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An Holistic Approach to the World's Water Woes

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We know that life depends on water. What might be a surprise is the amount of economic activity that is also reliant on water—a lot of water. Water is not just for human hydration and agriculture, but a critical component in the manufacturing processes of countless everyday products, such as smartphones and jeans.

The high usage and scarcity of water have become a consequential issue not only for human health, but for the global economy. In this piece we illustrate the impact of water stress on some important industries, and encourage investors not only to consider water issues as part of their investment decisions, but to engage companies on those water issues affecting their businesses and supply chains.

According to the World Economic Forum's Global Risk Report 2019, the water crisis is now the fourth greatest global societal risk,¹ defined as "a significant decline in the available quality and quantity of fresh water, resulting in harmful effects on human health and/or economic activity." Environmental concerns continue to dominate global risks.

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"The connections between causes and effects are often much more subtle and complex than we with our rough and ready understanding of the physical world might naturally suppose..."

— Douglas Adams, *Dirk Gently's Holistic Detective Agency*

¹ Up one spot from 2018, when it was #5. http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf

Water stress is rising...

Water use has been increasing worldwide by about 1% per year since the 1980s (*Display 1*).² While there is enough water in the world to satisfy current demand, it is often suboptimally located, where local supply solutions are potentially expensive and problematic. Today, due to a geographic mismatch between availability and demand, over two billion people live in countries under high water stress and about four billion experience severe water scarcity during at least one month of the year.

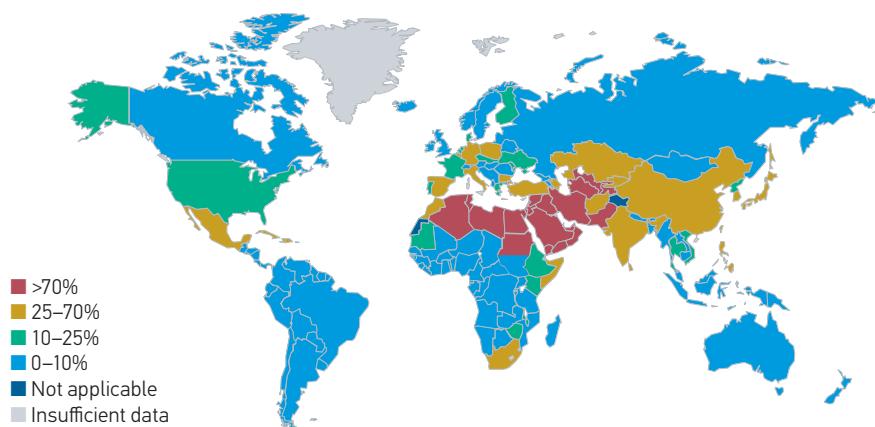
By 2050, global water demand is expected to have grown by 20% to 30%³ from current levels, with the ability to meet that demand made worse by deteriorating water quality. The worldwide consequences of insufficient safe drinking water range from child mortality,⁴ to gender inequality,⁵ to mass migrations triggered by water scarcity. Water stress has the potential to affect a broad range of businesses globally.

... and this water stress threatens a number of industries

FOOD, BEVERAGE AND AGRICULTURE

Agriculture accounts for 69% of global fresh water use.⁶ The water demands of agriculture make the entire food and beverage supply chain highly sensitive to water stress. As *Display 2* shows, a single kilo of beef takes over 15,000 litres of water to produce, based on irrigating the crops that the animals eat, providing drinking water, and hosing down factory farms, transport trucks and abattoirs. Similarly, a kilo of nuts uses around 9,000 litres of water, such that California dedicates roughly 10% of its water supply just for growing almonds.⁷ Furthermore, agriculture-related water stress is not

