



How To Invest In Water

SO WE DON'T RUN OUT

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BARINGS



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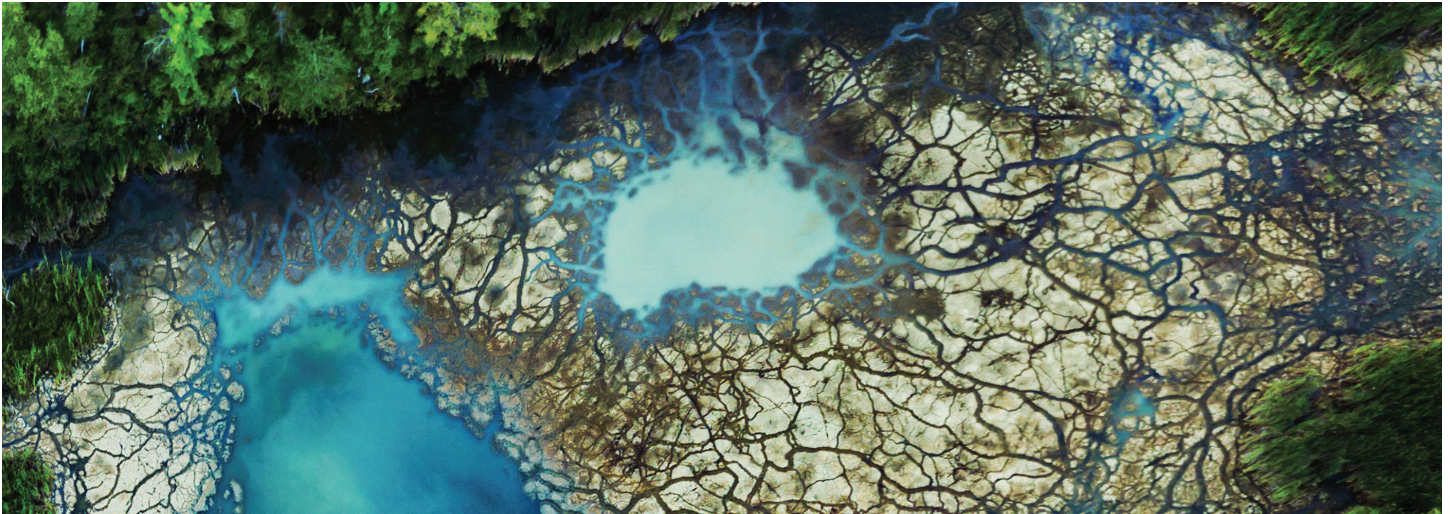
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EXECUTIVE SUMMARY

Regional fresh water supplies face rising stress in spite of the planet's seemingly abundant resources. Without laws and regulations to ensure that demand equals sustainable supply in populated arid regions, water risks running short. The task for governments, especially now that the United Nations has enshrined water as a human right, is to deliver reliable and equitable access by attracting investment capital to build the necessary infrastructure. The opportunity for investors increasingly sensitive to Environmental, Social and Governance (ESG) concerns lies in fostering the expansion of water rights markets that ensure sustainable supplies and offer an attractive return.

Water is cheap but heavy, which makes it costly to move long distances. But healthy water markets attract investment in infrastructure that will move it from where supply is abundant to where demand is rising. The drivers of water rights values include water scarcity, demand changes, depleting aquifers, high water utilization and legal frameworks. Good policies start with an acknowledgement that a region's current water use is unsustainable and include the institution of water regulatory bodies, as well as the means of matching demand and supply through a voluntary exchange of water rights—most often through water rights markets.

Investment strategies that target well-regulated geographies reward participants with higher water rights values. At the same time, they decrease waste and lower-value water usage by allowing water to reach a price where demand equals sustainable supply. Water rights investing requires thoughtfulness given the great political sensitivities around the costs of water and its impact on agriculture, communities and the environment, but a careful approach can be profitable and help in safeguarding water for future generations.

SECTION ONE: WHY AND WHERE ARE WE RUNNING OUT OF WATER?

Water is everywhere, and yet it's often not exactly available where and when it's needed most. The world does not necessarily have a water problem; more than anything else, it has a population-distribution problem. Civilizational development has led to concentrated population centers, often in arid regions of the world where water demand outstrips available supply.

This imbalance helps aggravate what economists often refer to as the “tragedy of the commons”—individuals taking advantage of an accessible resource in their own self-interest will ultimately overuse and deplete the resources previously available to everyone. The classic case is the common pastureland that becomes barren because it is open to all hungry cows. Wherever the world's water has been accessible and free, there has often been a similar result and a strain on this valuable and necessary resource.

