The Story of San Diego's Water

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San Diego County has faced significant challenges in securing a reliable water supply due to its geography and climate. The region has employed various strategies over the decades to address water scarcity, including reliance on imported water, infrastructure development, and diversification efforts. This report examines how these decisions and other climate and policy factors have contributed to the high costs that San Diegans pay for water.

San Diego's efforts to secure water have evolved over two distinct eras. Throughout the 20th century, the region relied on large infrastructure projects to import water from the Colorado River and Northern California. However, as droughts intensified in the late 20th and early 21st centuries, the focus shifted to securing local water sources through desalination, recycling, and conservation efforts.

Key Findings

San Diego has some of the most expensive water in the country due to the tension between service reliability, fiscal stability, and rate affordability. The region has prioritized infrastructure investments to ensure a reliable supply of water (for a higher level of anticipated demand than has been realized) while maintaining financial stability, often at the expense of affordability. This trilemma has led to rising water costs that disproportionately impact lower-income ratepayers.

THE ECONOMICS OF SAN DIEGO'S WATER

Major investments in local water supply have increased costs, exacerbated by overestimations of demand. Infrastructure projects like the Carlsbad Desalination Plant and Pure Water San Diego have helped diversify water sources, but they come with high fixed costs. Additionally, demand forecasts have historically overestimated water use, leading to excess capacity and higher per-unit costs for water users.

External factors—climate change, energy prices, and regulatory policies—continue to drive up water costs. Climate change has intensified water scarcity, increasing the need for costly infrastructure investments. Rising energy costs further contribute to the expense of treating and transporting water. Additionally, state policies and regulations, such as Proposition 218 and environmental compliance requirements, limit the ability of utilities to implement affordability programs to support those most vulnerable to high water rates.

San Diego's investments in infrastructure have significantly improved the reliability of our water supply but has also resulted in some of the highest water costs in the nation. The region's reliance on imported water, coupled with extensive investments in local supply projects, has created financial burdens that fall on ratepayers. While these investments have made San Diego more resilient to droughts and external supply disruptions, they highlight a difficult balancing act between ensuring affordability, reliability, and financial stability. Moving forward, policymakers and water agencies must explore strategies to mitigate rising costs while maintaining reliability. Improved forecasting, smarter infrastructure planning, and innovative financing mechanisms will be essential in striking a balance between affordability and sustainability. Without targeted policy interventions, the financial burden on San Diego residents—especially those in disadvantaged communities—will continue to grow. The region's challenge now is to refine its approach to water management, ensuring that water remains both reliable and affordable for future generations.

The Modern History of San Diego's Water

San Diego is known for its mild, temperate climate. However, the region is also geographically far from fresh water sources and has minimal groundwater resulting in a water supply problem.

THE WILD WEST OF WATER

Beginning in the early 20th century, the region became heavily reliant on imported water from the Colorado River. One foundational effort to bring a stable supply of water to the region was via the Colorado River Compact of 1922.[1] This compact consisted of four Upper Basin States: Colorado, New Mexico, Utah, and Wyoming/, and three Lower Basin States: Arizona, California, and Nevada. These seven states signed the Colorado River Compact as part of the Boulder Canyon Project, setting guidelines for water allocation that are still in effect today. California ratified the compact in 1925, and as part of the negotiations, signed the California Limitation Act in 1929. This capped the state's allocation at 4.4 million acre-feet (AF) annually, plus a share of surplus water, a constraint that has been felt ever since.[2]

In response, California water agencies created the Seven Party Agreement to divide the state's 4.4 million AF share. This agreement established a priority system for water allocation among southern California's cities and agricultural interests. The first three priorities were allocated to agricultural users, including the Palo Verde Irrigation District, the Yuma Project, and the Imperial Irrigation District/Coachella Valley Water District. Collectively, these groups were limited to using 3.85 million AF annually. Priority was given to eastern irrigation districts already using the river's water, consistent with Western water law's "first come, first served" principle.[3] The fourth priority, totaling 550,000 AF per year, was assigned to the Metropolitan Water District of Southern California (MWD) to serve urban areas. Importantly, these first four priorities guaranteed California 4.4 million AF under the Boulder Canyon Project Act to cover these allocations. Additional priorities depended solely on surplus water, which was intermittent and not guaranteed.

The City of San Diego held a fifth priority right alongside MWD and the City of Los Angeles: 112,000 AF per year were allocated to San Diego and 550,000 AF to MWD and Los Angeles combined. Importantly, these rights only mattered if there was surplus water to be allocated.

In the mid-20th century, the San Diego County Water Authority (CWA) joined MWD through annexation, and as part of the agreement, the City of San Diego transferred its water rights to MWD. Today, MWD holds rights to 1.2 million AF per year of Colorado River water: 550,000 AF per year under its fourth-priority allocation and 662,000 AF per year from the fifth-priority, contingent on surplus water being declared.

The Colorado River Compact and the Seven Party Agreement established a framework for Colorado River water distribution and laid the groundwork for not only California's long-term water management strategy, but also that of San Diego. Because of those foundational agreements, San Diego did not have priority rights, which meant the supply of water to the region was dependent on upstream flows and rainfall, as well as consumption of other regions.

During the middle part of the 20th century, the region continued to expand in population, driven in part by the establishment of military bases during and after World War II. Though investment from the Navy and federal government helped to develop the region's water infrastructure, investments only resulted in water supply keeping pace with demand, i.e., growth in future demand did not seem to be a major consideration for investment planning of the day. Between the late 1940s and the early 1980s, the region built five additional, ad hoc pipelines with a combined capacity of one-million-AF of water, a necessary development given that the CWA was already serving 95% of county residents by midcentury. These pipes brought water both from the Colorado River as well as from Northern California via the State Water Project. While the capacity of pipes had increased substantially, however, the allocation for the Colorado River Compact did not. As population growth and urbanization surged, this dependence on non-priority imported water created vulnerabilities, exposing San Diego to legal disputes, environmental concerns, and potential supply disruptions.

IN THE PURSUIT OF WATER SECURITY

These fears concerning water security in the region were realized when in February 1991, in response to dwindling water supplies caused by multiyear drought, MWD imposed a 20% reduction in water supplies for San Diego's urban users and a 50% cut for agricultural users. In total, this equated to an overall supply decrease of 31% across the region. In response to these challenges over the following decades, San Diego, led by the CWA, pursued a comprehensive strategy to diversify its water supply, reducing its dependence on imports and bolstering resilience against drought and climate change.

A cornerstone of this strategy was the landmark Quantification Settlement Agreement (QSA) of 2003, which allowed the CWA to secure long-term water rights from the Imperial Irrigation District (IID). The CWA agreed to fund investment in water infrastructure for the IID, with conserved water being allocated to CWA. The agreement transferred about 200,000 AF of water per year that had been leaking out of the aqueducts to CWA. This has proven an innovative approach for water-sharing agreements and has set a precedent in California. Two other essential elements of the QSA were the All-American and Coachella Canal lining projects, which, in aggregate, deliver 77,700 AF of conserved canal water annually to support the region.

Simultaneously, the region invested heavily in local water projects, including seawater desalination, recycled water programs, and groundwater development. The completion of the Carlsbad Desalination Plant, for example, marked a major milestone in providing a drought-proof source of potable water, though at a high cost. When it opened in 2015, the Carlsbad Desalination Plant was the world's largest, supplying roughly 10% of the San Diego region's water.

Another effort to shore up the region's water resources is the recent water recycling initiative. Pure Water San Diego converts wastewater into a reliable drinking water supply. It is estimated that once phase 1 of the project is active in 2027, the recycling facility will turn about 30 million gallons daily (MGD) of wastewater per day into high-quality drinking water. After the completion of phase 2, it is expected that an additional 50 MGD of drinking water will be produced, totaling more than 80 MGD by 2035, or about 90,000 AF per year. This is in addition to the more than four MGD of drinking water that is already being produced from wastewater in Pure Water Oceanside, equivalent to about 5,000 AF per year.