DISPLAY 1 Global water-stress levels differ across regions

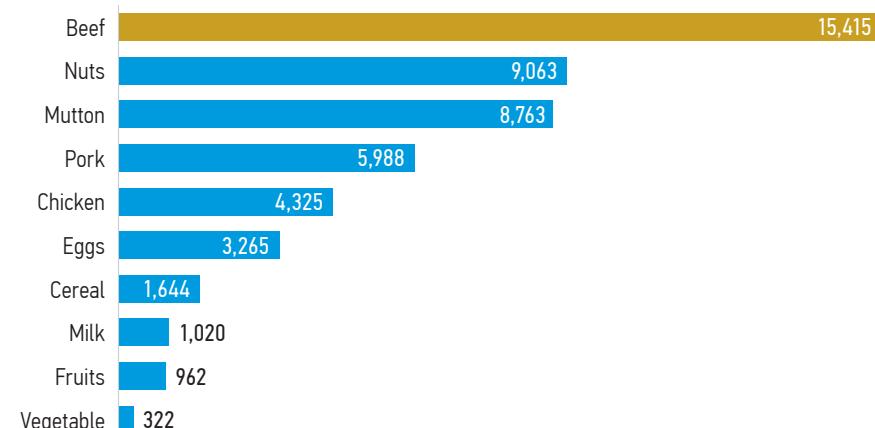


* Physical water stress is defined here as the ratio of total freshwater withdrawn annually by all major sectors, including environmental water requirements, to the total amount of renewable freshwater resources, expressed as a percentage.

Source: WWAP (UNESCO World Water Assessment Programme). 2019. The United Nations World Water Development Report 2019: Leaving No One Behind. Paris, UNESCO. UN (2018a, p72, based on data from AQUASTAT). 2018 United Nations. Reprinted with the permission of the United Nations.

DISPLAY 2 Agriculture consumes huge amounts of water

Water footprint per kg across food types



Source: www.waterfootprint.org/en/resources/interactive-tools/product-gallery Mekonnen, M.M. and Hoekstra, A.Y. (2012) A global assessment of the water footprint of farm animal products, *Ecosystems*, 15(3): 401-415

² AQUASTAT, n.d.

³ WWAP (United Nations World Water Assessment Programme)/UN-Water. 2018. *The United Nations World Water Development Report 2018: Nature-Based Solutions for Water*. Paris, UNESCO.

⁴ More than 340 000 children under five die annually from diarrhoeal diseases due to poor

sanitation, poor hygiene, or unsafe drinking water—that is almost 1000 per day. www.unwater.org/water-facts/water-sanitation-and-hygiene/

⁵ www.unwater.org/water-facts/gender/ In some regions the responsibility of fetching water often falls to women and girls which, if very time-consuming can prevent them from undertaking

other occupations or participating in education.

⁶ Food and Agriculture Organization of the United Nations. www.fao.org/aquastat/ AQUASTAT database. Water withdrawal by sector, around 2010. Update November 2016

⁷ *New Republic*, December 31, 2015

limited to food production. For example, it takes 9,500 litres of water to produce a single pair of jeans, based on growing the cotton used, washing it and dyeing it.

Not all businesses are prepared to deal with water stress, whether it impacts them directly or further along their supply chains. The yields of many crops used in the food and beverage industry are likely to fall as temperatures rise, but only 40% of beverage companies have developed programmes to optimise water usage, and only 24% of food companies report efforts to manage water stress in their supply chains.⁸ At the other end of the spectrum, there are companies in the industry targeting 100% water re-usage rates by 2020.

OIL AND GAS: USING WATER FOR EXTRACTION

Oil and gas companies face similar challenges related to environmental and community impact, and related costs—often not planned for in initial project financing—as well as reputational and regulatory risks. Water management costs can reach 15% of total well costs.⁹ Hydraulic fracturing (fracking) is particularly fraught, as it requires high-pressure water mixed with chemicals and sand to extract shale oil, while 38% of these projects worldwide are located in arid areas. The issue is aggravated by the fact that contaminated water is often a byproduct of fracking, introducing connected disposal issues.^{6,10}

UTILITIES: RISKING DISRUPTIONS

90% of global power production is dependent on water,¹¹ whether for raw material extraction, powering turbines,

cooling thermal processes or cleaning emissions, and 47% of global thermal power plant capacity (coal, natural gas and nuclear) is in regions already experiencing water stress.¹² Poor water management and unsustainable rates of water consumption increase the risk of operational disruptions and regulatory water-withdrawal limits.¹³ These disruptions can not only lead to a loss of revenue, but often require additional investment in infrastructure such as desalination plants or air cooling, that are often excluded from the initial project financing. And while these companies may reduce their exposure to water scarcity risk, the connected trade-off is that these strategies often result in an increase in energy intensity.

