

Disproportionate Impacts of and Community Responses to Climate-Induced Drought in Greater

São Paulo

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Executive Summary

The environmental phenomenon that will most impact Greater São Paulo moving into the future will be drought. As a result of rising global temperatures and less consistent rainfall patterns, the city is likely to experience increased water scarcity in the coming decades and will have to find ways to make do with less abundant water resources.

From 2012-2015 the city experienced the worst drought in its modern history, coming close to being completely unable to provide water to its residents. Not only did the drought lead to rationing and dry taps, but since São Paulo is largely reliant on hydropower, the emptying of the surrounding reservoirs decimated the city's power generation as well. Rolling brownouts caused disruptions to transportation and internet access throughout the city. Plus, water shortages interrupted both agricultural and industrial production, causing significant harm to the city's economy as well.

As may be expected, São Paulo's disadvantaged communities disproportionately experienced the effects of the drought. In poor neighborhoods, many of them informally constructed, water scarcity was more pronounced: taps ran dry more often and it was more difficult to safely hold water over time. For example, water held in large, open tanks led to the proliferation of mosquito-borne diseases, such as dengue fever.

Since 2015, Sabesp, Greater São Paulo's primary water and sewer provider, has implemented several projects aimed at improving drought resilience, most of which involve expanding the metro area's reservoir system to watersheds further away from the city. However, this in itself may prove to be insufficient.

Luckily, there have been other initiatives, especially at the grassroots level, aimed at improving the city's drought resilience. The most interesting of these has been the "Cisterna Já"

movement, which has supported the proliferation of home-installed rainwater harvesting systems. The movement claims that these devices can reduce residential water use by as much as 50% when used for non-potable applications, such as watering plants and flushing the toilet. Though the movement is decentralized and has no formal organizational structure, it has remained active from last decade's drought up to today. Actors within the movement have posted detailed instructions online explaining how to construct rainwater collection cisterns at home and hold workshops throughout the city through which they teach others to build these systems.

Large scale efforts that would improve São Paulo's drought resilience include cleaning up the Rio Tietê, reducing pipe leakage, and demand-side reform to incentivize more efficient water use. It would be the responsibility of Sabesp to implement such changes. Money spent on improving the city's water security could potentially be more efficiently spent by external entities through investment in grassroots organizations. This includes investing in Cisterna Já, which would allow it to scale up its operations, as well as in reforestation initiatives. Reforestation in key watersheds would decrease the amount of sediment that runs off into rivers and reservoirs. Support for local forest restoration through initiatives such as Ricardo Cardim's "Pocket Forest" initiative would help to decrease the pollution of the Rio Tietê and potentially increase Greater São Paulo's available water supply in the long run.

Introduction

Looking toward the future, it appears that drought will be the climate phenomenon that will generate the greatest pressures on Greater São Paulo. Though the city suffered more from landslides and flooding than drought for most of its history, rising global temperatures and changing rainfall patterns will exacerbate water scarcity. This report first outlines how climate-induced drought in Greater São Paulo can be expected to place additional pressures on marginalized communities in the city by recounting the city's experience with drought in the past and summarizing the climate change's projected effect on water availability in the region. It then discusses the community initiatives that have emerged to improve the city's drought resilience and how money can be spent in the future to further this end. Attached at the end of this report is a role-play simulation that we performed in class to demonstrate the pressures on public-private utilities providers, such as São Paulo's Sabesp, in times of drought.

History of Drought in São Paulo

The São Paulo drought of 2014 was a severe water shortage that occurred in the largest city of Brazil, São Paulo, and its surrounding metropolitan area. The drought began in 2014 and continued until early 2016, "The Zona Norte is supplied by the Cantareira system of interconnecting reservoirs which, on the verge of collapse, is still providing water for six million people. It supplied nine million people up to mid-2014" (Osava, 2015) . It was the worst drought in the region's history, with rainfall levels dropping to less than half the yearly average. The drought was caused by a combination of factors, including a lack of rainfall due to changing weather patterns, deforestation, and the overuse of water resources. The city's water supply largely relied on the Cantareira reservoir system, which reached critically low levels during the

drought. Some areas of the city faced strict water rationing measures, with residents having access to water only for certain hours or days. The drought had a significant impact on the region's economy and infrastructure, causing widespread crop failures and affecting industrial production. It also raised concerns about the sustainability of the region's water resources and the need for long-term conservation efforts. Efforts to address the water shortage included the construction of new water treatment plants, the implementation of water conservation measures, and the creation of incentives for residents and businesses to reduce their water usage. The drought ultimately came to an end with the return of rainfall, but its effects on the region continue to be felt. Sabesp is the water and sewage company of the State of São Paulo, Brazil. The company played a critical role in managing the water crisis that occurred in the region between 2014 and 2016, which was the “worst drought in 80 years” (Kozacek, 2015).

