CBS News | June 2, 2022

California cracks down on water use as it sees its most severe drought ever

All Dried Up!

Despite having been exposed to many dire articles in the media, I am embarrassed to admit that I have never focused on water shortages around the world because most have occurred in far off places that are not top of mind. Unfortunately, as depicted in the headline and photo above, the crisis is now much closer to home as Southern Californians have been asked to reduce their consumption by 15%, and many believe that as much as a 35% cut will ultimately be required to survive the current drought. In order to atone for my insensitivity to this important issue, I have done some research into the science of hydrology, the scope, causes, and impact of the crisis, and an array of possible solutions. Unfortunately, this is a very complex problem that does not lend itself to a single fix. Moreover, any solution will require a significant amount of cooperation between competing water users, including in some cases countries that have historically engaged in open hostilities. To place this issue in perspective, the World Economic Forum ranks water crises as the third most important global risk following weapons of mass destruction and extreme weather events.

DIVERSIFIED TRUST

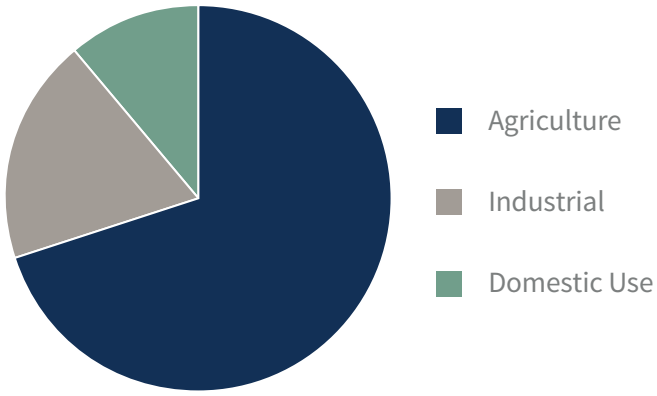
By Bill Spitz, Principal

As a Co-Founder of Diversified Trust, Bill has been instrumental in the ongoing development of the firm's investment platform. Bill also serves on the Board of Directors of Mass Mutual Financial Group, Acadia Realty Trust, and is Trustee emeritus of Kenyon College in Ohio. He authored Get Rich Slowly: Building your Financial Future through Common Sense and is a frequent speaker at financial conferences.

THE BASICS OF WATER

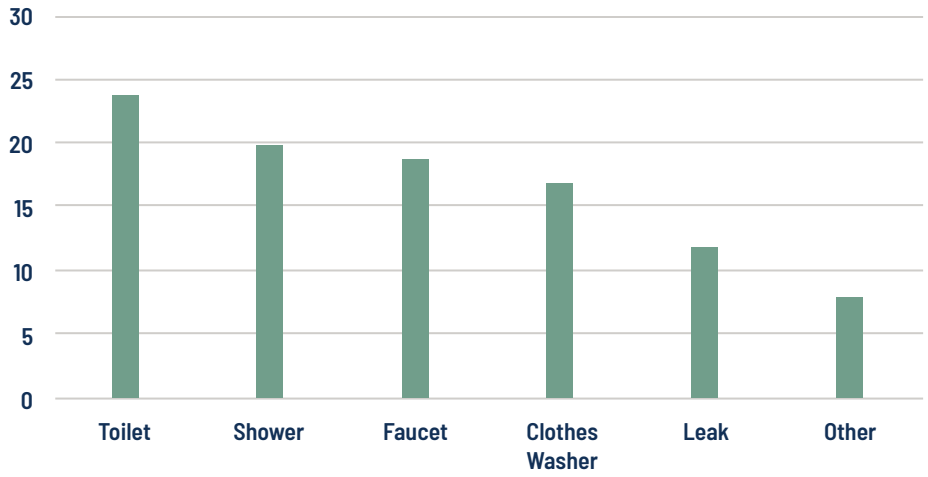
At first blush, it is hard to comprehend the existence of water shortages given that 71% of the earth's surface is covered by it. However, less than 1% is available for human use with the rest consisting of salt water, fresh water frozen in the polar ice caps, or water too inaccessible for practical usage. Water is basically a closed system in which it is consumed in a wide variety of uses and then returned to the environment through sewage or storm water systems, discharge into waterways, land runoff, or evaporation and subsequent rainfall. There are four primary sources of potable water: ground water (aquifers), surface water (rivers, lakes, streams, and oceans), collected rainwater, and recycled water. Overall water usage is as follows:

