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Water: Arizona's Ticking Time Bomb

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Abstract

As a landlocked state dominated by desert, Arizona has done an exceptional job supporting tremendous development and population growth with limited water resources. However, as climate change and anthropogenic environmental degradation further stress the region's already-strained water resources, the future of Arizona's still-growing populace hangs in the balance as current water policies and practices are proving inherently unsustainable. Despite an abundance of literature citing the consequences of a liberal attitude towards water in an arid climate, a myopic focus on promoting Arizona's economic and political growth has resulted in the state's modern need to adopt previously-unseen conservation measures in order to assure its future survival. Through a review of the history of its water resources, key policies shaping their use, and potential options to address increasing water scarcity, this research paper lays out a general overview of Arizona's present water situation and describes the uphill battle it faces to achieve sustainability. A holistic analysis of various policies and practices impacting the state's water resources highlights numerous pitfalls to and opportunities for enhanced water conservation, and this paper suggests that a comprehensive approach of greater market incentives, regulation, and education is necessary to remedy this current government failure. If the people and landscape of Arizona are to survive a future dictated by climate change, there must be a fundamental shift in attitudes towards water such that it is valued and efficiently utilized the way a precious, increasingly limited resource should.

Water: Arizona's Ticking Time Bomb

The American Southwest is a region of desolate beauty, full of striking mountain ranges and vast deserts whose scarce water resources bely the incredible array of biodiversity within this arid wonderland. Boasting natural treasures such as the Grand Canyon, the San Francisco Peaks surrounding Flagstaff, the red cliffs of Sedona, and the Saguaro-strewn Sonoran Desert, Arizona is home to a tasteful sampling of the varied Southwest landscapes, understandably attracting multitudes of people to bask in its warmth and enjoy Arizona's many amenities. Between 1957 and 2010, the population of this arid state grew by an incredible 470 percent without increasing its supply of water (Alley & Alley, 2017), truly an impressive feat for a region dominated by desert.

However, for all its apparent efficiency, Arizona's tremendous growth has been overly reliant on increasingly finite water resources and is proving inherently unsustainable. As shifting climates further reduce the region's precious, already pitiful, annual precipitation, Arizonans are beginning to witness the limits of their water supplies and infrastructure. In the face of a so-called "Megadrought", the likes of which have not been seen for 1200 years (Rott, 2022), the puzzle of finding and efficiently allocating enough water to support the modern American Southwest, and Arizona in particular, grows increasingly difficult. Therefore, if it wishes to continue sustaining civilization in the desert, Arizona must establish new, innovative policies surrounding the management of its water and land resources, embracing a multi-pronged approach of increasing regulation, taxes, widespread information campaigns, and addressing the policy loopholes that have allowed such unsustainable growth.

Arizona's Unique Water Portfolio

For all its apparent desolation, it was only relatively recently that Arizona began to legitimately struggle with sourcing sufficient water for continued growth and survival. Prior to its population boom, Arizona's lands had been nourished with water from the powerful, free-flowing Colorado and Gila rivers and tributaries, and the desert boasted an enormous store of pristine water held underground in ancient aquifers (Sullivan & Tarlock, 2019; York et al., 2020). Until eventually joining with the tail-end of the Colorado, the Gila River and its main tributaries, the Salt and Verde Rivers, travel across central Arizona and furnish almost one-quarter of the state's water supply (Schwabe et al., 2020). When it comes to the Colorado River, Arizona is only one of multiple territories whose water supplies are heavily reliant on this canyon-carving force of nature: six other American states and a small area of northwestern Mexico also lay claim to portions of its flow.