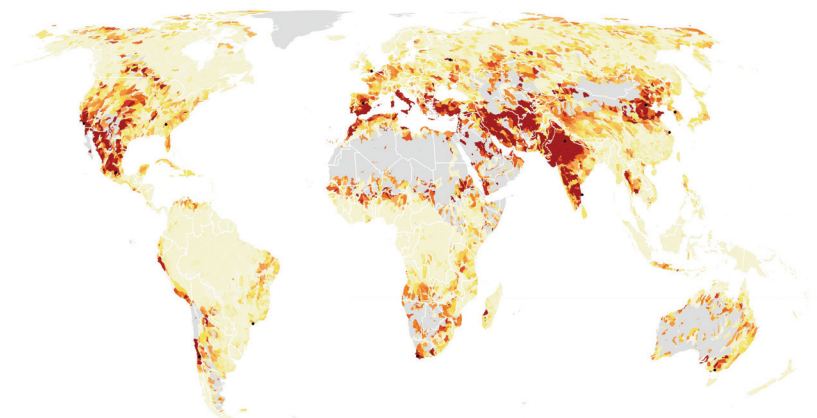
WATER STRESS

To be clear, water stress is a euphemism for “running out of water.” Water stress poses a threat to community staples like drinking water and sanitation, food and energy production, industrial and municipal uses, economic growth and environmental biodiversity. As water stress threatens these critical areas, it also increases the risk of instability, state failure and war.

Consider this for a planet that is 71% covered by water:

- Only 3.5% of that total comes from freshwater lakes, glaciers and the polar ice cap.
- Over half of the world's major aquifers are being pumped faster than the rates at which they are being replenished.
- More than 2 billion people today lack access to safe drinking water at home.
- The World Resources Institute estimates that 33 cities of more than 3 million people (affecting more than 255 million people) face extremely high water stress.

FIGURE 1: World Water Stress Projection



SOURCE: New York Times. As of August 6, 2019.

Globally, the right to clean water for basic human needs is protected by the United Nations through international law.¹ The UN places the main responsibilities upon governments to ensure that people can enjoy “sufficient, safe, accessible and affordable water, without discrimination,”² but their methods of achieving this vary widely. So does their success.

In developed markets, water is distributed to most individual consumers through regulated utilities. “Water may be a gift from God, but God doesn’t give us pipes, and pipes are expensive,”³ in the words of Robert Glennon, University of Arizona water law expert. Water costs are often subject to tiered pricing schedules in high-cost areas that vary based on volumes consumed. For example, water for basic human needs in these markets is available to consumers at lower prices than water used to irrigate lawns or fill swimming pools. More often, limited access to water is determined less by its price than by inadequate market infrastructure. If local institutions do not provide access to clean water for the region’s population, then the water rights market has likely failed to redistribute water rights from lower priority uses to the most important use—basic human needs.

WATER INVESTING AND ESG

The right to water is a human entitlement for current and future generations. As investors increasingly incorporate ESG awareness into their decisions, allocations to water rights encourage more “sustainable” usage of limited resources that must be preserved for the future. Water rights markets signal that a region’s policy makers, businesses and citizens recognize sustainability is essential to the continuity of their society. Investors who have committed to UN Principles of Responsible Investing (UN PRI) are well aware of the United Nations Global Compact, which addresses water access in detail and enshrines water as a crucial commodity that must be protected by regulation that provides a framework for sustainability.

The UN PRI also covers principles that encourage businesses to promote greater environmental responsibility. Water rights markets offer a preventative approach to running out of water. They are often born of necessity and recognition that without new regulation, water crises such as those in Arizona in 1980 and California in 2014 may be inevitable. Water rights markets quantify a resource and support quality standards. They also introduce systems of volume and water quality measurement that are critical to gauging, maintaining and improving water for environmental stakeholders. Bruce Aylward argues that water markets promote water savings by incentivizing reduced consumptive use. The Nature Conservancy also argues that water rights trading encourages increased water efficiency and discourages low value, wasteful use. Water rights trading plays a significant role in making water resources in arid regions more sustainable.⁴



SECTION TWO: GOOD WATER MARKETS AND BAD WATER MARKETS

Addressing this particular tragedy of the commons requires a market with both clearly defined legal rights and reliable institutions and rules. Participation in these water rights markets presents more than just attractive investment opportunities; it sets the foundation for water resources that are accessible and sustainable.

WHAT ARE WATER RIGHTS?

Water rights are defined as the right to use a quantity of water from a specific location for a defined purpose; for example, the right to use 400 acre-feet of water from the Colorado River to irrigate 100 acres of farmland. An acre-foot, the common measure of large water resources, is equal to a one-foot deep sheet of water one acre in area, roughly the same volume as an Olympic-sized swimming pool, or 1.233 megaliters. Globally, 70% of the world's freshwater use is dedicated to agriculture.⁵ Because most water rights are tied to the land they service, the majority of water rights owners also own farmland (in countries that permit water rights ownership) or are sovereign entities.

A sustainable water future benefits more than just the buyers and sellers of water rights—it benefits all the stakeholders who depend on that common group resource. By facilitating transactions from low-value water uses to high-value water uses, successful markets—and the regulations on which they depend—have raised the price beyond the simple cost to pump and move water to one that approaches its true economic value. Just as markets for carbon place prices on externalities to reduce pollution, water markets facilitate transactions between users that allow water to approach an economic price that reduces demand while facilitating changes in use that protect water availability and sustainability.