With prolonged droughts and shifting precipitation patterns placing additional pressure on water resources, the region has adopted measures to enhance storage capacity, upgrade infrastructure, and promote water-saving practices among residents. These efforts to adapt to climate change are part of a strategy to emphasize conservation and efficiency. Public awareness campaigns, tiered pricing systems, and rebates for water-efficient appliances have all contributed to reducing per capita water consumption and reflect a broader recognition of the need to balance water supply reliability with environmental stewardship.

The Economics of San Diego's Water

WHAT IS CAUSING HIGH PRICES

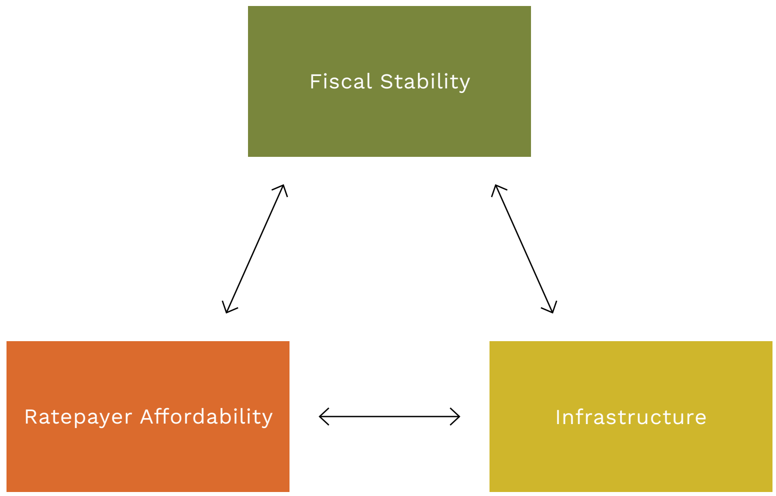
While these investments have strengthened San Diego's water security, they have also led to rising costs for water consumers: San Diego's water is among the most expensive in the nation, raising concerns about affordability, especially for low-income households.

So, what is driving high water costs for utilities that they are passing on to ratepayers? While some observers blame climatic pressure, the main reason is more economic in nature.

Water utilities need to balance a trilemma of interests, which include fiscal stability, affordability, and infrastructure– see Figure 1. Unfortunately, water utilities cannot simultaneously deliver on all of these interest in a satisfactory way for all of their stakeholders.[4] Instead, they will need to make trade offs between these interest, setting water priorities for their respective service area. That is to say, water utilities can only ever deliver on two of the interests at a satisfactory level. For example, a water utility can maintain affordability and spend money on infrastructure at the risk of compromising fiscal stability. Alternatively, they can maintain affordability and fiscal stability while putting off investment in needed infrastructure repair and replacement. Or they could raise rates (reducing affordability) to support infrastructure and maintain fiscal stability.

Patterson[5] notes that these priorities are often in tension with one another, especially if the financial health of an organization is not particularly strong. The poorer the financial health of an organization, the greater the tensions between these priorities become (e.g., during a period of poor financial health, water utilities can elect to raise rates, thus reducing affordability for ratepayers, while prioritizing either infrastructure investment and/or fiscal stability).

Figure 1: Economic trilemma for water utilities[6]



Since the 1990s, San Diego has prioritized fiscal stability and infrastructure investment, the latter to develop a more diverse, resilient water supply. In turn, these two focus areas have resulted in upward pressure on water rates (affordability). To worsen matters, as pressure to conserve water usage increases, whether from affordability issues or from drought concerns, these efforts can increase water rates per unit, potentially eliminating the economic benefits of conservation–see Over-Estimating Future Demand Has Raised Per Unit Costs, below. Policymakers seeking to lower the cost of water for ratepayers must understand how these factors affect the cost of water for all ratepayers, water utilities, and their suppliers.

While it is difficult to attribute an exact dollar amount or percentage of water costs to each factor (because they are interrelated and reinforce one another), the cost of water is shaped by the type of user (agricultural, residential, business, etc.), water utilities, location, local infrastructure, availability of water sources, and regional water management policies. There are also important external drivers of water rates: scarcity, infrastructure, energy, and regulation. By examining financial statements of CWA, MWD, and others, we describe the flow of money and water across the state of California and beyond.

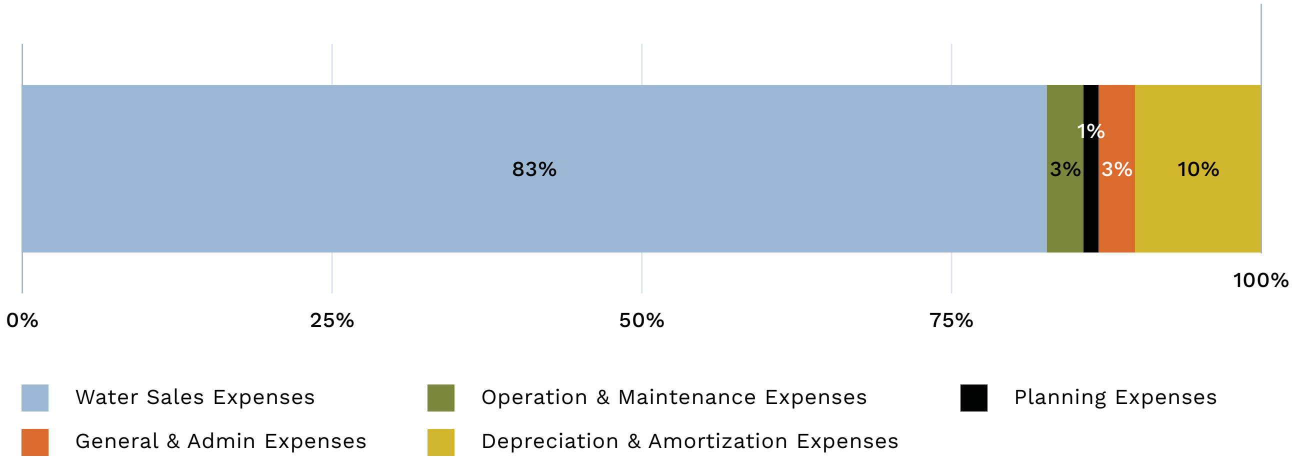
LOCAL DRIVERS OF HIGH WATER COST

The region is under pressure to create a more resilient water supply. Achieving this, however, is controversial and expensive.[7] The cost CWA will charge member agencies increased by 14% in 2024.[8] This section describes the impacts of supply chains, investments in local supply, and inaccurate local population estimates.

SUPPLY CHAIN

San Diego depends heavily on other regions for its supply of treated (i.e., potable) and untreated (used in agriculture and industry) water. More than 80% of water consumed in the San Diego region is imported from outside the region, much of which is via MWD.

Figure 2: Percent of total CWA expenses in each expense category



Local water rates reflect costs passed down from upstream suppliers of water, like energy, labor, maintenance, and operational expenses. The financial statements from the CWA both identify the rate at which an AF of water is purchased (the amount charged by MWD and includes all its expenses) and the rate at which it is sold to San Diego water utilities. About 83% of the authority's $676.7 million total expenses is related to the cost of importing and procuring water–see Figure 2.[9]

