

An Analysis of Desalination in California in Response to the Drought

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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INTRODUCTION

Human beings can survive only three days without water. Water makes up over 50% of the human body, and without it, bodily functions start to deteriorate (Sissons, 2020). Additionally, communities require water for agriculture and other major industries. Therefore, access to clean water is a necessity, but many areas worldwide do not have the availability required for their population. A majority of the areas experiencing a water shortage are impoverished and surrounded by polluted lakes and rivers which pose a health risk to those communities. Providing an economical and environmentally-friendly solution to this world water crisis has become the aim of many researchers and scientists.

In the United States, California is the state most frequently associated with an on-going drought. The solution many California water boards have turned to is desalination plants. Desalination is a process that takes in salty, polluted water and removes the impurities to produce potable water for drinking, agriculture, manufacturing, and more. These plants have been built in areas where the water availability is too low in over 120 countries worldwide (*Desalination Worldwide*, n.d.).

Desalination plants have been widely accepted and successful in providing water to areas suffering from droughts and water scarcity, however these plants have a fairly large negative impact on the environment. These plants produce a highly concentrated salt waste stream called brine which is often deposited back into the ocean or water source for the plant. The highly concentrated brine raises the salinity of the body of water and decreases the dissolved oxygen “suffocating animals on the seafloor,” (Gies, 2019). Not only does the brine waste harm marine life, but the plant in-take pipes kill millions of sea animals every year (Viswanathan, 2016). Another problem is the extremely high energy usage that desalination plants require. For

instance, the plant in Carlsbad, California has a yearly electricity usage equal to about 45,000 homes (Rosenfeld, 2011). These negative environmental impacts have raised controversy especially among environmental groups throughout the state.

In this paper, I am researching the decision to use desalination as one of the main water purification methods in California in response to the drought. My research will be conducted to better understand the controversy and different beliefs surrounding the production of water, in order to help lawmakers become more aware of the impact different social, technical, and political groups have on a government effort. One question I hope to answer through this research is whether or not there is a way for environmental and pro-desalination groups to reach a common ground on how to face the drought and what part desalination should play in that.

BACKGROUND

In California, there are many groups involved in the efforts to improve water availability. However, there are great disagreements about how this increase in water should be brought about, and there is a significant amount of controversy surrounding desalination specifically. The groups involved are California water boards and water district councils, California conservation programs and environmentalist groups, pro-desalination groups, and researchers. Each of these groups has a different opinion on desalination and its role in drought mitigation efforts.

In order to build and run a desalination plant, government officials on water boards have to approve and fund the project. The California water boards in the Bay Area, Metropolitan Water District, and West Basin are just a few examples of districts where desalination has been approved (Rosenfeld, 2011). The general consensus among the water boards in California is that the state is running out of water as the drought persists and populations increase, and desalination can be a large part of the solution to this issue.

The main opposition California water boards have faced in terms of desalination has come from conservation programs and environmentalist groups. Many plant proposals have been challenged, and even halted, by these groups, including the Marin Water Coalition, North Coast Rivers Alliance, Sierra Club, National Marine Fisheries Service, California Coastal Commission, Surfrider Foundation, and California Coast Keeper Alliance (Sward, 2009). Rather than resorting to desalination, these groups propose that “conservation, water efficiency, stormwater capture, and recycling” should be the measures taken first (Viswanathan, 2016).

Aside from the water boards, a pro-desalination group has organized called CalDesal. This statewide membership association stands for desalination in California on the principle that this technology is “local, reliable, sustainable, and secure,” (CalDesal, n.d.). They share the belief with the California water boards that desalination is a large part of the solution to the drought and the growing water scarcity in California.

On the more moderate end, the Pacific Institute and a professor of urban planning from the University of California, Irvine (UCI) claim that desalination should be part of the solution. Although, they also acknowledge that in some parts of California, conservation is enough to provide the water necessary to the community and so desalination would be an unnecessary and wasteful measure (Vasilogambros, 2022).

All of these groups relate in that they are shaping the way the drought will be handled in California. California water districts do require some amount of public approval before permitting the construction of desalination plants, so in districts where there is a large environmentalist population, it is much more difficult to convince the community that it is a necessary measure.

LITERATURE & METHODS

In order to analyze how desalination has been chosen as a main water purification method in California in response to the drought, various forms of literature can be useful. In order to understand the perspective of California water boards, water districts, and other pro-desalination groups, government program and organization websites give more information on the current desalination plants in use, the decision to approve them, and their plans for increasing water availability in the future. As for understanding the perspective of various environmentalist and conservationist programs, national and local news articles, as well organization websites, provide further detail on these groups' opinions and opposition to desalination plants. Lastly, the views of researchers at universities and institutions who have studied the drought and the various water purification methods were found through a transcribed interview and published research document. The views of each of these groups that the literature provides will help me analyze the use of desalination and the possibility for common ground on the issue.