During the crisis, Sabesp implemented a series of measures to address the water scarcity, including:

1. **Water rationing:** Sabesp introduced a system of water rationing, in which the rationing system was enforced through steep fines for those who exceeded their allotted water usage. This measure helped to raise awareness among consumers about the importance of water conservation and the need to reduce their water consumption.
2. **Water supply from alternative sources:** Sabesp started to use alternative sources of water, this included groundwater and surface water, which were treated and distributed to consumers.
3. **Reduction in water losses:** Sabesp invested in infrastructure to reduce water losses, including the replacement of old pipes and the installation of smart meters to detect leaks.

4. Public awareness campaigns: Sabesp launched a series of public awareness campaigns including social media, television, and radio. to encourage water conservation and educate the public about the severity of the crisis.

These measures helped to mitigate the impacts of the drought and ensure that the population had access to water throughout the crisis. However, the crisis also exposed vulnerabilities in the region's water management system, including the overreliance on a few large reservoirs, inadequate infrastructure, and poor water conservation practices.

After the crisis, Sabesp continued to invest in infrastructure improvements and water conservation measures to ensure the long-term sustainability of the water supply. These efforts have included the construction of new reservoirs, the expansion of water treatment plants, and the promotion of water conservation and reuse initiatives.

Climate Change and Drought in São Paulo

Moving into the future, it appears that climate change will only increase the São Paulo metropolitan area's risk of drought. As global temperatures increase and rainfall patterns become more erratic, it is likely that São Paulo will be significantly more water-insecure than it has historically been. Climate projections suggest that the Jaguari Basin, which is the main source of water for the São Paulo metro, will see significant changes in flow rate in the coming decades. One estimate projects that the hydrological dry season will be extended by two months and that total streamflow will decrease by 35% between September and November, increasing the risk of drought conditions (Gesualdo et al, 2019). Moreover, climate change is expected to reduce the water level of the reservoirs in the city's Cantareira system. A similar climate model estimates that the Itupararanga reservoir's average water level will likely decrease by roughly 35% by

2030 (Barbosa et al, 2021). Not only would this dropoff in the reservoir’s water supply exacerbate water insecurity, but it would also impede the reservoir’s electricity generation, both of which would directly affect water and electricity availability in greater São Paulo. As such, São Paulo will have to adapt to greater fluctuations in water availability as the impacts of climate change become more pronounced.

Disproportionate Impacts on Marginalized Communities

While the drought affected the entirety of Greater Sao Paulo, marginalized communities, especially residents of the favelas, were hit extremely hard. On top of the fact that these communities were actively disregarded by the city and state governments, they also had to deal with water rationing throughout the drought period. The situation was further worsened in these communities due to their topography and notoriously poor infrastructure, as these communities were located in the outskirts of cities. These factors caused disproportionate rationing, as well as the spread of disease. “Taps ran dry—especially in poor, racialized neighborhoods—while rates of dengue and dysentery spiked” (Cohen, 2022).



This PVC pipe was responsible for delivering water to the 2500 residents of the Favela de Mohino

For example, the water supply for the Favela de Moinho, which houses around 2500 people, came from a 300 meter PVC pipe that is a few centimeters wide and runs beneath the ground. This problem was further aggravated by the fact that the favela residents don't have water tanks, making it even more difficult to cope when the rations began. "Each household inside the favela makes its own connection to the community's single, slim water pipe, drilling a hole, attaching an elbow joint and running another pipe or hose into their homes. Leaks are common. At the far end of the favela, where the homes are most precarious and where the water simply doesn't reach, families come to collect water from a tap in the centre of the settlement" (Rigby, 2015). The residents of this favela have similar connections to the city's sewage systems using a pipe that runs beneath the favela. "Feeding into five or so holes drilled into the wide concrete tube, families link their wastewater pipes together like a web, sometimes with unpleasant results" (Rigby, 2015).