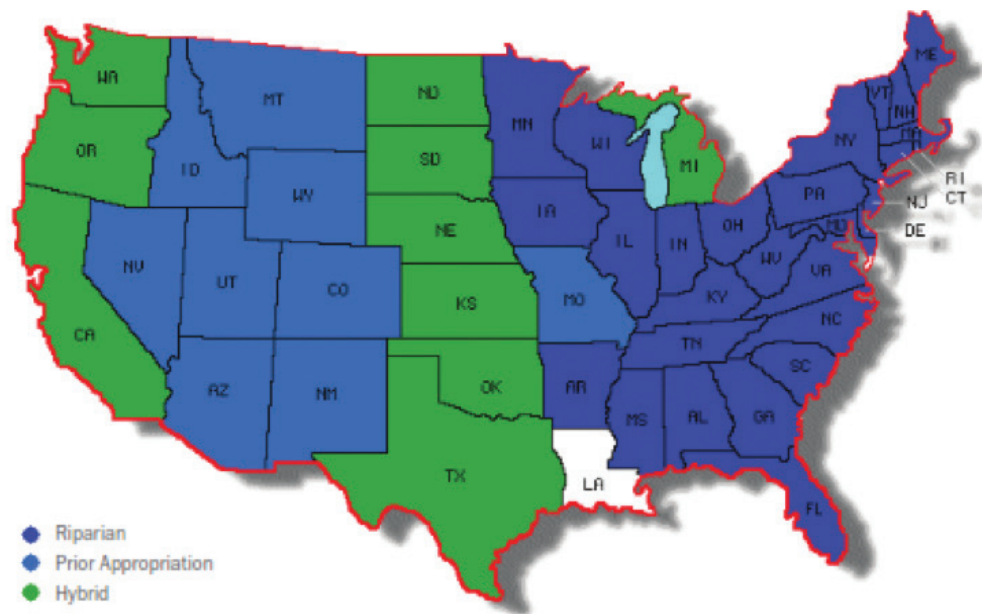
In the United States, water rights in the context of water usage are defined by three different legal systems. The right does not commonly convey ownership of actual water, just the right to use that water.

- The **riparian doctrine**, often applied in areas where water is abundant, allocates water rights for reasonable use among those who own land along the path of water (e.g. a stream or river, which is the origin of the word riparian). The concept of reasonable use means that riparian rights require one landowner's use to be weighed fairly and equitably against the water rights of neighboring riparian owners. In lean seasons, when demand exceeds supply, water is rationed to landowners in proportion to the frontage on the water source. Generally, these water rights cannot be sold or transferred independently without the adjoining land.
- The **prior appropriation doctrine**, which usually applies in arid regions, involves three key principles. First in time, first in right establishes a system of seniority based on when the water from a property was first put to beneficial use, with water rights on Western properties often traced back to the property's first occupant or the sovereign entity that formally granted the ownership, (e.g. the

U.S. government). Use it or lose it means a water right can be vacated or lose seniority if it is not used. While meant to guard against speculation, it can also create incentives for non-economic water use to protect a right's seniority. Water flows uphill to money means water rights may change beneficial use, from agriculture to industrial use for example, and location of diversion from the water source through a regulatory or judiciary process. This has allowed water rights to pass from water haves (generally farmers) to water have-nots (growing cities). This has been critical to urban development in the arid West of the United States and the development of water rights markets.

- The **hybrid doctrine** recognizes both riparian and appropriative water rights. Generally, states have this dual system because riparian rights were historically recognized but later changed as water demand began outpacing water supply. These states generally have more complex water rules that can vary by property, county and basin.

FIGURE 2: Water Legal Doctrines by State



SOURCE: Barings Alternative Investments, "CA water in the San Joaquin Valley: as a Commodity for Investment". As of March 2008.

Most countries practice concession-based systems, where a government will issue a right to use water for a specific purpose and quantity, but on a limited basis that subjects the water right to review, and potential cancellation by the government. In the United States, water rights themselves are adjudicated by water courts, and their use is policed by regulatory agencies in the geographies of the water right. Water regulators are in charge of monitoring flows into and out of a water system, ensuring withdrawals do not exceed the capacity of the water right, monitoring water quality, and a number of other responsibilities required to enforce existing water laws.

FIGURE 3: The Murray-Darling Basin



SOURCE: Australian Government. As of 2019.

FIGURE 4: Arizona's Regulated Areas



SOURCE: Arizona Department of Water Resources ("ADWR"). As of 2019.

WHAT MAKES A WATER MARKET WORK

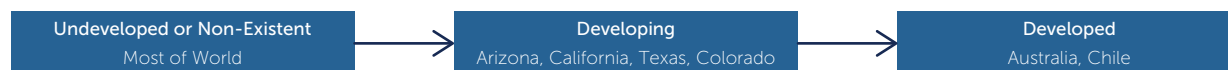
Water markets are typically defined geographically, most commonly by a water basin (or drainage basin) that includes users of a particular shared water resource (like a river or aquifer). Australia's Murray-Darling Basin, for example, encompasses significant agricultural territory between the Murray and the Darling Rivers in the country's southeast. Arizona water markets, on the other hand, are defined predominantly by shared aquifers.