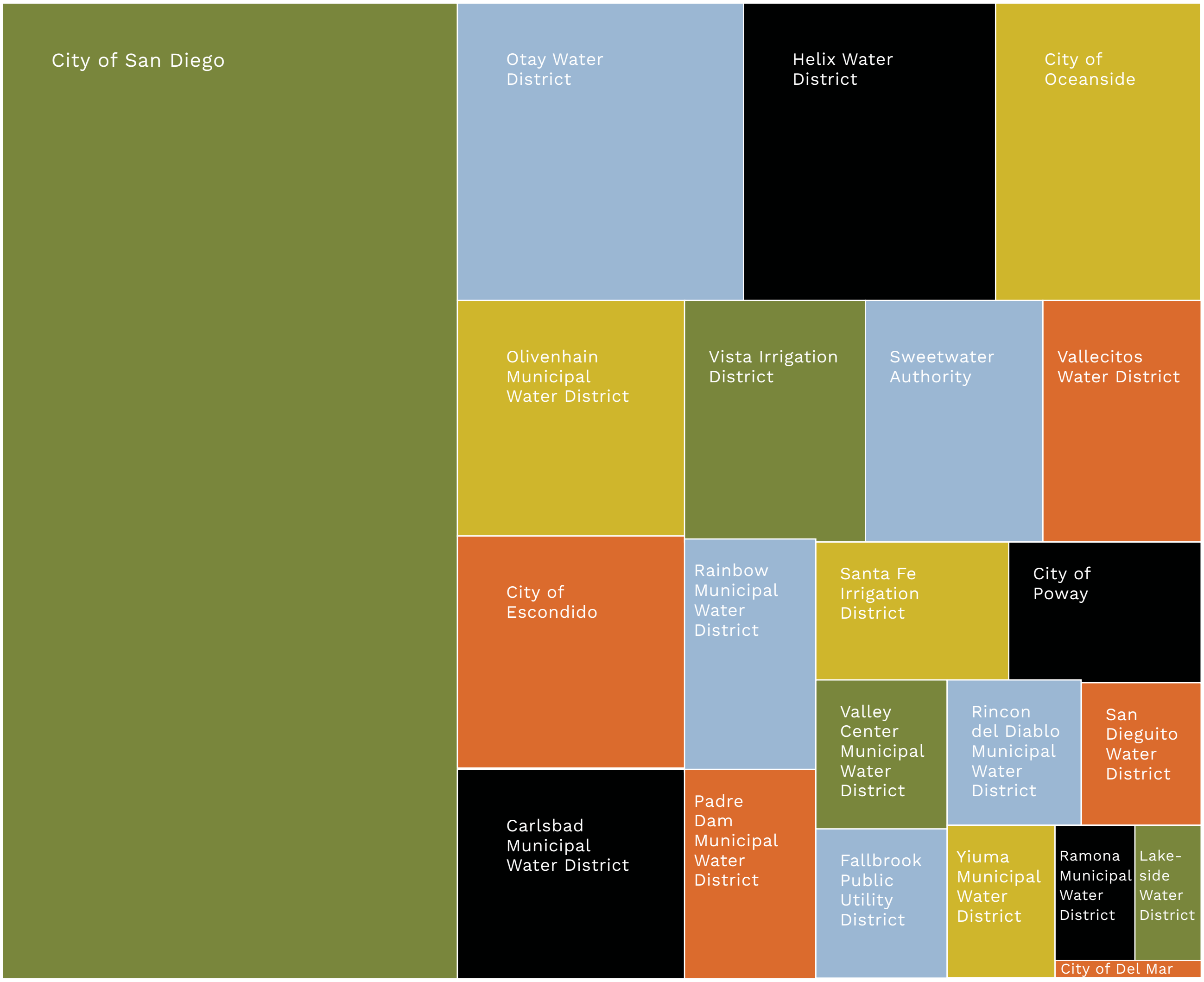
CWA does not bear these expenses itself, but instead passes them on to water utilities and, ultimately, to ratepayers. To examine the variation in water prices by water utility, we divided the gross dollar amount paid by the water utilities to CWA by the amount of water consumed by each district–see Table 1. One limitation of calculating the per unit cost in this way is that it is over-simplified. Though it may be an obvious way to calculate cost per AF, it assumes away variations in things like contracts between CWA and the various water utilities. Further, this calculation does not differentiate between the cost of treated and untreated water; charges for commercial, residential, and agricultural users; variable costs related to transportation and infrastructure access; and fixed costs to water utilities like customer service, storage, and supply and reliability. Instead, it only measures, on average, the cost of an AF of water for each water utility.[10]

TABLE 1: COST OF WATER, BY WATER UTILITY (2022)

Water Utility	Grossed Water Purchased from CWA ($)	Total Water Purchased from CWA (AF)	Average Cost of an AF of Water ($ per AF)
Vallecitos Water District	$30,719,000	11,448	$2,683
Carlsbad Municipal Water District	$30,571,000	12,303	$2,485
Vista Irrigation District	$16,188,000	8,419	$1,923
Rincon del Diablo Municipal Water District	$8,958,000	5,008	$1,789
Otay Water District	$52,997,000	29,632	$1,789
Padre Dam Municipal Water District	$17,755,000	9,942	$1,786
Lakeside Water District	$5,584,000	3,184	$1,754
Valley Center Municipal Water District	$28,831,000	17,131	$1,683
Ramona Municipal Water District	$8,197,000	4,950	$1,656
Fallbrook Public Utility District	$12,118,000	7,336	$1,652
City of Escondido	$20,125,000	12,226	$1,646
Yuima Municipal Water District	$8,254,000	5,154	$1,601
Rainbow Municipal Water District	$26,026,000	16,307	$1,596
City of Oceanside	$33,071,000	21,341	$1,550
Sweetwater Authority	$7,649,000	4,946	$1,547
Olivenhain Municipal Water District	$28,099,000	18,447	$1,523
City of Del Mar	$1,520,000	1,008	$1,508
City of San Diego	$256,354,000	170,801	$1,201
City of Poway	$14,475,000	9,781	$1,480
Helix Water District	$41,378,000	28,114	$1,472
Santa Fe Irrigation District	$11,382,000	7,789	$1,461
San Dieguito Water District	$5,977,000	4,191	$1,426
Total	**$666,228,000**	**409,458**	**$1,627**

The City of San Diego was responsible for the largest volume of CWA's gross sales, purchasing more than $256 million (making up 38% of total gross sales)–see Figure 3. At an average of $1,501 per AF, however, the rate paid by the City of San Diego is far lower than the average rate per AF of water paid in the region, which stands at $1,627 per AF–see Table 1. Twenty of the water utilities served by CWA pay between $1,400 and $2,000 per AF of water.[11] Vallecitos Water District and Carlsbad Municipal Water District pay the highest per AF fees to the CWA, paying $2,683 and $2,485 per AF, respectively.

Figure 3: Proportion of gross water sales from CWA to each water utility



Water utilities served by the CWA consumed about 492,000 AF of water in 2022, which includes import and local supply of water.[12] Of that total amount, 398,000 AF of water, or about 81%, was imported.

Figure 4: Cost per acre foot of water by entity[13]

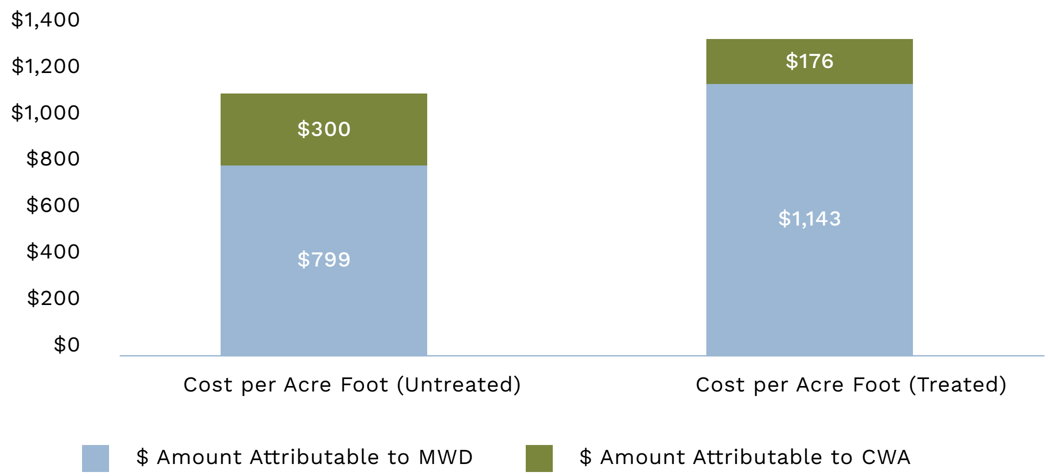
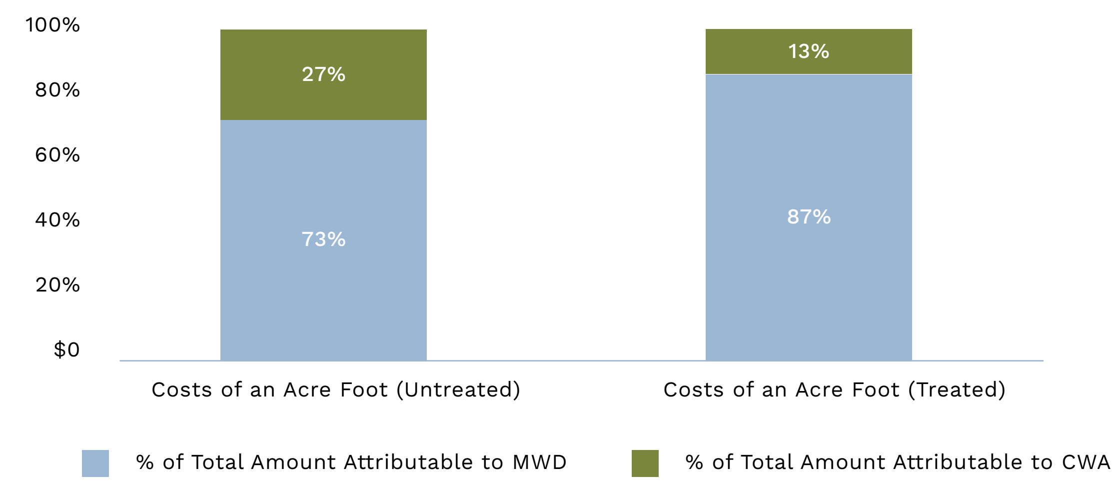