Water Consumption



Note that 70% of water usage is for agricultural purposes. While domestic usage is relatively small (11%), it is interesting to further break down consumption into the various uses within the home:

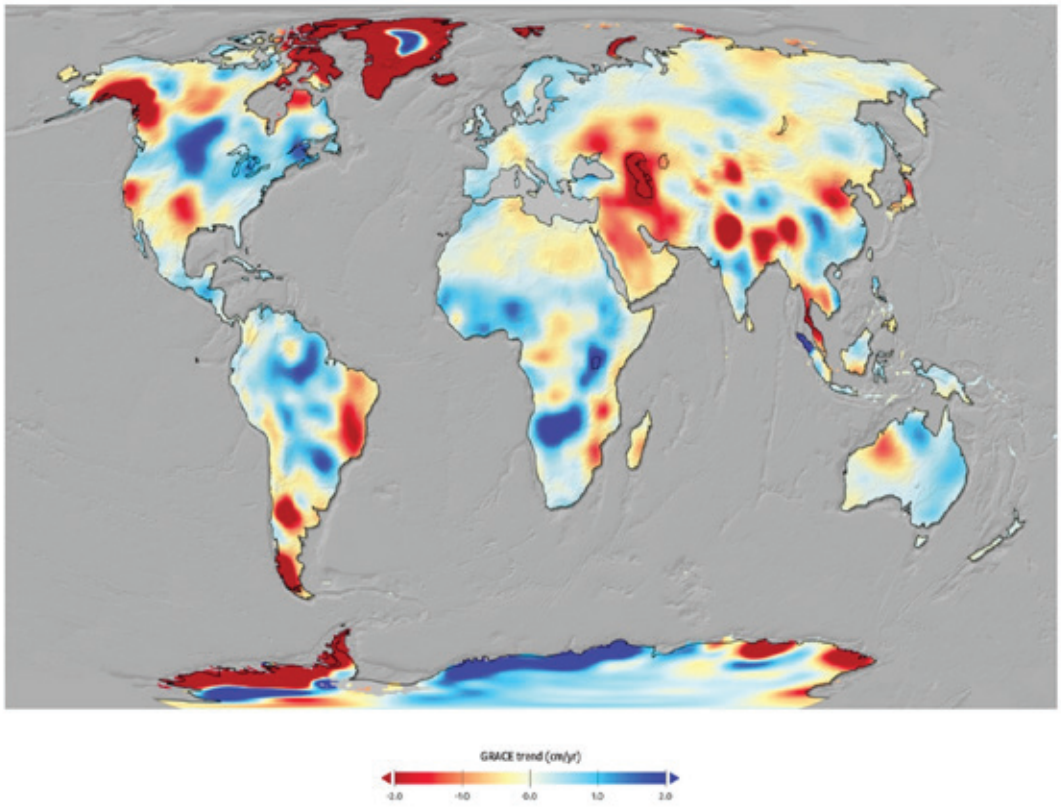
Domestic Water Consumption - % of Usage



One particularly distressing statistic is the estimate that 12% of all domestic water consumption is lost to leaks. In the Solutions section of this paper, I list a few of the steps that each of us can take to optimize home usage.

There are two primary types of water scarcity: physical and economic. **Physical** water scarcity is the result of demand outpacing the limited supply in a given region. Physical scarcity can be seasonal; in fact, about two thirds of the world's population lives in an area in which water is scarce for at least one month of the year. More important, physical scarcity is a longer term problem associated with changing weather patterns, some of which are natural and others that may be driven by global warming. In other words, water scarcity is ever in motion making it rather difficult to develop a well-funded and prioritized remediation plan. Moreover, many of the areas characterized by severe water shortages are also economically challenged.

While we tend to think about water scarcity in terms of the Middle East, parts of Asia, and Africa, the reality is that both North and South America have hot spots. The following map represents the summation of fourteen years of satellite images measuring changes in the density of both subterranean and surface moisture.



NASA EARTH-GRAVITY RECOVERY AND CLIMATE EXPERIMENT

The areas in blue are becoming wetter while those in red are increasingly arid. The intensity of the color displays the extent to which the level of moisture is changing. Contrary to one's initial impression, becoming wetter is not necessarily a positive in that heavy rainfall is often associated with flooding, landslides, and so on. The United Nations estimates that around 1.2 billion people live in areas characterized by physical scarcity.