A functioning water market requires laws and institutions that support water trading, which can take a couple of forms: water entitlement sales, or the right to use water in perpetuity (or in concession-based markets, until the next review period); and water allocation sales, which are the water due to a water entitlement's owner on a limited basis (typically, one year's allocation).

The existence of water rights markets demonstrates that a region: (1) recognizes that water is a common resource; (2) has adopted regulation that aims to match demand to renewable supplies; and (3) gives participants a means to transition water from low and/or wasteful uses to higher-value uses. When a watershed enjoys a combination of these attributes, its water supply is more likely to be sustainable.

But there is more. The type of strong water regulation that fosters water markets growth—whether in undeveloped, developing or developed water rights markets—depends on cornerstone legislation. Crucially, this legislation must recognize water as a scarce resource and attempt to reach sustainable use of that resource through a combination of regulation and incentives.⁶ Such legislation must create the necessary conditions for water trades, essentially encouraging the movement of water from where it is plentiful to where it is needed, at a reasonable profit. The speed of development depends on the comprehensiveness of the existing legislation, physical conveyance within a regulated geography and the climate subsequent to adoption (where drought conditions can hasten the development of trading markets). Crucially, the market's success also depends on a regulator that is empowered and resourced to enforce the regulations.

FIGURE 5: Water Rights Market Development Spectrum



SOURCE: Barings.

Necessary conditions, which must exist for trading to occur:

- Legal, transferable rights to use water
- Decoupling of water rights from land rights
- Contract adjudication and enforcement
- Means for buyers and sellers to communicate
- Physical infrastructure to move water from point of sale to point of use

Some water markets (like those of Arizona and Colorado) do not decouple water rights from land as a standard practice. They do, however, allow for decoupling via an adjudication process in the states' water courts or other regulatory bodies. This adds costs and uncertainty to the process of water rights investing. But it also limits water rights available for sale and creates investment opportunities for operators familiar with water court processes.

Enabling conditions, which help water markets function by reducing barriers to trading:

- Water banks (physical means of storing water for later sale, e.g. in an aquifer) and contracts
- Social cohesion, which becomes more difficult with multiple, competing stakeholders
- Mechanisms to monitor and measure water flows

Limiting conditions, which can hinder or reduce water trading include:

- "No injury" rules that provide that a user proposing a sale of water may not injure another party in that sale. This refers to the "common resource" problem. If the sale of one's water right has the potential to harm another water right from that resource, this may create an "injury." For example, if one irrigation district sells most of its water rights to a municipality, the farmers that remain will need to spread fixed costs of ditch maintenance across fewer landowners.
- Beneficial Use doctrine, which holds that water rights may be eliminated if allocations are not used.
- Public comment periods, which can extend the costs around the investment. For example, an asset-splitting strategy (where a landowner intends to sell water rights appurtenant to their land) might require a period of public comment in Arizona (a good market), but the period of public comment introduces risks to the timing and viability of the water rights sale. In certain areas of Colorado, by contrast, the same strategy may be more attractive because software is used to identify how groundwater pumping would affect other basin users, avoiding the delays.
- Eminent Domain, which allows governments to secure privately owned water rights. This practice varies by country and the strength of its property laws, but water rights in the U.S. West are based on Appropriative Water Rights law, which date to the 1860s (or earlier in some cases) and offer strong protection. During the last drought of 2015–2016, junior rights holders (cities) tried to take water controlled by senior rights holders (four irrigation districts) in California, but courts blocked the attempts of junior rights holders to divert water.

SUCCESSFUL MARKETS

Markets for water rights succeed if they provide market-based mechanisms for reallocating scarce water supplies from low-value uses to higher-value uses in a fair and transparent manner for the benefit of all stakeholders. Value can be viewed as monetary and societal, but even good markets can fail certain constituents. Market successes and failures are best defined by how specific trades treated different stakeholders in a region. Successful water trades create net economic gains from trading while avoiding negative outcomes to other stakeholders (like the environment or the source of water). They will also avoid injuring other stakeholders or will compensate those stakeholders.

Much of the complexity in water rights trading originates from how other users of the shared water resource are affected by the sale of a water right to that resource. More often than not, it's a balance between crops and city dwellers. One study found that the employment and income gains of California's water-importing regions exceeded the losses of the exporting areas.⁷ The concept of net gains from trading is commonly used to justify water trades in areas that require water rights adjudication or regulatory approval. Effective water markets often allow the courts and the public to play roles in the process of assessing whether these trades are fair to all parties, and if not, to compensate those who stand to lose. While long periods of public comment can hinder the effectiveness of markets, they can also be valuable in identifying social concerns that will eventually need to be addressed.