Figure 5: Percent of water sales cost paid to each entity, by water treatment type[14]



The MWD, which includes 26 cities, agencies, and authorities from around Southern California, charges $799 for an AF of untreated water and $1,143 for an AF of treated water–see Figure 4. The CWA charges $1,099 for an AF of untreated water and $1,319 for an AF of treated water to water utilities it serves. Said differently, of the water purchased from MWD, 73% of the cost of untreated and 87% of the cost for treated water that CWA charges to its member agencies is a pass-through from MWD–see Figure 5.[15] In 2016, MWD charged $594 per AF for untreated water and $942 per AF for treated water. This equates to a spike of 34% for untreated water and 21% for treated water in just six years.

Moving From Import Dependence Toward Local Supply

San Diego has long been exposed to volatility in both water rates and water supply; its geographic position and naturally occurring water supply has meant it has been dependent on imported water, the majority of which has come via MWD. As such, the region has had little control over the prices that have been imposed on the region. To counteract these external market forces, local leaders have been working to enhance and diversify water supply.

Larger scale investments in water infrastructure projects like the Claude "Bud" Lewis Carlsbad Desalination Plant, the largest desalination plant in the western hemisphere, have aimed at increasing the region's local water supply and reducing dependence on imported water.[16] The lining of the All-American Canal, which was paid for by CWA, helped to reduce the amount of water that would otherwise seep through the infrastructure into the ground, has accounted for about 16% of San Diego's total water supply in 2021.

The multi-year City of San Diego Pure Water program launched in 2019, and the first phase was expected to be completed by 2025. This project is an example of a large-scale investment to increase local supply of water. It involves constructing new water reuse/recycling facilities in the north of the city and expanding the piping system. Leaning on innovative technology, the project plans to contribute one-third of the City's water supply by 2035 and have the capacity to produce 80 MGD of purified water to the City.

Cost Impacts of Local Water Investments

While the drought-proof supply provided by San Diego's desalination plant has improved the resiliency of water in the region, it has come with a high financial burden to water utilities and, consequently, rate payers. In CWA's 2024 Financial Report, an AF of treated water was priced at $1,600.[17] Based on current electricity cost estimates, the price of water from the desalination plant is estimated to be about $3,400 per AF for fiscal year 2024,[18] more than twice the price of water from CWA. There is an annual obligation to buy 48,000 AF of water to cover the Desalination Plant's costs,[19] so during wet years, where water supply is abundant, this investment is particularly burdensome. On the other hand, it is hoped that the expensive source of water will secure supply and shield the region from, for example, mandatory cuts as climate change and environmental pressures continue to impact the region.

The Pure Water Project is an example of a water utility taking on debt to make the water system more efficient, lower the costs associated with its predominantly imported water supply, and develop a more resilient, local source of water. Achieving these objectives, however, has substantial costs, both to the City of San Diego and to the region at large. The EPA estimates that Phase 1 costs alone will surpass $1.4 billion.[20] The Water Infrastructure Finance and Innovation Act (WIFIA) has provided $733.5 million in loans with interest rates between 1.29% and 1.82% to help meet that cost.[21] Additionally, the State Water Board (SWB) has provided four separate loans that total $664 million with interest rates between 0.8% and 1.1%.

To cover the expenses associated with servicing this debt, San Diego has raised water rates substantially. The San Diego City Council has voted to raise drinking water rates by 2.5% on January 1st, 2023; 5% on December 1st, 2023; 4% on January 1st, 2024; 5.2% on July 1st, 2024; and 8.7% on January 1st, 2025.[22] Recent, continued rate increases reflect the cost of servicing the increased debt, both from past and new investments.

Importantly, this project will not only impact the water bills of City of San Diego residents but will likely impact those of other water utilities served by the CWA. The City of San Diego accounts for more than 40% of CWA's water sales. If the City of San Diego achieves its goal of reducing imported water by one-third, it would reduce its water use from CWA by about 56,000 AF, or 13% of the total amount supplied by CWA in 2022. Since the City of San Diego is by far the largest consumer of water, the CWA would be likely be left with a large oversupply of water. To pay off fixed costs, the water wholesaler will likely need to increase its own rates and defray costs across all users, driving the cost of water for consumers higher.

Over-Estimating Future Demand Has Raised Per Unit Costs

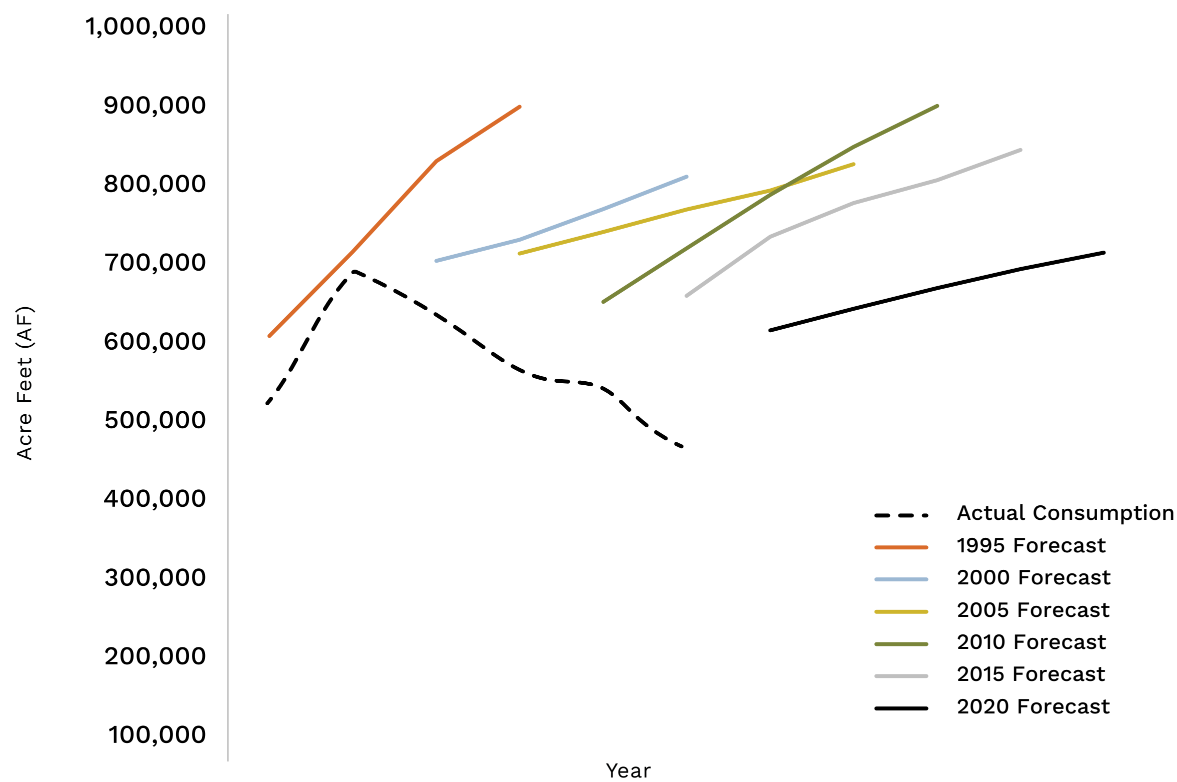
Models used in forecasting future water demand have consistently over-projected capacity needs across the state of California and within San Diego (see Figure 6).[23, 24, 25, 26, 27, 28] Because these overestimates have driven utilities to make infrastructure investments to increase water supply, they have ultimately contributed to rate hikes for consumers.