The flooding as a result of the makeshift plumbing/sewage system

Despite many attempts to get the city to take action, such as protests, the city's officials refuse to act, even after the mayor at the time and SABESP officials visited the favela and promised to bring about change. Maria de Fátima Riberio, a 51 year old bar owner in Parque Alexandra, another outskirt community, says "This is Brazil, where human beings are treated

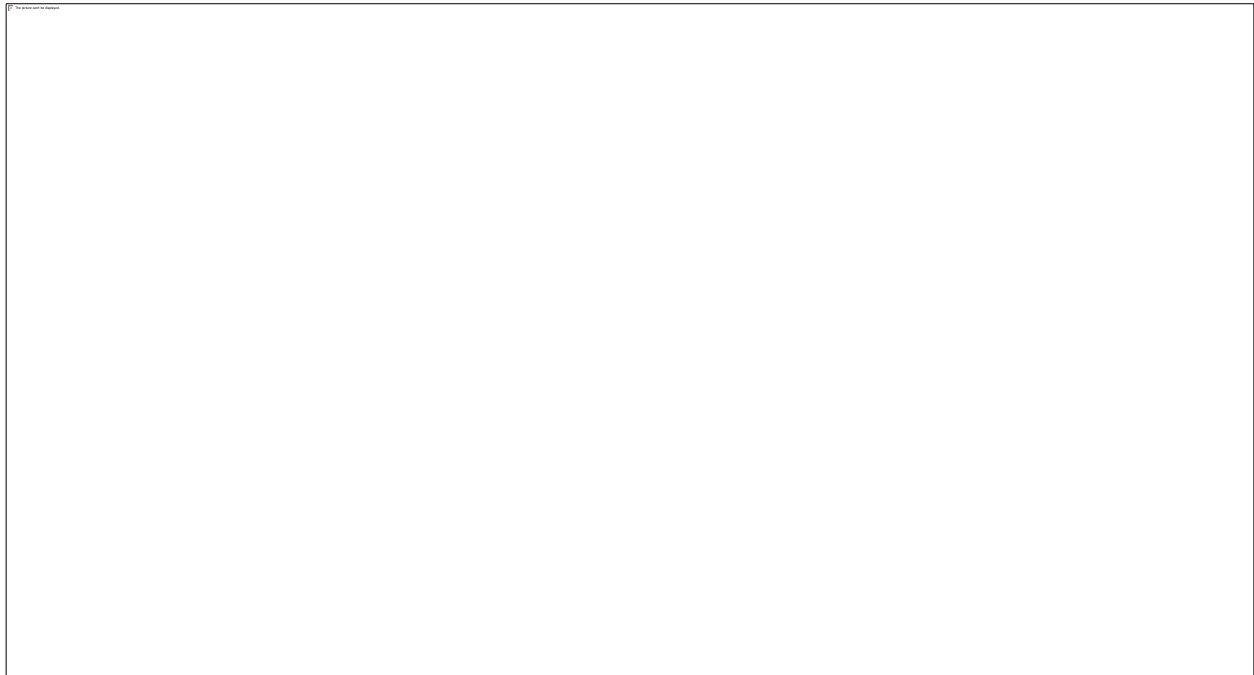
worse than dogs by our own politicians” (Rigby, 2015). Throughout the drought period, the neglect and disregard the government had shown the favelas was laid bare for all to see, as the failing infrastructure crippled the resident’s ability to adequately respond to the actively worsening situation despite the government’s attempt to minimize the drought’s effects.

Community Responses to Drought

São Paulo’s mid-2010s drought not only led to administrative and technical changes around issues of water security, but also sparked innovation and new means of political engagement. While our group’s capacity to gather information on the small-scale solutions implemented in specific communities was limited by not being on the ground in São Paulo, we were able to learn both about the technological and organizational developments that have come out of São Paulo in response to drought. The most interesting initiative we came across is the movement to install rainwater harvesting systems across the city in order to reduce municipal water use and improve climate resilience. Additionally, it is notable that a broad civil society movement emerged amidst the mid-2010s drought in order to address the crisis, though it appears that this coalition has not maintained its prominence in the years since the drought.