Foreseeing the potential for interstate conflict as the arid Southwest began to grow in earnest, representatives from Colorado, Utah, New Mexico, Wyoming, Nevada, Arizona, and California convened in 1922 to create the Colorado River Compact, an agreement dividing the Colorado River watershed into the Upper Basin (Colorado, Utah, New Mexico, and Wyoming) and Lower Basin (Nevada, Arizona and California) and allotting each basin 7.5 million acre-feet per year (AF - one AF of water equals 325,851 gallons), leaving Mexico entitled to the river's excess flow. Each basin's share was divvied-up between the basin states on a basis of established need and use, and Arizona was able to secure 2.8 million AF of Colorado River water per year in hopeful anticipation of significant growth (Jenkins, 2009; Water Education Foundation, 2022).

Although Arizona's key surface waters have many tributaries which broaden their "service area", they are concentrated in the less-populous northern and western portions of the state. Similarly, despite its legal right to a sizable allotment under the Colorado River Compact, Arizona initially lacked the infrastructure to transport and fully utilize its share of Colorado River water, much to the benefit of downstream users like California and Mexico who enjoyed access to the "excess" flow (Coate, 1995). Therefore, with its notable lack of adequate surface water, the development boom in the state's especially dry central region around Phoenix and Tucson has been largely reliant on the area's ancient groundwater. Pumped from porous aquifers deep beneath the desert crust, groundwater provides nearly forty percent of Arizona's supply (Schwabe et al., 2020).

A decidedly finite source of water, aquifers are slow to naturally recharge and can take hundreds or thousands of years to do so, making them highly susceptible to overexploitation. Understanding this, Arizona officials knew continued growth in its central region would be dependent on the state's ability to transport and use its "renewable" water from the Colorado River to supplement or replace groundwater use. In 1968, after years of political bargaining and compromise led by the native Arizonans Stewart Udall (former Secretary of the Interior) and Senator Carl Hayden, the state secured approval and funding to build the Central Arizona Project (CAP). Upon completion, the CAP would transport and deliver upwards of 1.5 million AF of Colorado River water across 336 miles of arid landscape. Originating in Lake Havasu and ending just south of Tucson, the CAP would lead to the Colorado River provisioning nearly one-third of Arizona's water supply (Jenkins, 2009; Schwabe et al., 2020).

The completion of the CAP alleviated some of central Arizona's water worries, but an incessant desire for a diverse, efficient, and reliable water portfolio inspired the region's metropolises to make significant investments to capitalize on treated wastewater. Also called "reclaimed" or "effluent" water, treated wastewater was "put to work" and has ultimately resulted in reclaimed water providing around six percent of Arizona's total water supply, its uses ranging from golf course and farmland irrigation to electricity production (Schwabe et al., 2020; Wilhelmi & Tucker, 2015). With a limited, yet increasingly creative, repertoire of water sources, this arid state has consistently provided its residents anywhere from 7 to 9 million AF of water per year since the 1950s (Hirt et al., 2017). Despite being both landlocked and blanketed by desert, Arizona proved itself surprisingly capable of procuring water sufficient to support astronomical growth.

Altering Policies and Practices for an Altered Landscape

In 1910 Arizona had around 200,000 residents and in just over 100 years that number grew to around 7.3 million people, spurred-on by a lucrative agricultural industry and the widespread accessibility of air conditioning after World War II (Arizona Commerce Authority [ACA] 2022; Hirt et al., 2017). After technological improvements in well pumps made groundwater easily accessible, farmers took full advantage of Arizona's long growing season, cheap land, and enormous underground water reserves, eventually accounting for over half the state's total water demand (Schwabe et al. 2020). Similarly, although municipal water demand typically pales in comparison to agricultural demand, Arizona's has grown such that municipal water use around Phoenix and Tucson, supplied largely by groundwater, has outpaced its agricultural

counterpart (Hirt et al., 2017). Because water rights in Arizona historically operated on a “first come, first served” basis, the rampant development during the mid-twentieth century quickly resulted in a chronic groundwater deficit (Payne & Root, 2011). By the middle of the twentieth century, it became obvious that measures had to be taken to protect the future of Arizona’s water (Jenkins, 2009; Payne & Root, 2011).