Every five years the CWA produces its Urban Water Management Plan (UWMP), which includes forecast of water use in five-year increments as well as population growth. It also includes information on financial and strategic information related to long-term planning. For example, the 1995 UWMP estimates water use for the year 2000, 2005, and 2010, while the 2000 UWMP estimates water use for 2005, 2010, 2015, and 2020, and so on.

In the 1995 UWMP, the CWA estimated water use of 755,000 AF in 2000– see Figure 6. The actual amount consumed in the CWA territory was lower at 695,000 AF of water. Importantly, that was the closest the 1995 UWMP forecast, or any subsequent UWMP forecast would get to estimating actual water use. An interesting takeaway is the trajectory of forecasts into the future. Water use peaked in 2000, and then consistently declined. Actual water use in 2020 was 463,000 AF; 12% lower than 1995 water use levels and down a third since 2000.

Nonetheless, all six of the UWMP assumed that water use, a function of population growth and per person water use behavior, will increase into the future.

Figure 6: Forecasted water use in UWMP compared to actual



Since actual water use has continually decreased while forecasted water use has continued to rise, the gap between estimated and actual water use has grown over time (see Table 2). For example, the 1995 UWMP forecast estimated that in the year 2000 water use levels would be 3% higher than they turned out to be. By 2010, the last year forecasted in the 1995 UWMP, the forecasts predicted 59% more water use than actually occurred. The 2000 UWMP overestimated water use by 10% in 2005 relative to actual consumption and by 76% in 2020. The 2005, 2010, and 2015 UWMP, have all since continued this pattern of overestimating water use.

TABLE 2: FORECASTS' OVERESTIMATION PERCENT COMPARED TO ACTUAL WATER USE

Urban Water Management Plan	Difference in 5-year Estimate & Actual Water Use	Difference in 10-year Estimate & Actual Water Use	Difference in 15-year Estimate & Actual Water Use
1995	3%	30%	59%
2000	10%	29%	43%
2005	26%	38%	67%
2010	21%	56%	-
2015	43%	-	-

As reported in CWA's 2022 Annual Comprehensive Financial Report, water sales stood at 295,000 AF for the fiscal year ending June 30th, 2024.[29] This means that actual water use is 17% lower than 2020, continuing the downward trajectory. Further, unless water use exponentially grows over the next year, the 2020 UWMP forecasted water use amount of 613,000 AF in 2025 will be more than 100% higher than actual use, continuing the trend of overestimation.[30]

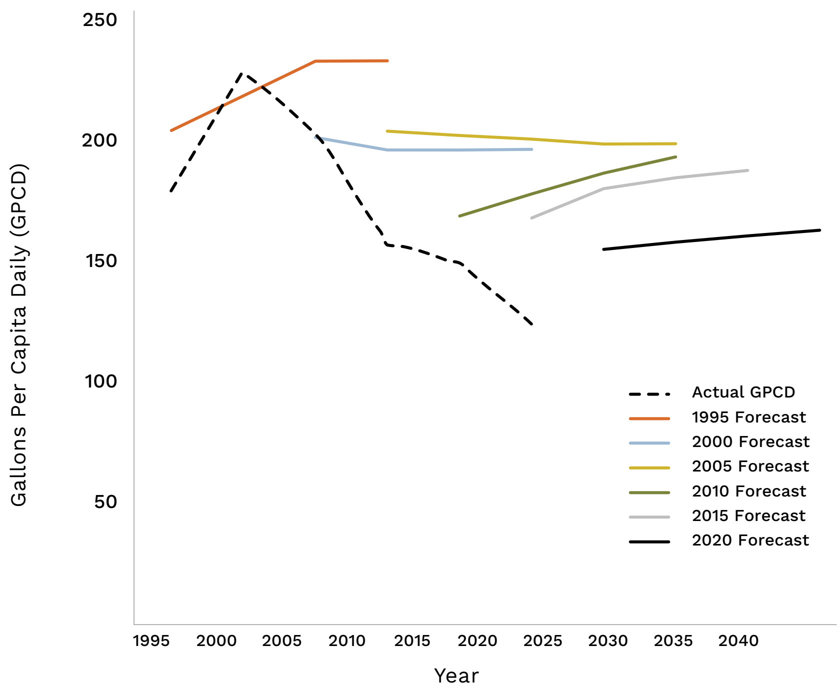
This chronic overestimation raises the question: what is causing lower than expected water use? In truth, there are several factors that impact water demand, including changes in population, economy, climate, weather, regulations, and conservation programs.

When sizing water infrastructure investments, per person water use and total population are two key inputs to models. If one, or in this case, both, are overestimated, the corresponding infrastructure projects will likely be oversized. For example, in the 2000 UWMP, the region's population was 2.6 million, and was projected to reach 3.7 million by 2020. According to census data, the region's actual population in 2020 was 3.3 million, 400,000 fewer than the projection.[31] At the estimated 200 gallons per capita daily (GPCD) for 2020 forecasted by the 2000 UWMP, this population overestimate accounted for about 89,000 AF of unconsumed water.

Moreover, over the last three decades, the region has used water more efficiently under the CWA's stewardship. Technological improvements, investment in efficient water infrastructure, and policies and regulations that mandate conservation efforts have driven this trend. Due to these improved water use practices, total urban water use per person has dropped from 230 GPCD in 2000 to 125 GPCD in 2020 (see Figure 7).[32] But while actual per capita water use has consistently declined since 2000, most UWMPs have projected water use per person to increase into the future. Even when total urban water use per person was expected to fall, as predicted in the 2000 and 2005 UWMPs, the projected reduction was considerably smaller than the actual reduction.