The initiative that we encountered that has the most immediate potential for improving drought resilience is “Cisterna Já,” which seeks to construct rainwater collection systems at home to reduce municipal water use. Cisterna Já is a movement without a formal organizational structure, though there is ample information online about some of its most-involved members (Wikiversidade, 2023). One of the most influential individuals in this movement is Edison Urbano. Urbano has created the website www.sempresustentavel.com.br (n.d.), where he has uploaded tutorials for how to go about gathering the materials for and then constructing

rainwater collection devices or “minicisternas.” Moreover, it appears that he frequently holds workshops where he teaches others how to build these systems. Though this rainwater is not inherently potable, it can either be treated using water purification tablets or simply used for non-consumption applications, such as flushing toilets and watering plants. The movement claims that even using rainwater for just these applications can reduce municipal water use by as much as 50% (Ecoeficientes, 2014).



“Minicisterna” design for home use (www.sempresustenavel.com.br, n.d.)

Cisterna Já is not the only rainwater harvesting initiative we came across, but it may be the only large one that is still in operation. A similar project, “Refresca São Paulo” was a finalist in the 2015 Best Climate Practices competition held by the International Center for Climate Governance (Universidade de São Paulo: Notícias, 2015). However, there is scant information about the project beyond 2015 and there is reason to believe that it is no longer operating. The socioeconomic background of the individuals installing rainwater collection systems through Cisterna Já is unclear. That said, even if the movement has not made headway in the city’s

poorer communities, there is significant potential in expanding this initiative's operations to disadvantaged neighborhoods and slums.

Separately, one of the most interesting developments due to the 2014 drought was the proliferation of civil society efforts aimed at promoting water security in the city. The most prominent of these efforts was the creation of a coalition named Aliança pela Água, which is an outgrowth of water conservation efforts by the nationally-operating Instituto Socioambiental (Roberto Jacobi et al, 2015). Though the initiative originated from the efforts of a national NGO, Aliança pela Água came to encompass dozens of local NGOs, including water advocacy groups for disadvantaged neighborhoods and Cisterna Já (Aliança pela Água, 2023). In 2014, the alliance, composed of local advocacy groups alongside academics, journalists, and representatives from national and international environmental organizations, put forth nearly 200 short-term proposals for weathering the drought as well as over 100 long-term ones for improving the city's water security, some of which were acted upon through collaboration with municipal and state authorities (Jacobi et al, 2015). Aliança pela Água was prominent enough to receive Gates Foundation funding, but has potentially become inactive, with no Facebook updates since 2020. Plus, the organization's website now reroutes to the Instituto Água e Saneamento, which operates at the national level and does not appear to have the same degree of local involvement as Aliança pela Água (Instituto Água e Saneamento, 2023).

Potential Solutions for Improved Water Security

Investing in Cisterna Já's rainwater collection initiatives and workshops on harvesting rainwater, constructing "minicisternas", and ecological water management could be a valuable solution to improve water security in urban environments. Aside from Cisterna Já, there are some

other community responses to explore as solutions, especially ones that support green infrastructure. One response is pocket forests. An initiative developed by Ricardo Cardim, the Floresta de Bolso is a natural way to restore the Atlantic Forest (Cardim Arquitetura Paisagística, 2016). Restoring the forest would provide a nature based solution to the drought that would increase environmental services, tree cover, and biodiversity and improve water quality and increase water storage. Forest restoration has helped the local environment because the plant density has lowered temperature, increased air humidity, and retained rainwater and infiltration into soil. By engaging citizens through voluntary efforts, the Capão Redondo Forest located in the low income rural neighborhood in São Paulo, Capão Redondo, has helped to retain water in the local environment (SUGi, 2022). Although most of the projects tend to be in wealthier areas, this project could be expanded for use in low-income areas.