Years of heavy reliance on groundwater in central Arizona resulted in a continual lowering of the water table as more water was pumped from aquifers than was recharged, a practice called groundwater mining or aquifer overdraft. As countless wells drew precious moisture out of the desert’s parched soil, some areas witnessed the disappearance of entire bodies of water, such as the Santa Cruz River near Tucson. Many places experienced land subsidence as the newly-dried earth compacted onto itself, losing elevation and in turn greatly inhibiting the landscape’s ability to reabsorb liquid. Although the CAP had initially been intended to promote agricultural expansion, by the time construction began in 1973 it was understood that CAP water would instead be needed to mitigate the aquifer overdraft so prevalent in central Arizona. Therefore, it was officially mandated that for every acre-foot of water delivered by CAP, an acre-foot of water was to be left in the ground (Jenkins, 2009).

In an effort to address the obvious threat of groundwater mining to Arizona’s assured water supply, the state passed the Groundwater Management Act (GMA) in 1980. The GMA established the Arizona Department of Water Resources (ADWR) and created five Active Management Areas (AMAs) around central Arizona where aquifer overdraft was of serious concern. The ultimate goal of the GMA was to eventually achieve “safe yield” for groundwater, where removal is better balanced (though not

necessarily negated) by aquifer recharge activities in the territories around the agricultural and metropolitan hotspots of Pinal County, Santa Cruz County, Tucson, Prescott, and Phoenix (Jenkins, 2009). Large users of groundwater located in AMAs were regulated and metered, and establishing new parcels of irrigated agricultural land was prohibited within the AMAs (Alley & Alley, 2017). For preexisting agricultural properties in AMAs, landowners were issued Irrigation Grandfathered Right (IGFR) certificates declaring their annual water allotment, or water duties, from all sources; the GMA also mandated the monitoring of water use by Arizona's municipal, industrial, and indigenous sectors (York et al., 2020). All sectors were to pursue increased efficiency and conservation practices to improve the sustainability of Arizona's water supplies, and the GMA required long-term plans instituting conservation standards which were to become more stringent over time (Glennon, 2005). Additionally, the construction of new residential subdivisions in an AMA required developers to prove access to primarily renewable water sources whose supply would be physically and legally accessible for 100 years, such as local surface waters, CAP water, or treated effluent. This last statute inevitably stood to be a notable barrier to continued development in areas historically reliant on groundwater for meeting municipal needs, such as the Tucson AMA. (Alley & Alley, 2017).

Largely completed by 1993, the CAP was the state's first major step in establishing safe yield within its AMAs. In 1994, the Central Arizona Water Conservation District (CAWCD) was created to operate the CAP and repay Arizona's share of construction costs through sales of CAP water. After completion, much of the agricultural, industrial, and municipal sectors with access to the CAP were expected to

adopt its waters over their long-preferred groundwater, however this proved to be much more difficult in practice than in theory. As it turned out, CAP water was more expensive and of lower quality for farmers and cities than the groundwater beneath their feet, requiring creative “workarounds” and subsidies to smooth the journey to safe yield. For example, though the city of Tucson was under contract to transition to CAP water once it was available, citizens found it highly undesirable as it corroded many appliances and exhibited abnormal odor and taste. The public outcry eventually resulted in Tucsonans returning to groundwater for their daily use and devoting most of their CAP water to aquifer-recharging operations in the effort to achieve safe yield; ideally, CAP water would slowly mix with the ancient aquifer water to a satisfactory dilution (Jenkins, 2009).

Significantly, the GMA had granted preexisting farms IGFRs that limited only the amount, not source, of irrigation water. When it was seen that irrigating with CAP water cost more than pumping groundwater, farmers naturally had little incentive to switch (York et al., 2020). Therefore, to encourage groundwater preservation and greater agricultural usage of CAP water, the Arizona Water Banking Authority (AWBA) was established in 1996. The AWBA oversees a program where excess CAP water is either charged directly into aquifers at a few designated recharging facilities around the AMAs, or sold to farmers for irrigation purposes at a highly subsidized price. The cheap CAP water purchased by farmers is then used in place of water that would have otherwise been drawn from a well (Alley & Alley, 2017).