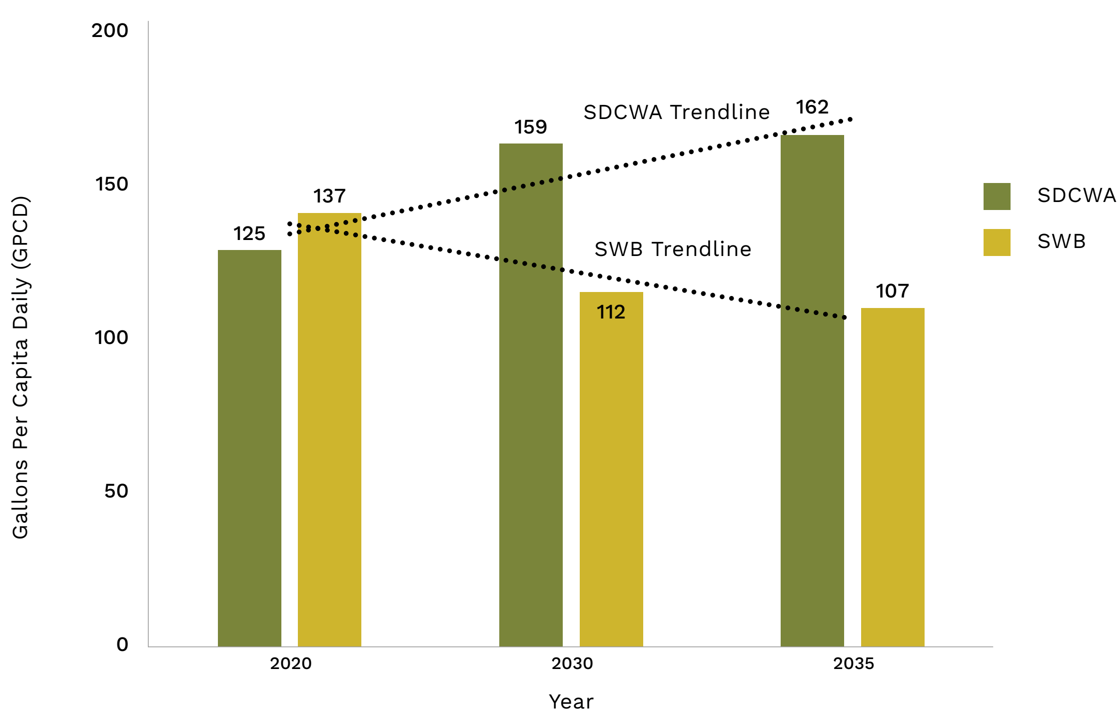
While local leaders have welcomed improvements in water use efficiency, especially given the impacts of droughts, there have been some notable consequences. Examining the 2000 UWMP, even if population expectations had been met in 2020, the region still would have consumed 518,000 AF of water, well below the expected 813,000 AF of forecasted water use in 2020. Instead, because of improvements in water efficiency and slower-than-expected population growth, actual water use was 463,000 AF in 2020, 43% below projections from 20 years prior.

Figure 7: Historic per person water use in San Diego compared to forecasted water use



The SWB calculated that Californians consumed 130 GPCD in 2024, and had the goal of reaching 117 GPCD by 2035.[33] In 2023, San Diego was almost already at that target, with total urban water use at 120 GPCD.[34] Coupled with further technological advances and efficiencies in the water system, increases in GPCD over the long-term seems unlikely. Nonetheless, as shown in Figure 7, the 2020 UWMP forecasted just that. If the UWMP projections form the basis for additional investments to expand capacity, they could result in further increases in the per unit cost of water (see: Water Affordability in San Diego County).

Figure 8: Forecasted GPCD for SWB and CWA



To be sure, it may be better to overestimate than underestimate water use. While overestimation results in increased per unit costs for water utilities and ratepayers alike, underestimating water use could impose cutbacks and rationing. As noted previously, over the last 30 years CWA has been investing to reduce San Diego's dependence on imported water and make its supply more resilient. And while the region likely has oversized its system for current and future demand, the spare capacity ensures that during dry years, multiple-dry years, and even megadroughts, San Diego has a resilient and stable water supply. In fact, while much of the state was cutting water use in recent years, due to steps to improve and solidify water supply in the region taken by CWA, the region was largely unaffected.[35] In 2022, for example, 6 million ratepayers of MWD were required to cut back water use one day a week while San Diegans were exempt.[36] In this way, policy makers have prioritized reliability over affordability. Still, it may be possible (and advisable) to right-size future projections of water use, and bring these priorities into greater balance.

FACTORS OUTSIDE OF REGIONAL LEADERS' CONTROL

State- and nation-wide macroeconomic and environmental factors are impacting water costs for water utilities in San Diego. CWA has limited ability to affect these drivers of water costs. Nonetheless, understanding their impact on water affordability in the region is valuable.

Water Scarcity & Climate Dynamics

California is prone to droughts and has limited water resources. Even though San Diego has additional infrastructural and contractual capacity, due to the high levels of imported water supply, it is also vulnerable to reductions in water supply in the future. The state relies heavily on snowmelt and rainfall for its water supply, which refills both ground and surface water. Changing climate patterns and population growth have reduced the availability of both.[37] More specifically, California extracts more groundwater than can be naturally restored. This imbalance has depleted groundwater reserves, causing issues such as failed wells, water quality concerns, permanent collapse of underground basins, and land subsidence (occurs when large amounts of groundwater have been withdrawn from certain types of rocks, such as fine-grained sediments).[38]

Even with the copious amounts of rainfall during the winter of 2023, drought and even megadrought conditions are likely to continue for years to come in the western US.[39] The US region has been in the midst of the largest megadrought for at least at least the year 800.[40] Several factors have intensified its severity, all of which can be explained, at least in part, by climate change.

Climate change caused a shift in precipitation patterns, resulting in reduced snow accumulation in the Sierra Nevada Mountains, which serves as a crucial natural reservoir of water.[41] Declining snowpack reduces the availability of meltwater during the dry season, impacting water supplies and increasing the risk of drought. The megadrought has prompted state and local officials to implement water efficiency and conservation measures, aiming to decrease the pressure placed on water systems.

Further, rising temperatures have altered rainfall patterns, leading to more intense and less predictable precipitation events. As seen during the uncharacteristically wet winter of 2023, this can lead to increased flooding and damaged infrastructure. These changes in rainfall patterns have affected water availability, groundwater recharge, and the timing of water storage and release from reservoirs. Further, inadequate infrastructure to capture this deluge of water means that much flowed directly out into the Pacific Ocean.[42] Warmer temperatures have also accelerated evaporation rates, leading to increased water loss from reservoirs, rivers, and lakes. This has exacerbated water scarcity and reduced water availability for various uses, including agriculture, industry, and domestic water use.

This recent history of severe drought, which have impacted communities across the Colorado River Basin, have intensified the need for sustainable groundwater management practices. Although recent storms may have contributed to the replenishment of some shallow groundwater basins, years of overuse in deeper basins mean that it could take an extended period, ranging from months to even years, to recharge groundwater in certain areas.

All these climate dynamics have had real world implications on the western United States, California, and San Diego. In May of 2023, after months of negotiations led by the Biden Administration, seven states agreed to cut water use from the drought-stricken Colorado River. California, Arizona, and Nevada agreed to cut 3 million AF of water through the end of 2026. Though important to stopping the destruction of the ecosystem and water system, these cuts will put pressure on water utilities and residents in San Diego, leading to even more conservation efforts.

In markets for many goods, scarcity drives up prices because a limited supply is sold to the highest bidder; when there are only 100 apples for 1,000 consumers, the 100 consumers who want those apples the most will pay a high price for them, assuming they have the means to afford them. Fortunately, we don't auction off water to whoever is willing to pay the most for a drink from the tap; instead, scarcity drives up rates because it requires us to build infrastructure to supply more water to the region, and ratepayers collectively bear the cost of that infrastructure.

Upstream Infrastructure Investments & Costs

San Diego water prices are also affected by infrastructure investments made upstream by the state and the MWD. The MWD, which provides most of San Diego's water, has an extensive network of reservoirs, canals, pipelines, and treatment plants that require ongoing maintenance and modernization. Most of the San Diego region's water is transported across hundreds of miles from sources like the Colorado River and through the California Aqueduct into the region. CWA and its member agencies control only the last section of infrastructure. Just as local districts pass along the costs of their investments to ratepayers, MWD passes the costs of their infrastructure projects on to San Diego.

The state also passes on infrastructure costs. California's 2021-2022 drought and water resilience package included total spending of over $3 billion dollars.[43] This included money for drinking water and wastewater projects ($1.2 billion), water conveyance repairs ($100 million), and water resilience ($165 million). Aging infrastructure and the need to adapt to changing water demands contribute to higher costs. In the case of the former, facilities require routine maintenance and repair to keep them in acceptable condition and to preserve and extend their useful lives. In the 2019-2020 budget cycle, California identified a total state infrastructure deferred maintenance need of about $70 billion.[44] Of this amount, about $12 billion is related to water resources. Importantly, these costs will be borne by both taxpayers and by consumers via increased water rates from water utilities.[45]

Energy Expenses

The treatment, transportation, and distribution of water requires energy. As energy prices rise, the cost of operating and maintaining water infrastructure increases, which can impact water rates. Transporting Colorado River water over hundreds of miles, including over mountains and hills, requires energy and adds substantially to the cost of water.