Moreover, the pocket forests could be used to support the cleanup of the Rios Tietê and Pinheiros. Sabesp previously launched a project in the 1990s to clean up the Rio Tietê with Arcadis. Although 200,000 households have been connected to a sewer system and now 84% of sewage is being treated, there is still much more work to be done, especially since according to the World Bank, Latin America contains some of the most polluted rivers in the world and 70% of wastewater reaches those rivers. Due to Sao Paulo's rapid urbanization without sanitation systems in place, sewage has been discharged into the Tietê and Pinheiros rivers. Some divers search for metal and other valuable objects in the rivers that can be sold, and Sabesp began a system to depollute the Tietê river and to remove sediment. Investing in a river cleanup would be very valuable to restoring a critical water source. By combining this solution with pocket forests, Sabesp would not need to spend nearly as much money removing sediment and silt. One major problem is that São Paulo is losing 20% of its treated water because of leaks in pipes. Forests can

help filter water to reduce sediment and help against the impacts of a drought, but since the forests are diminishing, the water utility brings in less filtered water, which increases treatment costs and frequent leaks. Restoring the forests would help “reduce sediment pollution by 36 percent within 30 years,” which would have a large impact on the sustainability of the water supply from Sabesp and the rivers (Ozment et. al).

Conclusion

Although São Paulo is at risk for significant impacts from drought due to the increasing climate pressures that will exhaust reservoirs, there have been community responses in both high-income and low-income areas in order to respond to the impacts. Due to the disproportionate effects on low-income communities, especially regarding rationing, sewage, and disease, we researched a variety of initiatives that may be able to help conserve water and improve water security for the future, hopefully reducing these negative impacts. Movements like Cisterna Já, Refresca São Paulo, and Aliança pela Água have the potential to help improve drought resilience. When partnered with public and private sector initiatives, such as cleaning up the major rivers and investing in other nature based solutions like pocket forests, these movements would help to change habits regarding water, as well as provide solutions for the communities in São Paulo.

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Annex - SABESP Drought Simulation

In our class meetings, each regional group devised a mock scenario to engage the rest of the class on the issues facing their region. Our group created a simulation to emulate embassy simulations by introducing a decision tree with varying consequences. Attached below is the written simulation with all possible outcomes explicated based on prior choices. We wanted to recognize the challenges that SABESP, the public-private utility company, faces, especially during a drought, in catering to the public by providing water and sanitation services and improving quality of life and the environment, while also maintaining partnerships with private companies and maintaining profits.

During the simulation, students first read the objective/background and decision 1. The students voted to “do nothing” for decision 1, instead of reducing the discount provided to large users or offering discounts for using less water. They chose to maintain the status quo due to the potentially harmful effects on the economy and production and the effects on limiting the expansion of water and sanitation networks for the community. Since the students chose option 3, we moved onto decision 2-3, which acknowledged no change in water consumption levels. As a result, the water crisis became more severe, and levels were as low as during the 2014-2015 drought. We hoped to instill a sense of urgency and panic through the history of the prior drought, and thus necessitate more drastic measures. We provided 3 options for students to choose from, including rationing water used in commercial production, rationing residential water use, or doing nothing again. Each of these options provided their own consequences on production, employment, and water usage. The students debated which option to choose, and ultimately selected to ration residential use due to the negative effects on the economy for rationing water used in commercial production. However, their debates over the residents’ discontent, as well as their own personal experiences with residential water rationing almost persuaded them to yet again, do nothing. The uncertainty surrounding drought forecasts as well as the fear of making some people discontent and challenging the status quo can reinforce the idea that doing nothing is the best option despite the potential of a severe crisis. For the final decision tree, we added an element of persuasion to show the role of politics in the public sector. There are many aspects of influence in bureaucratic decision making, and we chose to highlight three different ones depending on the prior choices in the decision tree. We acknowledge the influence of business leaders, government officials, and local grassroots and environmental organizations. If the students chose to ration water used in commercial production, then the following decision recognized issues facing the business leaders. They would approach Sabesp business leaders about the decline in profits due to rationing and would pledge money to finance sanitation expansion projects, which may entice due to the private interests of Sabesp. If the students chose to ration residential water use (as they did), then the mayor of São Paulo would approach Sabesp to remove the rationing policy due to his declining popularity. His offer would provide more funds to Sabesp’s sanitation network and river cleanup. If the students chose to do nothing, then the environmental NGOs would approach Sabesp due to the increasing desertification and decreasing water pressure. Due to their trust from the public, they would plan