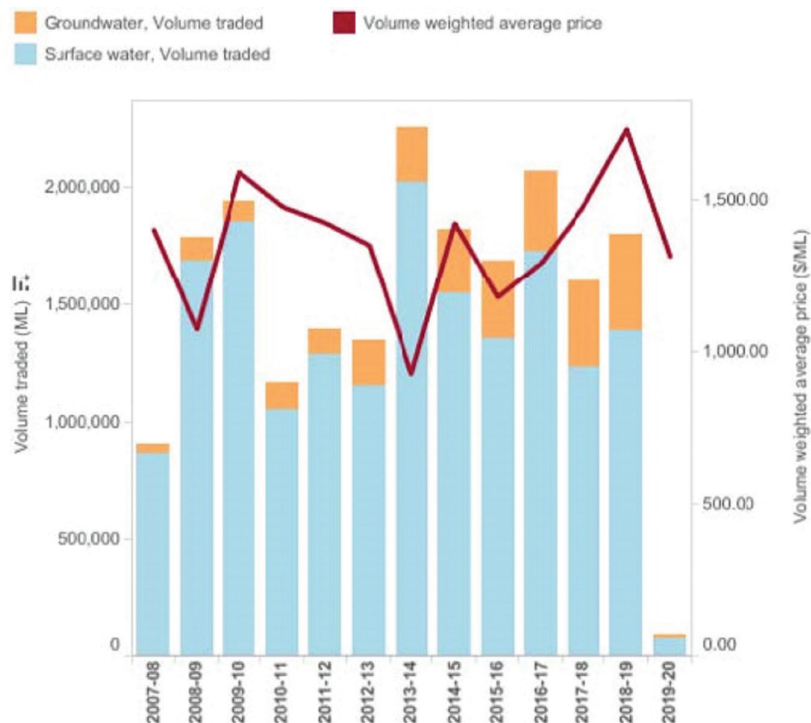
Water markets in California have also allowed for increased flows for environmental purposes (e.g. water meant to help salmon spawn). Environmental water purchases there accounted for about 14% of trading activity between 1982 and 2011.⁸

Water trading also promotes improved efficiencies, and at the same time these efficiencies can promote water trading. For example, the farmers of California's Imperial Irrigation District invested in better irrigation equipment and sold the water that was conserved to the Metropolitan Water District. These improvements yielded an additional 108,500 acre-feet per year that could be sold without taking the land out of production. The city got more water and the farmers got more money, producing an outcome that worked for both sides.



Australia is a market leader in the development of water rights markets. The regulatory framework for the Murray-Darling Basin has allowed for a transition from lower to higher value agriculture, as well as increased flows for environmental purchases. Lower margin dairies with water rights are now net sellers of water allocations, with fixed crop agriculture producers (almond and grape growers) in other parts of the basin expanding their operations with the aid of newly purchased water. The Australian government began a water rights purchase program known as “buybacks” in 2008. These buybacks represent a market-based mechanism for the Australian federal government to purchase water entitlements, or recurring water rights, from private holders for the benefit of the environment. Trading volumes have increased steadily over the last decade.

FIGURE 6: Entitlement Trade History—Australia



SOURCE: Australian Government Bureau of Meteorology. As of 2019.

Australia’s water market size (as measured by annual transaction value) averaged approximately \$1.3 billion since 2007 (see chart above) over the last decade. The value of water assets in the Murray-Darling Basin alone (which used 60% of Australia’s water) are valued at approximately \$29 billion. As markets mature, annual transaction values as a percentage of asset values increase. This bodes well for the developing markets of the U.S. West, where the value of water assets as proxied by irrigated farmland values range from \$1.2 billion in Nevada and \$10.5 billion in Colorado to \$37.75 billion in Texas and \$174 billion in California.⁹

UNSUCCESSFUL MARKETS

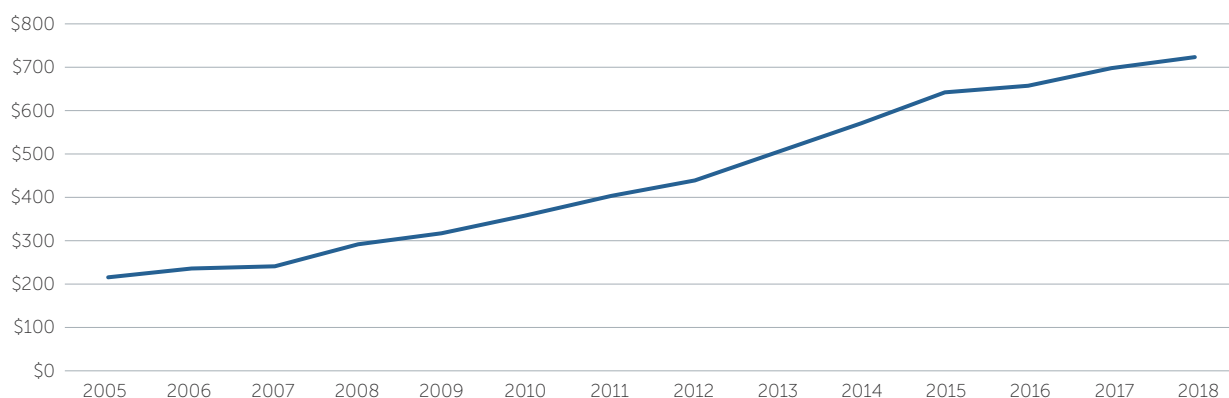
Even developed countries, however, suffer from poor water markets. As art imitates life, bad water markets shaped the plot of the 1974 classic movie “Chinatown,” where the growth of mid-century Los Angeles outpaced its water supply. From 1905–1925, for example, the real Los Angeles Department of Water and Power undertook the purchase and aggregation of water rights in Owens Valley, some 220 miles away. But Owens Valley Lake dried up with water exports, devastating the local farming industry and creating a dust bed that plagues the southern valley with alkali dust storms to this day. In the past decade, Los Angeles has spent more than \$1.4 billion on dust management attributable to this project. Since then, other water trades to supply Los Angeles have failed over citizen opposition. Two separate and failed efforts have been made to sell water from the San Luis Valley in Southern Colorado to Denver suburbs. Once in the late 1980s and again in 1998, large landowners and corporate interests tried to broker a sale of water rights but experienced strong resistance from locals who feared their valley would be dried up like the Owens Valley. Citizens for San Luis Valley opposed the trade and ultimately stopped it.