Arizona’s 1980 Groundwater Management Act initiated action in key areas to address unsustainable rates of groundwater mining, but persistent loopholes, oversights, and questionable practices work to undermine its efforts. Coincidentally (or

not), the same year the CAP reached the southern end of Tucson, Arizonans passed a bill creating the Central Arizona Groundwater Replenishment District (CAGRD). The CAGRD provided residential developers a loophole to the GMA's 100-years assured supply mandate: so long as a volume of surplus CAP water equal to that pumped from aquifers was purchased from CAWCD and recharged into the ground, neighborhoods dependent on direct withdrawals of groundwater could be built within AMAs without proving a century's worth of guaranteed water (Hirt et al., 2008). Similarly, the GMA allowed "low capacity" wells (drawing less than 35 gallons per minute) to be exempt from regulation so long as the water was not used for irrigation. Between 1980 and 2005, over 24,500 exemption permits were issued for wells located in just the Tucson and Phoenix AMAs (Hirt et al., 2017).

In the agricultural sector, the GMA allowed farmers to save unused water duties, called flex credits, each year to either redeem at a later date or sell to other farmers in their water district. Redeeming or purchasing flex credits allows farmers to draw more than their legally allotted water duties during lean years. Similarly, farms who had invested in water conservation and efficiency improvements prior to the passing of the GMA felt slighted after receiving IGFRs with (appropriately) smaller water duties than their less-efficient peers. This eventually led to the creation of Arizona's Best Management Practices (BMP) Program in 2002, whereby farms proving to have implemented specific conservation and efficiency measures could use water in excess of their established IGFRs (York et al., 2020).

Despite these and other noteworthy loopholes, a combination of increased conservation, efficiency, regulation, and a transitioning of thirsty cropland into municipal

and residential land has allowed Arizona's AMAs to slow their rate of groundwater mining while boastfully accommodating continuous population growth. Notably, the metropolises of Phoenix and Tucson have managed to reduce their average consumption in gallons per capita per day (GPCD) by a modest margin, even as they grew. Under a combination of recurrent drought conditions and the GMA requirements for conservation and efficiency improvements, these cities enacted policies mandating low-flow plumbing and appliances in all new construction, began penalizing incidences of obvious water waste (such as sprinklers directed into the street), and promoted a widespread adoption of xeriscaping, or drought-tolerant landscaping. Phoenix and Tucson were also important forerunners in reclaiming nearly all of their treated wastewater for municipal use. It is essential to remember, though, that population growth in itself can result in a reduction in GPCD, especially as adjacent agricultural land is transitioned into residential plots with smaller water demands. Regardless, in 1995 Phoenix and Tucson consumed, on average, 230 and 172 GPCD, respectively, but by 2013 both cities had reduced these numbers to around 160 GPCD (Hirt et al., 2017).

Slowing an overdraft is not the same as a reversal, however, and the GMA specified only Active Management Areas need take significant measures to address aquifer overdraft and water conservation, leaving large swaths of the state with only minimal regulation (Alley & Alley, 2017). While eighty-percent of Arizona's population resides within the limits of an AMA, the common property nature of groundwater means the few users outside AMAs have the potential to, and do, further inhibit achieving safe yield as they access the same aquifers with virtually no limit on use. Even though

measures are taken to maximize the water recharged to AMA aquifers, the wide disbursement of groundwater withdrawals is likely to produce localized areas of overdraft since charging occurs in only a few select locations and water moves very slowly through the ground (Hirt et al., 2008). Beyond that, in spite of its best efforts, Arizona continues to pump far more groundwater than it charges, removing 3 million AF for every 1 million AF recharged. Additionally, even those under the most stringent of GMA regulations have routinely fallen short of meeting conservation goals and have faced little in the way of enforcement from the Arizona Department of Water Resources (ADWR). As a whole, Arizona has been able to sustain unprecedented growth without requiring additional water sources, but it has done so by operating on a water deficit which is likely to grow and is increasingly unsustainable (Hirt et al., 2017).