to release a campaign harming Sabesp's image if they do not implement environmentally friendly water policies. Since the students chose to ration residential water use, see Decision 3-2. In this final option, the students decided not to accept the mayor's pledge because they were skeptical of the tangibility of the money supposedly provided, they wanted to continue cutting water consumption, and they trusted the potential future government to continue working with Sabesp. With the conclusion of the decision tree, we wanted to reveal the outcome for the students' decision, as well as show the other possible outcomes. For the outcomes we laid out the results of responsible and irresponsible actions, which coincide with the rejection of the offer and the acceptance of it, respectively, except for the environmental group offer. Since the students chose to reject the mayor's offer, the ration continued, the mayor lost the election, and the city was able to persevere through the drought. However, the new mayor then enacted drought-endurance policies that harmed Sabesp's profits and expansion initiatives. The other outcomes corresponded to the rest of the brackets in the decision tree, and either conveyed the ability of the city to curb the effects of the drought or the destruction of stability and deaths that ensued.

Objective/Background

The year is 2028 and there has been low rainfall in São Paulo. This has the potential to turn into a drought, because the water has been lower in our reservoirs. You are representing Sabesp, the local utility provider, which is an organization that is 51% public (49% private). Sabesp's mission is "to provide water and sanitation services, contributing to improving the quality of life and the environment." As such, your mission is to provide clean water to your clientele and greater São Paulo, while also maintaining your profits, and acting in the best interest of the overall community. The varying topics you may want to consider include social responsibility, corporate governance, strategy and vision of the future, environmental sanitation, and research development and innovation.

Decision 1

Due to the low rainfall, you must make a decision on how to conserve water. You are presented with the following choices:

1. Reduce the discount provided to large users (companies) of water by half

Many companies in São Paulo, especially in the agricultural and manufacturing sectors, are large users of water. Sabesp offers these companies discounts on water in order to increase their production and private sector interests. This action is expected to decrease water use in greater São Paulo by 2-5%. Reducing this discount will also likely lead to a decrease in production, and therefore profit for businesses. With these companies now facing higher costs and lower profits, they are likely to cut down on their local corporate social responsibility initiatives. Plus, this move could sour Sabesp's relationship with local industry moving forward.

2. Offer discounts for using less water

One of the ways by which São Paulo has encouraged lower water consumption in the past is by providing households with discounts if their monthly use does not exceed a certain threshold. This action is also estimated to reduce overall water consumption by 2-5%. While everyday users benefit from these lower prices, Sabesp's profits are reduced, hampering the company's ability to expand its water and sanitation network in the immediate future.

3. Do nothing

By not reducing the discount provided to companies or providing a discount for using less water, you are continuing water consumption at the same levels. Since companies are still provided a hefty discount, they are able to continue their charitable activities in the local community, and their relations with Sabesp have been maintained. Sabesp's profits are also maintained and its sanitation expansion plans in low income neighborhoods are maintained.

Decision 2-1

Reducing the discount provided to large users of water has helped decrease water consumption, but has reduced some production. While there was some unemployment at first, the economy has mostly been able to bounce back. Sabesp has been able to maintain their profits, and therefore their public works initiatives. However, six months later, the water situation has become dire. Water levels in surrounding reservoirs have reached levels as low as during the 2014-2015 drought. Given the increasing volatility of the situation, more drastic measures are now being proposed.

1. Ration water used in commercial production

A plan has been developed that would institute water shutoffs for commercial use once per week. Companies would not be able to access water for 24 hours once every week, which will affect agricultural and manufacturing production to the extent that it would create a loss of jobs, as well as food insecurity. This loss of jobs and food insecurity would disproportionately affect lower income communities. This will reduce water consumption by 10-15%.

2. Ration residential water use

A plan has been developed that would institute water shutoffs for residential use once per week. Homes would not be able to access water for 24 hours once every week, with different neighborhoods having their water shut off each day. Under this plan, the supply of water to commercial and public sector uses would be unaffected. This plan would be unpopular among the general population, and will disproportionately affect lower income families. Due to its effects on lower income communities, there will be minor health impacts. This will reduce water consumption by 10-15%.