PRO-DESALINATION

There are currently 12 active desalination plants in California, with the largest residing in Carlsbad and producing 50 million gallons of desalinated water per day (California State Water Resources Control Board, 2022). According to the California State Water Resources Control Board, there are four proposed seawater desalination facilities that are waiting to be approved in the regions of Monterey Peninsula, West Basin, Huntington Beach, and Doheny. After the 2016 Desalination Amendment in California, the approval process became more strict, and was further amended in 2019. The Desalination Amendment (2019) states that the regional water boards will analyze desalination plant proposals based on four factors: location, design, technology, and sealife mortality mitigation measures. The regional water boards will then determine the best

feasible combination of these factors that will result in the lowest sea-life mortality rate, and determine whether that rate is sufficiently low enough to approve the plant or reject it (“Desalination Amendment,” 2019).

Even though the process for approval has become increasingly more strict, the California Department of Water Resources (DWR) still views desalination as a large part of the solution to the drought. In order to further the development of current desalination technologies and reduce the harmful environmental impacts related to it, the DWR contributed \$16 million in 2021 towards desalination research (California DWR, 2021). The DWR acknowledged the impact that the energy usage, in-take pipes, and brine waste have on the environment and suggested that through their efforts and research this impact will be reduced and desalination can become even more widespread in California. The department’s plan for conducting this research includes collaboration with 180 institutions, the National Alliance for Water Innovation, and the U.S. Department of Energy. The DWR is optimistic that with the funding they have provided and the research being conducted, there will be significant improvements that will make desalination a more affordable and energy efficient solution to the drought in California and increase the state’s water supply (California DWR, 2021).

In support of furthering desalination in California, the pro-desalination, non-profit organization called CalDesal formed, whose members consist of “regional water utilities, special district water providers, cities and counties, private water companies, desalination technology firms, water industry advocates, consultants and related agencies and organizations,” (CalDesal, n.d.). Their mission is to address the growing water deficiency in California caused by climate change, lessening water supply, and population growth by supporting state “policies and funding that promote desalination,” (CalDesal, n.d.). As mentioned previously, their support of

desalination is on the premise that it is a “local, reliable, sustainable, and secure” way to provide water to California (CalDesal, n.d.).

ENVIRONMENTAL GROUPS

Despite water board efforts to decrease the negative environmental impact of desalination plants, they still face a significant amount of opposition from environmentalist groups. In a state where clean energy initiatives and sustainability movements are prominent, the substantial amount of energy usage and marine life endangerment due to desalination does not align with many of California’s professed values. Some of the green initiatives California has put in place to reduce their carbon footprint include “energy efficient state building design and construction, renewable energy generation at state facility sites, environmentally preferable state purchasing, and sustainable state-owned vehicles,” (*Green CA Application*, 2022). With all of these initiatives in place and a commitment to helping the environment and reducing global warming, many environmentalist groups have pushed back against the rise of desalination throughout the state.

One of the most controversial districts when it comes to desalination is Marin County. A proposal for a desalination plant on San Francisco Bay was approved for the county, but was overturned by the North Coast Rivers Alliance (NCRA). The NCRA’s main concern was the energy usage and harm to marine life (Sward, 2009). The NCRA board president, Frank Egger, suggested that Northern California could survive without desalination if water resources were properly managed. Egger maintained that the bay species were in decline, especially herring, and that if a desalination plant was built, these species would be further harmed (Sward, 2009).

Another controversial district is Huntington Beach. The proposal for a desalination plant in this region has been opposed by both the Surfrider Foundation and the Sierra Club. The

Surfrider Foundation is a non-profit organization committed to protecting oceans and beaches. Their opposition to the Huntington Beach desalination plant stems from their belief that the plant proposal does not have sufficient information for the board to make their decision based on the 2019 California Desalination Amendment guidelines. Their main concern is with the open ocean intake pipes and the large size of the plant because based on the amendment, if a plant is unable to use subsurface intake pipes, the plant size has to be small enough to reduce the quantity of marine life at risk (Prom, 2020).

From a different perspective, but just as opposed to the Huntington Beach desalination plant, the Sierra Club Angeles Chapter makes the case that the plant is unnecessary and will disadvantage low-income households in North Orange County (Leon-Grossmann, 2022). The Sierra Club Angeles, like many other environmentalist groups, suggests that rather than investing in desalination, investments should be made into sustainable solutions such as “stormwater and rainwater capture, water recycling efficiency, industrial reuse, and recharging groundwater, aquifers, and greywater systems,” (Leon-Grossmann, 2022). Aside from environmental impacts, the Sierra Club Angeles discussed a study conducted by the University of California Los Angeles Luskin which found that the Huntington Beach desalination plant would only increase the price of water in Orange County, thereby hurting low-income households in the district that are already struggling to afford the current high water rates (Leon-Grossmann, 2022). The group makes the case that desalination plants are backed by Wall Street investors and lobbyists who want to commodify water at the expense of the public, and should therefore be avoided in favor of local solutions like conservation (Leon-Grossmann, 2022).