Rapid population growth as well as changing weather patterns have resulted in dramatic decreases in the sources of fresh water in some locations. For example, Lake Mead and Lake Powell, two of the primary sources of water for the Western U.S., are at historically low levels. Both lakes are currently only about 150 feet above the level at which they become "dead pools" which means that water would be too low to flow downstream. Similarly, one half of the world's aquifers are thought to be past sustainability given that the rate of groundwater withdrawal exceeds that of natural replenishment.

The other source of water scarcity is **economic** which refers to the fact that many regions have inadequate infrastructure to safely deliver available water to the population. In many of these areas, there is adequate supply but mismanagement or underdevelopment often

results in water that is too polluted or unsanitary for human consumption. For example, approximately 40% of Mexico City's water supply is lost to leaks resulting from aged infrastructure and earthquakes. Closer to home, you will recall the gross mismanagement of Flint, Michigan's water system that resulted in elevated levels of both bacteria and lead. The high levels of lead pose serious potential long term health problems, particularly for children. Finally, roughly 80% of the world's wastewater is returned to the environment without being treated or reused. Another problem is that competition for the available water supply may result in its being directed toward agricultural or industrial use at the expense of more immediate human needs. The UN estimates that 1.6 billion people suffer from economic scarcity.

THE HUMAN IMPACT OF WATER SHORTAGES

The human toll of water shortages is staggering and the following statistics are likely to be shocking to most of us who have understandably taken clean water for granted. As mentioned above, close to 3 billion people lack access to clean, secure drinking water, and 2 billion depend on health care facilities without basic water services. Over one half of the world's population lives without reliable sanitation. A shocking estimate is that 1.7 billion people do not have regular access to a toilet and 670 million still practice open defecation. These deprivations lead to the transmission of diseases such as cholera, typhoid, polio, and hepatitis. Quantifying the precise impact of all of these health issues on humanity is difficult, but life expectancy in those countries suffering from the most acute water shortages ranges from 65 to 70 years as compared to 79 in the U.S. By the way, life expectancy in the U.S. is three to five years below that of other industrialized countries. A particularly powerful statistic is the UN estimate that one to two million children die every year from diarrhea which stems from poor sanitation and hygiene, both a function of water scarcity.

A particularly powerful statistic is the UN estimate that *one to two million children die every year from diarrhea which stems from poor sanitation and hygiene, both a function of water scarcity.*

In addition to the direct health effects, there are a variety of other casualties of water shortages. In many areas, women and children spend a significant portion of every day gathering water for the family because they are forced to travel to communal wells. Carrying large water vessels can result in debilitating injuries. Moreover, securing daily water imposes limitations on the time available for the education of children, and hinders overall productivity and economic development. Water scarcity also renders agriculture more difficult in many areas resulting in food insecurity, or even worse, malnutrition which is associated with a variety of chronic diseases such as diabetes. As reservoirs shrink, hydroelectric power is imperiled which may increase the demand for electricity generated

by fossil fuels. Most scientists believe that the use of fossil fuels, global warming, and water scarcity are intertwined. Significant competition for water exists in many areas that could lead to actual military conflicts. In particular, Turkey, Syria, Iraq, and Iran are making desperate attempts to secure water supplies, potentially at the expense of their neighbors. Similarly, Egypt, Sudan, and Ethiopia all depend on water from the Blue Nile and have long exchanged threats over dam projects. Finally, the UN estimates that water shortages will lead to as many as 700 million "water refugees" by 2030 causing a variety of political and economic problems in addition to humanitarian concerns.

SOLUTIONS

As mentioned at the outset, there is no "silver bullet" that will solve the water crisis. Making a dent in the problem requires significant investment in infrastructure, action by governments at all levels, international cooperation, changes in the practices of industry and agriculture, and the development of new technologies. Obviously, these challenges are quite daunting. While the impact will be small, each of us also has a small role to play.

Each of the following deserves a detailed discussion but I only provide a summary in the interest of brevity.

- **Agriculture** - As previously stated, agriculture accounts for 70% of water usage making it the most important target for conservation. Unfortunately, 40% of that 70% is lost to the environment due to poor irrigation systems. Farmers generally use large sprinkler heads that cover their fields in intervals resulting in water that evaporates, runs off of the field, or is lost in transit. By installing drip irrigation systems, farmers can reduce consumption by as much as 80%. Additional steps include the construction of ponds or reservoirs as the irrigation source and the development of drought resistant crops.
- **Infrastructure development** - Engineers estimate that $7.5 to $9.7 trillion in global investment will be required to rehabilitate aging facilities and develop new water and sanitation infrastructure. The Infrastructure Bill enacted in the U.S. in November of 2021 allocates $55 billion to providing clean water to all Americans. Obviously, this is only a small step but at least it represents a start.