Water trading without appropriate regulation can also diminish groundwater recharge rates. In the southern Indian state of Tamil Nadu, farmers have extracted groundwater for both irrigation and for sale via tanker to urban areas. This resulted in over pumping, lower aquifer levels, and dry wells. In Iran, meanwhile, water rights can be rented or traded. Groundwater is mainly private property and traded between farmers, and wells can be sold with or without the land.¹⁰ What Iran lacks, however, is regulation that targets sustainability and a regulator to enforce it. Unrestrained investment in groundwater wells has expanded to put Iran beyond its aquifers’ sustainable recharge level. This has led to water table declines that contribute to political protests and subsidence, or the lowering of land’s elevation as water supplies are depleted.

SECTION THREE: HOW TO INVEST IN WATER

Investors in water rights have traditionally focused on increasing demand for water largely in arid regions (spurred mostly by population growth), decreasing sustainable supplies of water (driven by higher than sustainable use), and rising water prices (especially for senior water rights in well-regulated geographies). They have also been attracted to the perpetual nature of water rights from renewable sources of water.

FIGURE 7: Phoenix Water Cost/AF



SOURCE: CAGRD, Barings.

In some cases, the rewards have been significant. In Arizona, water rights values have increased 10.1% per annum from 2005 to 2018.¹¹ Investors have also liked the steady direction of price increases, as the volatility of yearly rate changes in Arizona has been only 5.6% over this same period.

Similar price increases have been witnessed in Texas (which experiences similar fundamental supply and demand drivers to Arizona), where delivered wholesale water to the San Antonio area has grown 8.4% annually since 2001. Similar price trends and fundamentals have been observed in certain California water basins as well.



THE VALUE OF WATER

Water is already being priced and sold in large quantities (via farmland acquisitions and dispositions) and water scarcity is driving prices higher in most regions. The development of water rights markets, which use market-based techniques to divert water from low-value usage to higher-value usage, are a result of this scarcity and the resultant higher price for water. Water rights themselves are priced as a function of the rising market price for water.

Water, like other commodities, is subject to the traditional laws of demand and supply.

Demand is mainly driven by human (agricultural, municipal, industrial) and environmental (water flows dedicated to environmental purposes as well as evaporation) uses, including:

Fixed crop planting vs. row crop planting trends. California is transitioning acreage from row crops, which are planted and harvested once a year (e.g. corn, soy, wheat), to permanent crops, which produce several harvests and require significantly more water (e.g. pistachios, almonds, grapes). They also make the demand for water more inelastic. High water prices will lead farmers to avoid planting row crops, but farmers with permanent crops will need to water their trees or vines even at a loss just to keep them alive (often to protect investments of more than \$10,000 per acre). In 1995, California planted acreage was 76%¹² row crops and 24% fixed crops; by 2018, it had shifted to 57%¹³ row crops and 43% fixed crops.

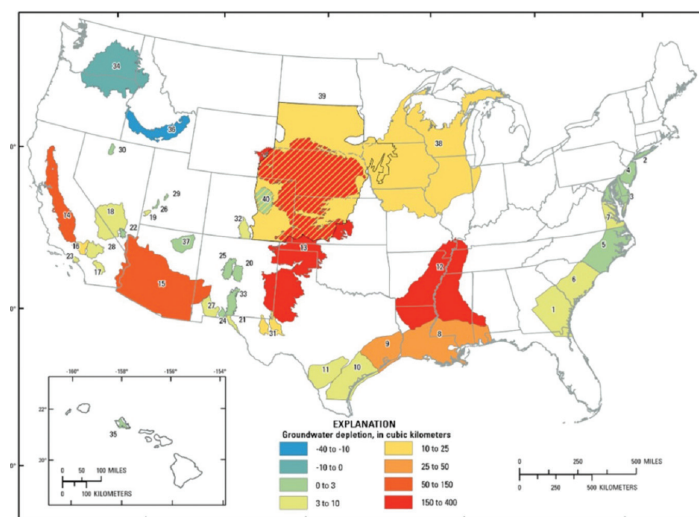
Regional population growth, typically measured with housing starts and non-farm payroll increases for future water demand assessment, also increases water demand.