The main similarity between all of these groups aside from their opposition to desalination, is their belief that desalination should be the last resort, not the first. Whether they

believe that allocation of water resources could be improved or methods of water conservation need further implementation, none of these groups consider desalination to be part of the solution.

WATER RESOURCE RESEARCHERS

From a more technical perspective, various researchers have studied the water availability trends in California and have their own opinions on the matter of desalination. Primarily, they believe that there are certain benefits to including desalination as part of the solution to the decreasing water availability in California, especially since it is reliable and consistent even during a drought. However, they also see the negative effects such as the environmental impact and high price of the actual water produced. Similarly to environmentalists, they urge the use of conservation where possible, but do believe that in certain instances desalination is a necessary part of the solution.

In a transcribed interview conducted by the University of California, Irvine (UCI) with David Feldman, a professor of urban planning and public policy, he addresses the severity of the drought and how many of their main water sources are diminishing (Orlowski, 2021). When asked about desalination as a potential answer to California's water crisis, he suggests that it should definitely be considered as part of the solution. His reasoning is that in many parts of California, there are few other options available that could provide the amount of water necessary for the population. He does reason though that the public's opinion should be taken into consideration before desalination plants are built within their cities, especially since they will bear the brunt of the cost. Ultimately, Professor Feldman argues that Californians need to "stop taking water for granted...while it can be a renewable resource, it can also be an exhaustible resource," (Orlowski, 2021).

Similarly, the Pacific Institute shares the opinion that desalination is a necessary part of drought management in California, however they also believe the technology should be well-regulated. In a document called “Desalination, with a Grain of Salt – A California Perspective,” the Pacific Institute lays out the advantages and disadvantages of desalination as well as their recommendations for regulations regarding the technology. Many policy makers have referred to this document when writing desalination legislation as it provides a comprehensive overview of desalination and ways to regulate it fairly. Specifically, the document gives an in-depth analysis of the economics, reliability, water quality, environmental effects, and location requirements regarding desalination in order to fairly assess the technology and improve its utilization in drought-affected areas (Cooley et al., 2006). Their research and conclusions specify that “desalination should not be hindered by inappropriate regulation nor accelerated by regulatory exemptions,” (Cooley et al., 2006). This statement clearly displays their objective view where they neither believe that water boards should approve desalination plant proposals without proper regulations, nor deny desalination plant proposals based on unfair standards.

ANALYSIS

The root of the problem surrounding desalination in California is authoritative knowledge and disagreement on the severity of the water crisis. Government officials on the California water boards feel that they have the authoritative knowledge to determine whether or not a desalination plant should be built in various districts, as the agencies in charge of finding a solution to the drought. They call attention to the fact that it is their responsibility to provide water to the community, and that if they determine that desalination is the best course of action, then they have the authority to make it happen. The environmentalist groups in California, on the other hand, believe that they have the authoritative knowledge to decide that desalination has

more negative impacts than benefits and should not be part of the solution. They call attention to the efforts California has been making to fight climate change, and that they have been leading, and use that as their way to suggest that they should have the final say when it comes to technology that affects the planet.

Ultimately, the environmentalists prefer conservation to desalination. They believe that by introducing simple water-saving technologies such as low-flow toilets and shower heads, as well as increasing the efficiency of dishwashers and washing machines, would be enough to increase the water available and decrease the effects of the drought (Rosenfeld, 2011). The district officials, however, claim that they are seeing the long term and know that eventually conservation will not be enough, but at that point it might be too late if they do not start building these desalination plants to fill the gap.

Based on the laws and regulations in the 2019 Desalination Amendment to decrease the environmental impact of desalination, I believe that the environmentalist groups have unrealistic expectations especially regarding the severity of the drought. I agree that eventually conservation measures will not be enough to fill the gap between the water available and the demand, and so it is necessary to support the growth of desalination but also the development of the technology to continually decrease its negative environmental impacts. If environmentalist groups worked together with the water boards and desalination technology developers to find areas of improvement and ways to mitigate the harm these plants cause, then I see a much better future for the water availability in California.

Additionally, I believe that there is definitely some value to what conservationists and environmentalists are pushing for, especially in regards to decreasing water waste by finding ways to recycle and conserve water. I think that this should certainly be part of the drought

mitigation efforts because it will set them up better for the future if they have ways to conserve the water they produce. It will also make it more clear which districts in California are really in need of desalination and which ones are wasting unnecessary amounts of water that could be solved through increased conservation measures.

CONCLUSION

In conclusion, I ultimately believe that California needs to use a variety of solutions to face the drought. Conservation measures supported by environmentalists should be increased to have a more accurate idea of where the greatest need for water is in the state, and desalination should not be used as a way to commodify water. Desalination plants do have their place in the solution, as they are the most consistent and reliable way to provide potable water to Californians as researchers have pointed out, but there has to be a real need for them in the districts where building one has been proposed. That being said, I feel that with the laws and regulations in place, policy makers have done a very good job creating safeguards against unnecessary or insufficiently designed desalination plants, and with the research and development being currently performed, I believe that desalination will become a very good and reasonable option for areas experiencing a drought now and in the future.

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