SEMICONDUCTORS: A GROWING THIRST FOR ULTRA-PURE WATER

The semiconductor industry may not appear to be an obvious candidate for water concerns, but the production of wafers—the thin layers that are used to make integrated circuits—requires massive amounts of ultrapure water (UPW) to rinse every layer. UPW is simply hyper-purified water needed to meet the industry's stringent manufacturing requirements.

A typical semiconductor manufacturing facility uses two to four million gallons of UPW per day. In the industry water withdrawal intensity on average grew at a 2.1% compound annual growth rate between 2014 and 2016.¹⁴ Additionally, semiconductor companies have historically incurred clean-up costs connected to groundwater contamination of up to \$100

million per incident.¹⁵ While the main solution appears to be water recycling, recycling rates for processed water in the industry range from as high as 80% (mainly in Asia) to as low as 10%.

It is interesting to note that the production of a single iPhone requires 14,500 litres of water,¹⁶ reinforcing the idea that semiconductors should feature prominently in any discussion of industries facing potential challenges from water scarcity and stress.

How water scarcity informs our top-down macro views

As managers of top-down, macro-driven multi-asset strategies, we have often discussed infrastructure spending as a contributor to global economic growth; this also links to water scarcity, as water-infrastructure projects worldwide are expected to see annual growth of 5%-8%.¹⁶ The economic benefits of access to clean water and sanitation are estimated to outweigh their costs by a factor of 5.5 to 1.¹⁷

In the U.S., the rapidly decaying infrastructure of water systems is bringing dangerous levels of lead and other contaminants into homes. Every \$1 invested in basic drinking water produces medical cost savings and increased productivity amounting to an average of more than \$3 in urban areas and \$7 in rural areas. For every \$1 invested in basic sanitation, the returns are \$2.5 (urban) and \$5 (rural).¹⁸ We believe that the approval in 2019 of a significant US infrastructure package, which could include spending on water infrastructure, remains a possibility.

⁸ MSCI

⁹ Morgan Stanley Research, How Water Can Impact Share Economics, 14 January 2019 <https://ny.matrix.ms/eqr/article/webapp/4905a290-bb33-11e8-b6e7-c19f6cc9e6af?ch=rpext&sch=sr&sr=1> bbl. stands for barrel

¹⁰ The contaminated water can add up to 10x the amount of oil produced from a well.

¹¹ UN Water. www.unwater.org/water-facts/water-food-and-energy/ Accessed 28 June 2019.

¹² World Resources Institute. www.wri.org/

¹³ blog/2018/04/water-stress-threatens-nearly-half-world-s-thermal-power-plant-capacity Published: 11 April 2018.

¹⁴ E.g., a U.S. company is facing increased pressure to shut down a nuclear power plant over its freshwater withdrawals from the Hudson River for cooling, while water scarcity in India closed 14 out of the largest 20 thermal power plants from 2013-2016, causing a \$1.4bn loss of revenue.

¹⁵ MSCI Industry Report, Semiconductors & Semiconductor Equipment, July 2018.

¹⁶ <https://www.sustainalytics.com/esg-blog/world-water-day-water-use-semiconductor-industry/>

¹⁶ Source: www.watercalculator.org/water-use/the-hidden-water-in-everyday-products/ Gallons converted to litres. www.forbes.com/sites/toddmillay/2016/11/28/investing-in-water/#4d630d8b5948

¹⁷ A Post-2015 Global Goal for Water. UN Water. www.un.org/waterforlifedecade/pdf/27_01_2014_water_paper_on_a_post2015_global_goal_for_water.pdf Published 27 January 2014.

¹⁸ UN Water. www.unwater.org/water-facts/water-sanitation-and-hygiene/ Hutton et al. 2015.

Water scarcity as an input into our investment process

When constructing global multi-asset portfolios, we can use scores on companies' ESG¹⁹ performance, provided by specialist ESG data providers, who can identify the leaders and laggards in water stress exposure and risk management, analysing factors such as water recycling rates, consumption reduction targets and investment in water infrastructure.

For example, companies that implement sustainable water usage solutions can ease the stress on local communities, reduce the risk of unexpected disruptions to their operations and mitigate financial and reputational risks. They may even reduce costs—for example, recycling the water used in mining can generate savings of more than \$1 per barrel of oil. Among utilities, natural gas, wind and solar have significantly lower water intensities than nuclear and coal, so some utilities are transitioning towards these less water-intensive approaches, to reduce their long-term risk exposure to water scarcity.