Supply depends on inventories of water introduced to a geography most often via rivers, including:

Changing-climate patterns are affecting supplies. Typically, wet areas are forecast to be wetter and arid areas are getting drier. Precipitation increasingly falls in shorter, more concentrated storms, increasing runoff and making it more difficult for rain to penetrate the soil for crops and aquifer recharge.

Aquifer declines can drive values for water rights in different directions. Aquifer declines in one watershed can increase the value of, say, rights to nearby river water. They can also decrease the value of groundwater rights, largely in markets that have inadequate regulations to protect aquifers. One U.S. government study concluded that 40 major aquifers are being depleted three-times faster than historical rates.¹⁴

FIGURE 8: U.S. Aquifers at Risk



SOURCE: USGS, Groundwater Depletion in the United States (1900–2008)
By Leonard F. Konikow. As of 2013.

Desalination. A glance into the future of water investing must also consider desalination and technology risk. Desalination plants that convert sea and/or brackish water into drinking water are in use around the world, particularly in the Middle East. Current desalination production costs are highly dependent on energy prices, and the technology has a negative environmental footprint (both in its energy use and in the disposal of the hot, high salt content water that is produced as a byproduct). The impact on U.S. water markets remains limited since adoption is slow relative to the rest of the arid developed world (largely due to permitting processes and environmental costs). It is also limited to coastal regions and remains ~1.5–5 times more expensive than current water costs to municipalities.

There are also important structural drivers, including:

Conveyance. Water markets require moving water. Pipelines, rivers or canals that cross watersheds can drive water value convergence between markets. An aqueduct in the Central Arizona Project, for example, carries water 336 miles from the Colorado River to the central Arizona communities of Phoenix and Tucson.

Strong regional or watershed authorities. Where water is scarce, water rights values are driven largely by regulatory systems that commit to sustainable water use and enforce regulations. This kind of commitment forces demand into balance with renewable supplies, stabilizing aquifer levels and ensuring sustainable supplies. A commitment to balance supply and demand also limits lower economic value uses of water, driving the prices of water allocations and water rights up.

INVESTMENT STRATEGIES

A **passive investment** in water rights uses water as a commercial input required to make a product but does not try to monetize water rights specifically. A passive water rights investor might be a farmer who owns water rights and uses water to make crops.

An **active investment** in water rights fundamentally seeks to reduce water use to protect the communities that rely on it, often this is accompanied by attractive investment returns. We outline below four strategies that have been deployed in the past to save water by transferring water rights.

FIGURE 9: Investment Strategies

Strategy	Description	Core
Paper Water Rights	Paper water rights give the owner a one-time right to pump water out of a groundwater basin. These rights are valuable to water users who do not have the means to replenish the aquifer—a requirement in certain cases. Once used, these rights are retired.	A secondary market for trading paper water rights has developed in the S.W. U.S. Municipalities have been significant buyers, however, they have consumed and retired many of these rights.
Farmland Conversion	In a farmland conversion a farmland owner retires their water right and converts it into one-time use paper water rights.	This has been a popular strategy for landowners but the economics of conversion were designed to sunset and few new conversions are being pursued.
Direct Sale	In a direct sale the water right is detached from the property and sold directly to a buyer who owns that right in perpetuity, which requires regulatory approval. Finally, the residual land is sold to a separate buyer, typically a developer.	There are numerous examples of land owners along the C.O. River detaching their water right and selling to other users along the river.
Collective Lease	In this strategy a farmland owner voluntarily participates in an annual water leasing program that is implemented throughout the irrigation district in which it resides. Leased water may not be used by the landowner but the water right remains attached to the land. Typically only a fraction of the water attached to farmland is eligible for such a collective lease program.	In 2004 a water district in California adopted a fallowing program in which farmers reduced farming activity and leased water to municipal users. In 2013 another water district in California adopted an efficiency program that paid landowners for water use reductions achieved via improvements in irrigation efficiency.

INSTRUMENTS AND STRUCTURES

Instruments and transaction structures can vary significantly by buyer, asset type, legal, regulatory, hydrologic and economic factors.

PRIVATE MARKETS

Water instruments are generally broken into two groups: entitlements and allocations. An entitlement grants the user the right to use water from a source (typically a river, lake or an aquifer) in perpetuity, whereas an allocation is the right to use water from that source in a fixed period (typically one year) from an entitlement. As such, the value of a water entitlement can be thought of as the sum of the present values of future water allocations.

$$\text{Entitlement Value} = \frac{\text{Yr 1 Allocation Value}}{(1 + \text{DR})^1} + \frac{\text{Yr 2 Allocation Value}}{(1 + \text{DR})^2} + \dots + \frac{\text{Yr n Allocation Value}}{(1 + \text{DR} - \text{GR})^n}$$

Where:

- **Entitlement Value** = the present monetary value of a water entitlement
- **Allocation Value** = the future monetary value of a water allocation
- **DR** = the discount rate used to discount future allocations¹⁵
- **GR** = the growth rate, which represents the anticipated annual growth rate of allocation values

Most water entitlements are owned through irrigated farmland in the U.S., which are valued as a function of the farm's income and/or comparable sales. Most water rights investors look to identify opportunities for investment in basins where the sum of water rights entitlement values attached to the land exceed the value of the farmland purchased. This is a key source of transactions for the "land purchase" transactions, but there are many other types.