A study conducted by the energy institute at UC Berkeley's Haas Business School in collaboration with the nonprofit think tank Next 10 revealed that customers of PG&E, one of California's largest investor-owned utilities, pay approximately 80% more per kilowatt-hour than the national average.[46] The study also examined the rates of the state's other two major investor-owned utilities, Southern California Edison and San Diego Gas & Electric. It found that Southern California Edison charged 45% more than the national average, while San Diego Gas & Electric charged double the national average for electricity. This matters because water from northern California is transported through all these energy utilities' territory, impacting the cost for a unit of water. Since energy prices are relatively high, water utilities need to raise rates to cover the transportation from north to south.

The cost of energy in California is expected to increase further. Senate Bill 100 requires California to rely on 100% renewable energy by 2045.[47] To comply with SB 100, California-based energy utilities are increasing their capital expenditure on renewable energy infrastructure, and these costs will be passed on to consumers, including water utilities across the supply chain. As such, ratepayers will be impacted both by energy prices directly, as well as indirectly via increased water prices.

Regulatory & Policy Factors

Water provision in California is subject to regulations that limit local agencies' options, create goals that agencies must reach, and add administrative complexity.

Proposition 218, a constitutional initiative passed by California voters in November 1996, imposes significant limitations on the revenue-raising abilities of local governments.[48] This proposition applies to various entities, including water utilities, and establishes guidelines for setting water rates. It limits the ability for water utilities to increase rates for service beyond the cost of the service itself. They cannot, for example, increase rates to quickly pay back debts or to address water affordability issues for low-income earners.

Moreover, the state of California's Senate Bill X7-7, the Water Conservation Act (2009), requires water suppliers to increase their water efficiency.[49] This was further reinforced by 2018 legislation (Senate Bill 606 and Assembly Bill 1668) which establishes a new framework for long-term improvements in urban water use efficiency and drought planning.[50] While these policies aim to assist California in meeting its adaptation targets in its effort to adjust to ever-worsening climate change impacts, they require a reduction in water use, which impacts water cost.

The governance and regulation of water in California involves complex systems and multiple agencies, which can contribute to administrative costs and potentially impact water rates. For example, the California Environmental Quality Act, (CEQA) has substantial implications on the water system at large. CEQA mandates that a public agency thoroughly considers the potential significant environmental effects of "discretionary projects" it engages in, provides funding for, or authorizes. The agency is required to make efforts to avoid or minimize those impacts, if feasible. A "discretionary project" refers to a project that necessitates the exercise of judgment or careful consideration when the agency decides to approve or reject a specific activity. Local examples of discretionary projects that have had to go through CEQA review include City of San Diego's Pure Water Project, Otay Water District Water Facilities Master Plan Update, and Carlsbad's Desalination Plant.[51, 52, 53]

Additionally, CEQA obligates private and public organizations, such as water utilities, to disclose potentially significant environmental effects of discretionary projects to the public. These environmental regulations aim to protect water resources and ecosystems. Compliance with these regulations necessitates investments in water treatment technologies, pollution control measures, and ecosystem restoration projects, all of which increase the cost of water.

Conclusion

The story of water in San Diego is one of persistent challenges and innovative solutions shaped by geography, climate, and historical agreements. Facing limited local water resources and increasing pressures from population growth, legal constraints, and climate change, the region has implemented a variety of strategies to ensure water security. These efforts have included reliance on imported water, investments in desalination and recycling projects, and conservation measures that aim to balance demand and supply. However, while these strategies have bolstered the region's resilience to drought and climate variability, they have also made San Diego's water among the most expensive in the country, raising questions about long-term affordability and equity.

A significant driver of these costs has been the region's dependence on imported water from the Colorado River and Northern California. San Diego's investments in infrastructure, such as the Carlsbad Desalination Plant and the Pure Water San Diego recycling initiative, were designed to reduce reliance on external sources and increase local supply. These projects have provided drought-proof water options but at a high financial cost, impacting ratepayers, particularly low-income households. The region's decision-making has consistently prioritized fiscal stability and infrastructure investments, resulting in higher water rates for consumers.

San Diego's challenges are compounded by systemic issues, including chronic overestimation of water demand. Historical forecasts by the San Diego County Water Authority have routinely projected higher water usage than what materialized, leading to investments in oversized infrastructure. This has inflated per unit costs, as fixed expenses are distributed across lower-than-expected water consumption. Furthermore, climate change has introduced new uncertainties, including reduced snowpack, erratic precipitation, and intensified droughts, all of which heighten the urgency for sustainable water management.

The regulatory environment has further shaped water affordability in San Diego. Proposition 218 limits utilities' ability to design progressive rate structures or implement affordability programs, making it difficult to address the needs of vulnerable populations. Additionally, compliance with environmental regulations such as CEQA adds costs for water utilities, as they must invest in technologies and measures to mitigate environmental impacts. These challenges highlight the delicate balancing act required to maintain infrastructure, ensure affordability, and comply with legal and environmental mandates.

Despite these challenges, San Diego has demonstrated a strong commitment to long-term water security through diversification and conservation. Conservation measures have significantly reduced per capita water consumption over the past two decades, reflecting a growing awareness of the need for sustainable water use. Programs like Pure Water San Diego and efforts to line the All-American and Coachella Canals illustrate the region's proactive approach to securing local water sources. These initiatives have positioned San Diego as a model for innovation in water management, offering lessons for other regions facing similar challenges.

Moving forward, San Diego must continue to navigate the intersection of water affordability, infrastructure needs, and environmental stewardship. Policymakers and utilities must explore strategies to mitigate rising costs, improve forecasting accuracy, and address equity concerns, particularly for disadvantaged communities. Investments in data collection, innovative financing mechanisms, and policy reform will be essential to ensure that the region's water supply remains both reliable and accessible for future generations. Through continued adaptation and collaboration, San Diego can build a water system that balances resilience, affordability, and sustainability.

References

[1] 43 USC 617l: Colorado River Compact Approval (1922). https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title43-section617l&num=0&edition=prelim

[2] Mirvis, K. & Delude, C. (2023). *To quench a thirst: A brief history of water in San Diego.* San Diego County Water Authority. https://www.sdcwa.org/wp-content/uploads/2022/01/TQAT-publication.pdf

[3] The dust bowl hampered agriculture in much of the US, increasing the importance of the sector in Southern California during this time.

[4] Patterson, L. (2020). *Water affordability & equity: Re-imagining water services.* Nicholas Institute for Environmental Policy Solutions & The Aspen Institute Energy & Environment Program. https://www.aspeninstitute.org/wp-content/uploads/2020/12/Water-Forum-Consolidated-Report-2020.pdf

[5] *Ibid.*

[6] *Ibid.*

[7] Smith, J. E. (2022). Why the cost of water in San Diego has blown past L.A., according to a new report. *San Diego Union-Tribune.* https://www.sandiegouniontribune.com/news/environment/story/2022-02-12/water-cost-san-diego

[8] Joyce, E. (2023). *Water authority launches budget-rate setting process for 2024.* San Diego County Water Authority. https://www.CWA.org/water-authority-launches-budget-rate-setting-process-for-2024/

[9] San Diego County Water Authority. (2022). *Annual comprehensive financial report: Fiscal year ended June 30th, 2022.* https://www.sdcwa.org/wp-content/uploads/2020/11/FY22-ACFR-Electronic11.08.22SECURED.pdf

[10] CWA is a wholesale water agency that sells only to retail water agencies and not the public. As such, there is not a one-to-one correlation between CWA's rates and water bills for homes and businesses. Though this calculation can inform analysis focused on the relationship between CWA selling rate and the rate paid by consumers, it is limited in its ability to shed light on the drivers of water.