3. Do nothing

Under this scenario, no rationing is instituted. The economy continues functioning as normal, and people have 24/7 access to water from their home taps. However, continued extreme water use could prove to be deeply detrimental to the city's ability to continue to provide water at all if the drought continues.

Decision 2-2

Offering discounts for using less water has reduced water consumption, and has provided families with less costly water bills. Sabesp has suffered some loss in profits, which has hampered their ability to initiate a cleanup of the local river and expand their water and sanitation network. Six months later, the water situation has become dire. Water levels in surrounding reservoirs have reached levels as low as during the 2014-2015 drought. Given the increasing volatility of the situation, more drastic measures are now being proposed.

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Decision 2-3

By doing nothing, water consumption has continued at the same levels. Six months later, the water situation has become dire. Water levels in surrounding reservoirs have reached levels as low as during the 2014-2015 drought. Given the increasing volatility of the situation, more drastic measures are now being proposed.

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Decision 3-1

It has been another month, there has been no additional rainfall and the city continues to endure the effects of the drought. The rationing has been effective in reducing the consumption of water by 10-15%; however, not everyone has been happy with the decision due to the reduction in production and loss of jobs.

Business leaders are outraged by the economic effects of rationing, which have led to layoffs and a steep decline in profits. A group of prominent business leaders has approached Sabesp about removing the rationing on commercial production. In order to sweeten the deal, they have pledged a large sum of money to the company in order to finance projects that would expand access to sanitation services and clean up the Rio Tiete.

1. Accept their offer

Accepting the offer may be risky if there is no further rainfall to support high water consumption. The economy may or may not bounce back, but it would likely restore some production losses. The money from the offer would be spent on social services, such as cleaning up the river and expanding access to sanitation services, which would also increase the availability of water for consumption and reduce water pollution in the long run.

2. Decline their offer

If the offer is declined, rationing will continue as it has for the past month, continuing to negatively impact production while significantly reducing water consumption. Business leaders may be especially frustrated by this decision, but it would ensure that the water crisis does not become a full blown water emergency.

Decision 3-2

It has been another month, there has been no additional rainfall and the city continues to endure the effects of the drought. The rationing has been effective in reducing the consumption of water by 10-15%; however, not everyone has been happy with the decision due to the inconveniences and the effects on the people and communities, including minor health issues.

Upper and middle class Paulistas are especially upset with the new rationing policy, and the mayor of São Paulo has seen a nosedive in popularity. In order to try to prevent his image from being irreparably damaged in light of upcoming elections, he has decided to approach Sabesp about a plan to revoke the rationing it has put in place. In return for doing away with residential rationing, the mayor promises to push for a greater diversion of public funds to the agency. Such funds would finance the expansion of Sabesp's sanitation network into poor neighborhoods as well as the cleanup of the Rio Tiete.

1. Accept his offer

Accepting the offer may be risky if there is no further rainfall to support high water consumption. The removal of rationing would be popular, however, and would boost a key political ally's chances of remaining in office for a second term. Moreover, the money pledged to Sabesp would be spent on social services, such as cleaning up the river and expanding access to sanitation services, which would also increase the availability of water for consumption and reduce water pollution in the long run.

2. Decline his offer

If the offer is declined, rationing will continue as it has for the past month, much to the dismay of some residents, though water use would remain significantly deflated. The mayor would likely suffer a strong blow to his popularity, along with Sabesp as an institution, which may constrain the company's ability to advance projects in the future.

Decision 3-3

It has been another month, there has been no additional rainfall and the city continues to endure the effects of the drought. While the people and commercial users are generally content with the lack of rationing and continued water consumption at the same levels, they have started to realize that this mass consumption will be unsustainable. Environmental groups have been noticing the increasing desertification of the landscape, as well as the lowered water pressure due to the minimal reservoirs of water. The city is teetering on the brink of being able to provide water at all, and the local flora and fauna have been dying from the lack of water available.

Environmental NGOs have been unable to continue their restoration of the ecosystems in the city, and they are increasingly worried about the loss of biodiversity and potential extinction of the Pau-Brasil tree, the national tree of Brazil. In order to try to prevent further destruction of the local ecosystems and losses of biodiversity, environmental NGOs have decided to apply some pressure to Sabesp to act. Sabesp has a relationship with the NGOs in order to improve public image and deflect criticism, as well as contribute to its mission to act in the overall best interests of society. The NGOs attract a greater public trust and are planning to release a campaign harming Sabesp's image if they do not enact more environmentally friendly water consumption policies.