- **Desalinization** - Given that 97% of the world's water is saline, desalinization offers great promise. However, the current technology is very energy intensive which has largely limited its use to two countries in the Middle East, Saudi Arabia and Israel. Saudi Arabia's energy reserves make desalinization an obvious choice whereas Israel does not have material energy resources but basically has no viable alternative. Twelve desalinization plants are currently in operation in California although the permitting process makes it very difficult to add to that number. New membrane technology is being developed and it is reasonable to expect that solar energy will replace fossil fuels as the power source over time, so there is every reason to believe that desalinization will have an important future role in dealing with the crisis. A related technology involves treating brackish groundwater that is much more prevalent than "clean" water drawn from wells. Brackish water is much less salty than sea water and can be treated with smaller scale plants.
- **Rain collection** - This ancient technology is widely used in parts of Europe and accounts for most of the water applied to agriculture in Africa. Expanding its usage on a global basis could significantly increase water availability in a cost effective manner.
- **Water pricing** - Water is generally priced below its economic value because many citizens view cheap water as an entitlement. In addition to pricing this commodity at its true cost of production and distribution, utilities could implement a tax or surcharge on heavy users. Higher prices would likely result in increased conservation efforts and provide funds for infrastructure development. In terms of positive reinforcement, some utilities offer rebates for the replacement of water-wasteful appliances and plumbing.
- **Water pollution** - Eliminate dumping of toxic substances and treat all wastewater.
- **New technologies** - For example, sewage plants could provide wastewater for the production of biofuels.
- **Cooperative agreements** - Water needs to be managed holistically requiring the cooperation of governments at all levels.
- **Climate change** - Water shortages represent one of many reasons to address this issue.
- **Population control** - Many water-challenged areas also have high birth rates.

Finally, there are a number of steps that each of us can take:

- Replace aging appliances.
- Replace high-flow shower heads with low-flow alternatives.
- Don't let the water run continuously when showering, brushing teeth, or washing dishes.
- Flush toilets only when necessary.
- Implement drought resistant landscaping in order to reduce required irrigation.
- Consider changes in diet. A pound of beef requires four times as much water input as a pound of chicken. Similarly, coffee is very water intensive. To place coffee's thirst in perspective, it requires twenty times the water input of wheat.

CONCLUSION

The water crisis is enormous and the solutions varied, complex, difficult to implement and expensive. Given these realities, the course of least resistance is probably to adopt the ostrich strategy and bury one's head in the sand. However, the situation in California adds a sense of urgency to a problem that was formerly "over there." We can each take some of the actions listed above, but a broader solution begins with awareness which is the purpose of this paper. While this topic has not been top of mind for most of us, the World Economic Forum's classification of it as the third most important global risk should bring it to the forefront.

While this is not a paper on investments, there are a number of private capital strategies focused on water resources. For those who do not qualify or prefer liquidity, several ETFs provide a marketable means of investing:

- *Invesco S&P Global Water Index ETF (Symbol CGW)*
- *Invesco Water Resources ETF (Symbol PHO)*
- *First Trust Water ETF (Symbol FIW)*

ATLANTA
877.955.8266

CHARLESTON
866.619.1003

GREENSBORO
855.821.4999

MEMPHIS
800.264.7498

NASHVILLE
877.386.7332

Important Notes and Disclosures

This White Paper is being made available for educational purposes only and should not be used for any other purpose. Certain information contained herein concerning economic trends and performance is based on or derived from information provided by independent third-party sources. Diversified Trust Company, Inc. believes that the sources from which such information has been obtained are reliable; however, it cannot guarantee the accuracy of such information and has not independently verified the accuracy or completeness of such information or the assumptions on which such information is based.

Opinions expressed in these materials are current only as of the date appearing herein and are subject to change without notice. The information herein is presented for illustration and discussion purposes only and is not intended to be, nor should it be construed as, investment advice or an offer to sell, or a solicitation of an offer to buy securities of any type of description. Nothing in these materials is intended to be tax or legal advice, and clients are urged to consult with their own legal advisors in this regard.