A second way in which an understanding of water scarcity can benefit our portfolios is through our approach to engaging with the companies in which we invest:

- Engaging in a targeted way, to encourage water stewardship and to evaluate water metrics and conservation policies, can provide valuable insights into the risks and opportunities that companies face
- Monitoring the water footprint in all steps of a company's supply chain can give us a better understanding of inefficiencies and viable improvements
- Encouraging companies to improve the quality of their disclosure on water management, for example, by participating in the Carbon Disclosure Project annual water survey
- Ensuring companies follow the relevant water stewardship code for their industry

Spillover effects of water management

Clean Water and Sanitation is one of the United Nations' 17 Sustainable Development Goals (SDGs), "a call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity." By addressing water issues, companies and countries can also better manage other SDGs including food, energy, health and wellbeing, gender equality, and work and economic growth. As Douglas Adams wrote in *Dirk Gently's Holistic Detective Agency*, "interconnections can be both subtle and complex."

There is not an aggregate water shortage on the planet, but water scarcity and quality at the local level are serious problems that affect many industries. As investors, we necessarily consider these risks in making investment decisions for our portfolios.

¹⁹ ESG refers to Environmental, Social and Governance factors

Risk Considerations

There is no assurance that the strategy will achieve its investment objective. Portfolios are subject to market risk, which is the possibility that the market values of securities owned by the portfolio will decline and that the value of portfolio shares may therefore be less than what you paid for them. Accordingly, you can lose money investing in this portfolio. Please be aware that this strategy may be subject to certain additional risks. There is the risk that the Adviser's **asset allocation methodology and assumptions** regarding the Underlying Portfolios may be incorrect in light of actual market conditions and the portfolio may not achieve its investment objective. Share prices also tend to be volatile and there is a significant possibility of loss. The portfolio's investments in **commodity-linked** notes involve substantial risks, including risk of loss of a significant portion of their principal value. In addition to commodity risk, they may be subject to additional special risks, such as risk of loss of interest and principal, lack of secondary market and risk of greater volatility, that do not affect traditional equity and debt securities. **Currency fluctuations** could erase investment gains or add to investment losses. **Fixed-income securities** are subject to the ability of an issuer to make timely principal and interest payments (credit risk), changes in interest rates (interest-rate risk), the creditworthiness of the issuer and general market liquidity (market risk). In a rising interest-rate environment, bond prices may fall. In general, equities securities' values also fluctuate in response to activities specific to a company. Investments in **foreign markets** entail special risks such as currency, political, economic, and market risks. **Stocks of small-capitalisation companies** carry special risks, such as limited product lines, markets and financial resources, and greater market volatility than securities of larger, more established companies. The risks of investing in **emerging market countries** are greater than risks associated with investments in foreign developed markets. **Exchange traded funds (ETFs) shares** have many of the same risks as direct investments in common stocks or bonds and their market value will fluctuate as the value of the underlying index does. By investing in exchange traded funds ETFs and other Investment Funds, the portfolio absorbs both its own expenses and those of the ETFs and **Investment Funds** it invests in. Supply and demand for ETFs and Investment Funds may not be correlated to that of the underlying securities. **Derivative instruments** can be illiquid, may disproportionately increase losses and may have a potentially large negative impact on the portfolio's performance. The use of **leverage** may increase volatility in the Portfolio. **Diversification** does not protect you against a loss in a particular market; however, it allows you to spread that risk across various asset classes.

DEFINITIONS

The **Global Risks Report 2019** is the 14th edition of the Global Risks Report, prepared by the World Economic Forum with the support of Marsh & McLennan Companies and other partners, examines the evolving macro-level risk landscape and highlights major threats that may disrupt the world in 2019 and over the next decade. An **electric-vehicle battery (EV Battery)** or **traction battery** is a battery used to power the propulsion of battery electric vehicles. Vehicle batteries are usually a secondary battery. The **water desalination processes** separates dissolved salts and other minerals from water. Feedwater sources may include brackish, seawater, wells, surface (rivers and streams), wastewater, and industrial feed and process waters. A **water footprint** is the amount of fresh water utilized in the production or supply of the goods and services used by a particular person or group.

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