1. Implement NGO advice

Implementing NGO advice would help to reduce water consumption, maintain biodiversity and the Pau-Brasil tree, and save Sabesp's public image, but would create a significant loss in profits. Although they have public support, their lack of funds may prevent them from the ability to advance projects in the future, such as sanitation services and the cleanup of the Rio Tiete.

2. Decline to implement NGO advice

If the offer is declined, water consumption will continue at high levels, increasing the desertification of the landscape. There may not be enough water to support this consumption, especially if there is no further rainfall. They would lose some public trust, which may impact their future abilities as a provider, but they would work to gain trust back through the advancement of social projects. Since they are maintaining their profits, they would use the additional money to expand sanitation services and clean up the river.

Decision 3-1 Outcome A

The previously imposed rationing policy is reversed, leading to an increase in water consumption. As the drought continues to progress, it becomes apparent that Sabesp no longer has the water resources available to meet the city's demand. Reservoirs begin to dry up, leaving segments of the metropolitan area without running water. Water is shipped into the city via train and truck and dispensed in public, meeting minimum survival needs, but sparking immense instability. Riots ensue, and the governor calls in the military to restore order. Several weeks later, rains return to São Paulo, but the damage has already been done. 37 people are dead from confrontations with police and hundreds more from a lack of access to clean drinking water. Though reservoir capacity has returned to a much safer level, the city struggles to adjust to its return to "normal."

Decision 3-1 Outcome B

The rationing policy remains in place. The city is able to weather the remaining weeks of drought before rains return, though at a cost. The local economy has entered a mild recession and unemployment remains higher than normal. Moreover, the local business class's opinion of Sabesp has deteriorated, which may create additional difficulties in the future. However, with the return of reservoir capacity to normal levels, economic activity is able to slowly return to normal.

Decision 3-2 Outcome A

The previously imposed rationing policy is reversed, leading to an increase in water consumption. As the drought continues to progress, it becomes apparent that Sabesp no longer has the water resources available to meet the city's demand. Reservoirs begin to dry up, leaving segments of the metropolitan area without running water. Water is shipped into the city via train and truck and dispensed in public, meeting minimum survival needs, but sparking immense instability. Riots ensue, and the governor calls in the military to restore order. Several weeks later, rains return to São Paulo, but the damage has already been done. 37 people are dead from confrontations with police and hundreds more from a lack of access to clean drinking water. Though reservoir capacity has returned to a much safer level, the city struggles to adjust to its return to "normal."

Decision 3-2 Outcome B

The rationing policy remains in place. The city is able to weather the remaining weeks of drought before rains return, though at a cost. Sabesp has become a common target of public grievance and the current mayor has become notoriously unpopular. He is defeated in the next election, with one of the key issues being water governance. Under the city's new mayor, Sabesp is directed to upgrade its drought-endurance capacity- to the detriment of its profits and initiatives to expand sanitation services and clean up local waterways.

Decision 3-3 Outcome A

Implementing NGO advice has helped to provide some stability due to public support, as well as reduce some water consumption, which means that the city is starting to curb some effects of the drought. They have been able to save the national tree. Commercial production has declined, so people have lost jobs, disproportionately affecting low income families. The water resources are dwindling and will not meet the city's demand for the future, which has critical implications for future stability.

Decision 3-3 Outcome B

Declining to implement NGO advice has allowed water consumption to continue at high levels, which has contributed to increasing desertification. The river has not been cleaned up in time, and Sabesp has lost public trust. Reservoirs are drying up, leaving segments of the metropolitan area without running water. Water is shipped into the city via train and truck and dispensed in public, meeting minimum survival needs, but sparking immense instability. Commercial production all but ceases, and companies are forced to layoff thousands of workers. Riots ensue, and the governor calls in the military to restore order. Several weeks later, rains return to São Paulo, but the damage has already been done. Hundreds are dead from confrontations with police and hundreds more from a lack of access to clean drinking water. Unemployment is through the roof, the local economy has entered a recession, and the city needs to implement an emergency plan to save its population and environment.