger companies use even more. Given the substantial market capitalization of these manufacturers and the direct link between their products and the consumer electronics market, we think this industry could come under greater scrutiny, compelled to disclose water use and efforts to become more water efficient.

Misconception 5: The world lacks enough water to satisfy growing demand

Less than 1% of the earth's overall water is readily available for human use. The rest is in our oceans, glaciers, soil, and atmosphere.⁵ Used effectively, that small amount is enough to sustain human life. The bigger issue is the geographical distribution of both supply and demand for water. Just six countries — Brazil, Russia, Canada, Indonesia, China, and Colombia — have half of the world's freshwater supply. According to Ms. Thomas, while some countries in the Middle East have approximately 200 cubic meters of water per person, Canada's natural water resources amount to nearly 90,000 cubic meters per person. Even within water-rich countries, water disparities exist. China, for example, has 20% of the world's population but just 7% of its water, and while most of China's water is located in the south, the majority of its crops are grown in the drier northern regions. In all, 50% of China's total land mass falls in the global 90th percentile for water stress.⁶

Misconception 6: Desalination will be an economical solution to supply drinking water

Desalination remains expensive and difficult to scale in most parts of the world. Countries in the Middle East and North Africa are using desalination technology at scale, accounting for 50% of global desalination implementation. The economics of desalination make sense in the Middle East, where water has always been scarce and oil-rich economies can afford the high energy costs of operating desalination facilities and storing the briny by-product. The market capitalization for desalination is still extremely small, given the high associated costs. It is a promising avenue for mitigating the problems associated with water scarcity, but we do not believe we will see the market at scale in the foreseeable future.

⁵The Groundwater Association

⁶Woodwell Climate Research Center



“...gaining a deeper understanding of water scarcity and its effects on capital markets will help us make better investments decisions on behalf of our clients.”

Closing thoughts

Ms. Thomas describes water as “one of the most misunderstood issues today, weaving through our economy, health, energy supplies, food supplies, and national security.” We agree. And from an investment perspective, gaining a deeper understanding of water scarcity and its effects on capital markets will help us make better investments decisions on behalf of our clients.

Investment implications

- Companies that use water efficiently and disclose their usage may accrue cost savings and capture a green premium in the market, possibly enabling them to outperform peers.
- Water protectionism in countries that depend heavily on mining could drive a supply shock.
- Companies whose products contain large amounts of embedded water, from beef to computers to clothing, could see higher costs from water use, more disclosure requirements, or the need to invest in water-saving technologies and processes.
- In California, water scarcity could pose a risk on par with wildfires, with the state’s agricultural sector in the crosshairs.
- South Asia could face intense water-related problems due to deteriorating water quality.
- Water will trigger or exacerbate regional geopolitical tensions. One stark example is Pakistan, where its water stress will further strain relations with India and China. ■

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