Arizona's Foreseeable Flux of Future Water

Arizona has admittedly made remarkable strides in transitioning to a more renewable and, in theory, sustainable water portfolio with less dependence on groundwater, but a rapidly changing climate and nonstop population growth have brought into question the state's ability to survive, even with a mostly-renewable water supply. Warming temperatures and shifting precipitation patterns have resulted in reduced flows and heightened concern for key rivers of the American Southwest, and the powerhouse Colorado is an especially poignant example. The river was destined to face water challenges from the very beginning of the Colorado River Compact, when the inaccurate average flow rate of 16.8 million AF per year was used to determine water rights in the Upper and Lower Basins. Though estimates vary, tree-ring data suggests a more realistic long-term average flow for the Colorado River to be around

13.5 million AF per year, and the overestimation of 16.8 million AF can be explained by the unfortunate coincidence that flow-rate observations took place during an abnormally wet decade (Jenkins, 2009).

While all the Colorado River Basin (CRB) states will struggle with an already-overallocated, shrinking river, Arizona stands to be hit especially hard. Though it had secured a significant volume from the Colorado River in the Compact, Arizona had done so by assuming junior water rights in deference to the thirsty political giant of California. This meant that in times of drought and reduced allotments, California would be sure to get its full lion's share of the river before Arizona was allowed to take any for the CAP. Unfortunately, due to programs like CAGR and the AWBA, water delivered by the CAP has become intricately tied to the continued success of civilization in central Arizona, and this gives California's seniority in water rights all the more potential to be harmful (Jenkins, 2009).

The beginning of the twenty-first century being plagued by drought, 2019 saw the CRB states sign a Drought Contingency Plan (DCP). The DCP is intended to protect the Colorado River's water inventory and slow the drainage of its keystone reservoirs, Lakes Mead and Powell, whose slow and steady water releases have supplemented the faltering river for decades (Hirt et al., 2017; York et al., 2020). When enacted, all states can expect to experience reductions in their annual allotments from the Colorado River, and for Arizona this translates into an almost twenty-percent reduction in their allowance for 2022, an effect to be felt almost entirely by the agricultural sector serviced by the CAP (James & Syed, 2021). This will undoubtedly result in many farmers returning to the groundwater they had temporarily abandoned for cheap CAP water as prices

necessarily increase, while others may opt to sell unprofitable land to developers, swap to less water-intensive crops, or leave land fallow and sell their unused water credits, demonstrating a unique flexibility within the sector that its municipal counterpart lacks (Hirt et al., 2017). But, as Arizona's municipal water demand continues to grow to rival that of thirsty agriculture, the state begins to find itself with fewer, increasingly stringent and inherently questionable options for combatting water scarcity.

With the days of massive, federally-funded water projects being well in the past and current drought conditions showing little sign of lifting in the near future, Arizona is being forced to come to terms with the pitfalls of tacit stakeholder acceptance of continued, undeniably unsustainable, rates of growth in central Arizona. With new housing developments erupting from the desert sand all around the region, capitalizing on the cheap land, CAGR, and "desert allure" (Tory, 2021), the absence of any real limitations on population growth has meant that the water saved through conservation efforts and a reduction in agricultural use has been overshadowed by a net increase in demand in some AMAs as more people move to Arizona (Hirt et al., 2017). The probable future of increasingly reduced CAP allotments virtually assures a return to greater reliance on central Arizona's finite aquifers, undoing much of the progress made under the GMA to reduce groundwater mining. Thus, unless new sources arrive to slake the thirst of a growing population, Arizona will ultimately have to choose between a slow self-destruction of draining its rivers and aquifers, or a transition into a new era of limited growth, hefty taxes, strict regulations, and a greater focus on efficiency and conservation (Hirt et al., 2008).