In California, urban buyers pursue long-term supplies through multi-year leases but also utilize spot market leases during dry years. Agricultural water users are the primary lessors in all transaction types on the sell side and acquire water through dry-year spot market transfers on the buy side. Environmental water users, who need water for purposes like stream flows to support fish populations, have significant flexibility to enter into creative, unconventional transactions but typically pay low prices relative to other buyers.¹⁶

Water transactions and values can also vary greatly within California. Potential transactions depend on many factors, including the water basin, the water laws of that basin, the type of demand (agricultural vs. urban) and the viability of separating water rights from the land. The degree of variation between water rights and transactions between basins requires local knowledge and operators who understand both local agricultural and municipal water markets, laws and politics.

	Transaction Type	Description
Conventional	Entitlement Sale	Permanent transfer of a water entitlement (water in perpetuity)
	Spot Market	Single-year transfer of an entitlement (water for one year)
	Multi-Year Lease	Non-permanent transfer of an entitlement for two or more years (water for multiple years)
	Take or Pay	Multi-year lease requiring lessee to pay for full transferred amount, even if less water is used (water for multiple years)
Unconventional	Land Purchase	Purchase of irrigated farmland for the purpose of securing the associated water entitlements (water in perpetuity)
	Unbalanced Exchange	Lessor provides an amount of water to lessee in a dry year in exchange for a larger amount of wet-year water
	Dry Year Option	Lessee has the option to call for water during dry years
	Rotational Fallowing	Lessor makes transfer water available by fallowing irrigated fields
	Conserved Water Project	Irrigation efficiency improvements are implemented to make transfer water available
	Partial Season Lease	Lessor discontinues irrigation water use for a portion of the irrigation season to make transfer water available

SOURCE: WestWater Research, Barings.

PUBLIC MARKETS

Public markets offerings in water rights investments are few and far between. The listed companies often offer exposure to water rights investments as ancillary to other activities like water technology, distribution or even farming. Water utilities can be considered a hybrid water rights investment in that many water utilities own water rights (or concessions), but the majority of utility balance sheets are dominated by distribution and processing infrastructure, rendering them less-than-perfect pure plays for water rights investors targeting water rights exposure.

Other public investments in water rights can be largely divided into public equities focused on water rights investing and investable indices. Public equities focused on water rights investing include such companies as Duxton Water, which owns water entitlements in Australia's Murray-Darling Basin. Cadiz Inc. owns groundwater and is pursuing sales of that water to the Los Angeles Metropolitan Water District. In spite of liquidity and price transparency, equity prices can diverge from fundamental values for reasons unrelated to water strategies, just as they do in real estate investment trusts or REITs.

The California Water Exchange (NASDAQ: NQH20) is an index that tracks water allocation prices in five of the state's geographies. The index was launched in 2018 and may serve as a way to hedge intra-year water volatility. As the index focuses on spot prices (water allocation prices), it does not give investors access to water entitlement prices, whose values are more likely to benefit from the water value drivers discussed at the beginning of this table.

CONCLUSION: THE FUTURE OF WATER INVESTING

Experience evaluating water rights investments globally has shown that water rights markets have begun to develop in regions that target sustainable use of water with supportive regulation. Australia remains the world leader and most developed market. Its foundational water regulations have supported an increase of water rights values, and its market mechanisms accommodate demand from agricultural, municipal and environmental through market trading.

Markets in the southwest United States, such as California, Arizona, Colorado and Texas, are still developing and have yet to see demand fully met with sustainable supplies of renewable water resources. This creates unsustainable draws on aquifers and reservoirs, as well as opportunities to purchase undervalued water rights in markets that have not fully priced their worth. As markets develop, however, more regions will likely adopt regulation supportive of water rights markets and approach standards and values seen in Australia. As California groundwater legislation takes effect and water transfers in Arizona receive anticipated regulatory approval, we expect the opportunities to buy and sell water rights in these regions to grow with their markets.

The future of water investing is likely to mimic its past. Water rights transactions have histories that exceed 100 years in the United States, and the transfer of water rights from water “haves” (typically farmland owners) to water “need-mores” (typically municipalities/cities) will continue. Careful investors can play a role as well in accelerating these developments as they provide capital to markets that decrease waste and lower-value usage by allowing water to reach a price where demand equals sustainable supply. Water rights investing requires thoughtfulness given the political sensitivities around the costs of water and its impact on agriculture, communities and the environment, but a careful approach can be profitable and help protect lasting supplies where they are needed.



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