[11] San Diego County Water Authority. (2022). *Annual comprehensive financial report: Fiscal year ended June 30th, 2022.* https://www.sdcwa.org/wp-content/uploads/2020/11/FY22-ACFR-Electronic11.08.22SECURED.pdf

[12] Water use does not necessarily reflect AF of water sales. This is because water consumed includes local supply that have already been paid for, for example, water stored in the previous year in a dam. Water sales only include the sales per AF and does not always reflect how much water was used during a certain period.

[13] *Ibid.*

[14] *Ibid.*

[15] There is a significant disparity between the average price paid for an AF of water reported in Table 1 and the quoted price per treated and untreated water shown in Figure 4. This difference is likely a result of variable costs associated with, for example, energy use and the transportation of water.

[16] Carlsbad Desal Plant. (2024). Claude "Bud" Lewis Carlsbad Desalination Plant. https://www.carlsbaddesal.com/

[17] San Diego County Water Authority. (2024). *Annual comprehensive financial report: Fiscal year ended June 30th, 2024.* https://www.sdcwa.org/wp-content/uploads/2020/11/SDCWA-FY-2024-ACFR-Final-CD-Secured.pdf

[18] San Diego County Water Authority. (2020). *SEAWATER DESALINATION: The Claude "Bud" Lewis Desalination Plant and related facilities.* https://www.sdcwa.org/wp-content/uploads/2020/11/desal-carlsbad-fs.pdf

[19] *Ibid.*

[20] US EPA. (2023). Pure Water San Diego. https://www.epa.gov/wifia/pure-water-san-diego

[21] City of San Diego. (2022). Pure Water San Diego 2022 Annual Report. https://www.sandiego.gov/sites/default/files/2022_pure_water_annual_report.pdf

[22] The City of San Diego. (2025). Rate Adjustments. Retrieved January 6, 2025, from https://www.sandiego.gov/public-utilities/customer-support/water-and-sewer-rates-increases

[23] San Diego County Water Authority. (1995). *1995 Urban Water Management Plan.* https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/iid_CWA/CWA/exhibits/sdc25.pdf

[24] San Diego County Water Authority. (2000). *2000 Urban Water Management Plan.* https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/iid_CWA/CWA/exhibits/sdc07.pdf

[25] San Diego County Water Authority. (2005). *2005 Urban Water Management Plan.* https://www.waterboards.ca.gov/rwqcb9/press_room/announcements/carlsbad_desalination/updates_3_13_09/item_104_vol2_n.pdf

[26] San Diego County Water Authority. (2010). *2010 Urban Water Management Plan.* https://www.CWA.org/sites/default/files/files/water-management/2010UWMPfinal.pdf

[27] San Diego County Water Authority. (2015). *2015 Urban Water Management Plan.* https://www.CWA.org/sites/default/files/UWMP2015.pdf

[28] San Diego County Water Authority. (2020). *2020 Urban Water Management Plan.* https://www.CWA.org/wp-content/uploads/2021/03/Draft-2020-UWMP.pdf

[29] San Diego County Water Authority. (2024). *Annual Comprehensive Financial Report: Fiscal Year Ended June 30th, 2024.* https://www.sdcwa.org/wp-content/uploads/2020/11/SDCWA-FY-2024-ACFR-Final-CD-Secured.pdf

[30] San Diego County Water Authority. (2020). *2020 Urban Water Management Plan.* https://www.CWA.org/wp-content/uploads/2021/03/Draft-2020-UWMP.pdf

[31] US Census Bureau. (n.d.). County of San Diego Population 2020. Retrieved October 31, 2024. https://data.census.gov/https://data.census.gov/profile/San_Diego_County,_California?g=050XX00US06073

[32] Note: while Figure 7 appears visually similar to Figure 6, the former displays the total urban water use per person as opposed to total water use displayed in the latter.

[33] California State Water Board. (2024). *Framework for the Making Conservation a California Way of Life Regulation (Proposed Regulatory Framework).* https://www.waterboards.ca.gov/conservation/regs/docs/2023/summary-of-reg-framework.pdf

[34] San Diego County Water Authority. (2025). San Diego County continues efficient water-use practices. https://www.sdcwa.org/your-water/water-use/

[35] Cowan, J. (2021). Despite a punishing drought, San Diego has water. It wasn't easy. *New York Times.* https://www.nytimes.com/2021/10/17/us/san-diego-drought.html

[36] Elmer, M. (2022). L.A.'s historic water shortage won't affect San Diegans. *Voice of San Diego.* https://voiceofsandiego.org/2022/04/27/l-a-s-historic-water-shortage-wont-affect-san-diegans/

[37] Groundwater depletion in California is becoming increasingly severe, posing significant challenges to the state's water supply. While surface water is more plentiful during wet years, water users tend to rely less on groundwater. However, in smaller and more vulnerable communities that lack access to surface water sources, groundwater can account for up to 100% of drinking water supplies.

[38] Liu, P., Famiglietti, J. S., Purdy, A. J., Adams, K. H., McEvoy, A. L., Reager, J. T., Bindlish, R., Wiese, D. N., David, C. H., & Rodell, M. (2022). Groundwater depletion in California's Central Valley accelerates during megadrought. *Nature Communications*, 13(1). https://doi.org/10.1038/s41467-022-35582-x

[39] Jacobo, J., & Manzo, D. (2022). Megadrought out West expected to intensify, expand east: NOAA. *ABC News.* https://abcnews.go.com/US/megadrought-west-expected-intensify-expand-east-noaa/story?id=84221152

[40] Williams, A. P., Cook, B. I., & Smerdon, J. E. (2022). Rapid intensification of the emerging southwestern North American megadrought in 2020–2021. *Nature Climate Change,* 12(3), 232–234.

[41] UCLA Center for Climate Science. (2018). *Climate change in Sierra Nevada: California's water future.* https://www.ioes.ucla.edu/wp-content/uploads/UCLA-CCS-Climate-Change-Sierra-Nevada.pdf

[42] Vartabedian, R., & Lampcov, M. (2023). In a drought, California is watching water wash out to sea. *The New York Times.* https://www.nytimes.com/2023/01/13/us/california-drought-storms-water-storage.html

[43] Petek, G. (2022). Water and drought response proposals: the 2022-23 budget. Legislative Analyst's Office (LAO). https://lao.ca.gov/reports/2022/4509/Water-Drought-Response-013122.pdf

[44] Petek, G. (2019). Deferred maintenance: the 2019-20 budget. Legislative Analyst's Office (LAO). In https://lao.ca.gov/reports/2019/3929/deferred-maintenance-020819.pdf

[45] Water Policy Center. (2016). Paying for Water. Public Policy Institute of California. https://www.ppic.org/wp-content/uploads/content/pubs/report/R_1016EH2R.pdf

[46] Borenstein, S. (2021). Report: Californians pay up to triple what it costs to provide electricity. *Haas News: Berkeley Haas.* https://newsroom.haas.berkeley.edu/research/report-californians-pay-up-to-triple-what-it-costs-to-provide-electricity/

[47] California Energy Commission. (n.d.). SB 100 Joint Agency Report. https://www.energy.ca.gov/sb100

[48] California Legislative Analyst's Office (1996, December). Understanding Proposition 218. https://lao.ca.gov/1996/120196_prop_218/understanding_prop218_1296.html

[49] California Department of Water Resources, (n.d). Senate Bill X7-7. Retrieved on July 13, 2024, from https://water.ca.gov/programs/water-use-and-efficiency/sb-x7-7#:~:text=The%20Water%20Conservation%20Act%20of,that%20DWR%20is%20responsible%20for

[50] State Water Resource Control Board (n.d.). Water Conservation Portal - California Statutes | California State Water Resources Control Board. Retrieved on April 16, 2024, from https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/california_statutes.html

[51] City of San Diego. (2016). Pure Water Program. https://ceqanet.opr.ca.gov/2014111068/2

[52] Otay Water District. (2023). Otay Water District Water Facilities Master Plan update. https://ceqanet.opr.ca.gov/2023040044

[53] San Diego County Water Authority. (2022, May 16). NOD Addendum 7 Precise Development Plan and Desalination Plant Project. https://ceqanet.opr.ca.gov/2004041081/15

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