Potential Pathways to Promote Sustainable Water Supplies

In 2014, the ADWR released a report noting that if Arizona is to continue its economic development it will likely require the importation of out-of-state water, an expensive and energy-intensive undertaking that takes years to bring about results. Additional water importation would require immense fundraising efforts, primarily through higher taxes, and political bargaining between regions, processes that are historically slow-moving. Imported water would necessarily cost more than local water, theoretically incentivizing conservative use; a recent estimate of one penny per gallon (Gysel, 2021) is double what the average Tucsonan typically pays, and could result in up to a ten-fold increase for some Phoenixians (City of Phoenix, 2022; City of Tucson, 2022). However, the ADWR report concedes that since water scarcity is not a phenomenon unique to Arizona, it is highly unlikely further importations of water from rivers afar will be possible (Arizona Department of Water Resources [ADWR], 2014).

It would appear that despite the state's past reliance on and preference for an augmented water supply over a reduced demand, stakeholder perspectives have shifted and there is a growing belief that Arizona must learn to better manage the supplies it has and work towards reducing its use (White et al., 2015). Having nurtured continuous growth through periods of intense drought, Arizonans are quite familiar with the potential for water savings offered through a widespread adoption of conservation and efficiency measures. When asked, stakeholders generally felt these to be the most effective and achievable means for addressing water scarcity (White et al., 2015), often pointing to the successes of Phoenix and Tucson in reducing their GPCD and reclaiming nearly all effluent water for beneficial use (Hirt et al., 2017).

The enormous agricultural presence in Arizona provides some flexibility with future water allocations as established water markets have allowed these and other large-scale users to sell or lease surface water rights and bank or trade groundwater credits locally (Schwabe et al., 2020; York et al., 2020). However, as even the ADWR (2014) report admits, the bureaucratic and legal processes and protections surrounding any form of water transfer in Arizona makes it "...clear this is not the mechanism for dealing with more comprehensive enhancement needs around the state" (pg. 58). As farmers experience the brunt of reduced CAP deliveries and higher water costs, they weigh the options of transitioning to less water-intensive crops, improving infrastructure efficiency, "waiting it out" until conditions improve (all of which can involve high upfront costs and/or a loss of profitability), or selling their land to developers (York et al., 2020).

In light of Arizona's few realistic options for achieving a sustainable water inventory, it seems the most important and impactful step would be to take measures inhibiting further growth. An intuitive first move would be addressing the loopholes around GMA policies protecting groundwater from excessive exploitation within AMAs, such as CAGR and low-flow well exemptions. Since a future ability to adequately recharge aquifer inventories is questionable as CAP deliveries are expected to shrink, AMAs cannot permit additional development that is directly reliant on groundwater if there is ever to be a hope of achieving safe yield. Similarly, although the vast majority of Arizonans live within the confines of an AMA, a serious step towards better water management statewide would be to incorporate the rest of the state into additional AMAs, producing relatively uniform policies statewide and mitigating counterproductive loopholes and practices.

As a means of pursuing the conservation goals deemed necessary by water professionals, Arizona should increase taxes across multiple sectors such that water is priced high enough to reinforce the notion that, especially in a desert, it is a limited resource not to be used with abandon. The city of Tucson utilizes block rates where price per unit increases noticeably as volume used transitions from one pricing range to the next (City of Tucson, 2022). Phoenix, on the other hand, uses a system of raising unit prices during dry months, but even the “expensive” rates have the average user typically paying no more than half a penny per gallon (City of Phoenix, 2022). Of the two, Tucson’s progressive block rates appear to better reflect the cost of its water, though still falling far short of being truly representative. With this in mind, a potential step towards sustainable water in Arizona would be to simultaneously increase taxes on water while enacting statewide block pricing. Higher taxes help to encourage conservative behavior across the board, while the progressive block pricing will provide further incentives to minimize water use and stay within the less-expensive range of consumption.

