

Water and Power Scholarship Essay

Despite the deluge of storms that inundated California this winter, Pasadena continues to experience severe drought conditions both compounded and protracted by climate change. By increasing evaporation, global warming has reduced surface water and desiccated vegetation as well as diminished snowfall, which serves as a crucial source of freshwater. Furthermore, climate change is altering the distribution of snowfall by shifting storm tracks, creating instability for downstream water supplies. These climate change dynamics have contributed to the most acute dry spell in at least 1200 years in southern California; indeed, according to a study published in the journal *Nature Climate Change*, climate change is approximately 19% responsible for the severe drought condition of 2021 and 42% responsible for the extended drought during the past two decades.

The drastic water shortage plaguing Pasadena has necessitated commensurate measures to conserve water. Accordingly, in August 2021, Pasadena implemented a Level 2 Water Supply Shortage Plan, which restricted residential outdoor watering to one day per week. The following May, Pasadena Water and Power (PWP) instituted further emergency water conservation measures proscribing the irrigation of non-functional turf on commercial, recreational, and institutional property. In addition to imposing restrictions on irrigation, PWP has established incentive schemes that encourage residents to redress inefficiencies in their water use: through rebates for turf replacement, greywater systems, high-efficiency plumbing, and drought-friendly irrigation, PWP is reducing the cost of water conservation interventions. In order to promote the adoption of water saving techniques and educate residents, PWP provides an abundance of free resources, including in-home evaluations and installations, guides for water-smart landscaping, and water efficiency surveys. Meanwhile, the department's Water Savers Team has spearheaded

a public awareness campaign to heighten public consciousness of the drought, and PWP is developing a *Water is Climate* campaign to educate residents on the statewide drought, its connections to climate change, how to address the drought, and how to protect the watershed. Beyond facilitating water conservation among residents, PWP is seeking to enhance drought resilience by constructing new reservoirs, dams, and a treatment plant that can address the city's aging infrastructure.

Alleviating the drought demands that each individual resident—including myself—strive to limit their water consumption through water conservation efforts both indoors and outdoors. Over 50 percent of indoor water use occurs in the bathroom; accordingly, I can limit water consumption by taking short showers, turning off the faucet while soaping or shampooing, minimizing bathtub use, and recycling bathtub water for irrigation. To reduce water consumption in the kitchen, I can wash fruits and vegetables in a basin rather than with running water, scrape rather than rinse dishes before placing them in the dishwasher, run the dishwasher only when completely full, and avoid thawing frozen foods with running water. Moreover, nearly one-third of residential water use occurs outdoors, necessitating action to curtail outdoor water consumption; therefore, I can work to improve water efficiency by sweeping instead of hosing, washing the car with a bucket instead of a hose, replacing the lawn with native plants, and installing drip irrigation systems. In addition, replacing outdated household appliances such as dishwashers, washing machines, toilets, showers, and sinks with water-efficient models as well as installing a laundry-to-landscape irrigation system and promptly addressing leaks can help reduce my household's water usage.

In conjunction with individual conservation efforts, addressing the drought and preserving long-term water supply necessitates that policymakers and community leaders initiate

a two-pronged plan to both encourage residents to curb their water consumption and improve the water supply through infrastructural investments. Decades of social psychology research has demonstrated the persuasive power of conformity to social norms, and studies have applied this dynamic to encouraging water conservation efforts: by providing residents who consume above-average volumes of water with information comparing them to their neighbors, researchers have managed to alter such residents' short and long term water consumption habits. In particular, studies have found that sending residents informational sheets detailing how their water use compares to others in addition to tip sheets on how to limit water consumption and a personalized letter promoting conservation efforts reduces water consumption by approximately 5%; moreover, such a one-time intervention continues to diminish water consumption even in the long term. PWP's online portal already features this social comparison nudging for electricity usage; however, the page exhibiting water use statistics displays a graph depicting water consumption along with other statistics only for an individual household, neglecting any comparison with neighbors. By applying a similar user interface as the one for electricity use to the online water use portal, community leaders in Pasadena can easily motivate more residents to actively engage in water conservation efforts. To improve the water supply, Pasadena leaders could expand efforts to recycle wastewater and improve storm runoff capture. Wastewater recycling is "emerging as one of the main options for securing reliable water supplies" according to Professor David Sedlak of the University of California, Berkeley. Accordingly, Pasadena's Non-Potable Water Use Project will allow for 10 percent of the city's water to be recycled; expanding upon this initiative, Pasadena could construct an additional wastewater processing plant to engage in indirect potable reuse, which involves injecting recycled wastewater into existing groundwater basins. Due to Pasadena's reliance on the Raymond Basin, indirect potable

reuse presents a viable means by which to bolster the water supply. Moreover, given the erratic climate patterns augured by climate change, improving infrastructure for capturing storm runoff would help ensure adequate water supply during dry spells. During the most recent spate of storms, nearly 95% of the rainfall flowed into the Pacific Ocean, demonstrating the inadequacy of current storm runoff capture systems. According to the Pacific Institute, cities in Southern California such as Pasadena exhibit the greatest potential for storm runoff capture due to the abundance of impermeable pavement that channels water into storm drains. By collecting runoff to bolster aquifers or treating the water for potable use, Pasadena could avoid wasting the rare rain that it receives. Through these initiatives, the city can both mitigate its water consumption and expand its supply, alleviating the present drought condition and building resilience for future crises.

Despite help from the recent season's atmospheric rivers, long-term water supply problems continue to bedevil southern California: since groundwater conditions are slow to recover, according to Jay Lund of the UC Davis Center for Watershed Sciences, even if "the drought is largely over, water scarcity is enduring." Therefore, both Pasadena residents and PWP must avoid complacency and work to both conserve the limited water resources available as well as strengthen the resilience of our water supply.

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