Though past conservation efforts around Arizona resulted in laudable improvements in the water efficiency of some areas, the state has continued to operate on a water deficit such that it now appears necessary to adopt and firmly enforce strict regulatory practices, the latter of which has often been thwarted by a deference to the status quo of economic growth (Hirt et al., 2017). In addition to legitimately upholding the 100-years assured water supply mandate of the GMA, among other things, a sustainable water profile in Arizona is likely to require quotas and increased fees for municipal uses, including residential. Since the growing municipal sector makes

Arizona's water demand evermore inelastic, it will be essential to address wasteful uses of water in the sector considered "high-value" to maximize conservation. As it stands, over fifty percent of the state's municipal water is used outdoors (Hirt et al., 2017), providing an ample opportunity to establish a conservative quota that adequately meets residential needs but doesn't allow for the indulgence of wasteful temptations without an accompanying fee. Since the water required for life's basic necessities does not vary greatly year-round, it could be relatively easy to determine equitable and adequate quotas that do not accommodate "indulgent" uses and targets those consumers whose usage could jump upwards of 50% between seasons as they filled pools or watered lawns (Glennon, 2005).

Hands-down the largest consumer of water, improved efficiency and conservation in the agricultural sector could be a major stopgap in Arizona's looming water crisis. It will be necessary to reexamine the Best Management Practices (BMP) program and reinstate water duty limits for the farms who had them relieved (York et al., 2020). Since many of the most popular crops in Arizona, like cotton and alfalfa, are extremely water-intensive, subsidies could be established to promote a widespread transition to crops requiring lower water inputs, assist in the installation of efficient irrigation infrastructure, or even to switch to a different form of land-use entirely, such as solar farming. Additionally, Arizona could establish a program, funded by tax revenue from higher water prices, where the state government, instead of private developers, purchases agricultural lands listed for sale and ensures no development occurs which would further stress limited water supplies.

Of course, any significant increases in taxes or regulation will almost assuredly be met with consternation and appeals for leniency. In order to combat this inevitability, the government would have to invest in a considerable education and implementation campaign capable of reaching every Arizonan and educating them on the necessity of strict conservation measures. Individual conservation practices being a classic combination of the common property and principal-agent problems, an effective campaign would be sure to target citizens' core values and express the very real threat to Arizona's high quality of living presented by a failure to meet conservation goals. It is essential individuals understand that their seemingly negligible overuse of water, when taken en masse, has the potential incur great collective harm for the future.

Like moths to a light, countless people find themselves drawn to Arizona for any number of reasons, be it the history, politics, industry, land prices, natural beauty, or golf. Having seen so many go before them, they are assured of an oasis in the desert that defies the laws of nature and can exist as-is, or grow, indefinitely. From their myopic perspective, the only real downside of living in the desert is the heat, while a sustainable future is all but certain since all needs are currently met. Thanks to enormous feats of governmental action with the building of numerous dams and the CAP securing its now-tenuous water supply, Arizona has remained one of the nation's fastest-growing states for decades. However, the water shortages promised in Arizona's future of climate change under the current shortsighted policies and regulatory loopholes have highlighted the devastating potential for failure a government holds when trying to assure equity and efficiency in resource allocation. In lieu of a virtual halt to all population growth, a sustainable Arizona will require a statewide, all-sectors

adoption of strict conservation and efficiency practices through a creative mix of education, assistance, regulation, and market incentives. Unfortunately, though, in a state where growth has long been the priority, it is unlikely that the necessary changes will occur until the region's few surface waters vanish and there has been an almost universal return to Arizona's ever-shrinking stores of groundwater.

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