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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

WATER CONSERVATION, BELIEFS, AND FAIRNESS PREFERENCES IN COLLECTIVE BURDEN-SHARING

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As the likeliness of severe droughts grows, cities across South Africa will be forced into implementing restrictions on their residents to curb their consumption. To effectively apply these austerity measures an understanding of the links between household water consumption and people's beliefs is key. Further, knowing how information affects household policy and fairness views will enable effectual targeting and minimise wasteful spending of public funds. Within this, investigating the differences between different socio-economic conditions, particularly across income groups, allows for more effectual targeting of interventions. Through the investigation into respondents' beliefs on household water consumption a Water Research Commission (WRC)-funded study found that most respondents showed a large misperception about the amount of water consumed by rich and poor households during the drought in Cape Town. From the survey data, there was a lot of heterogeneity in beliefs about the likelihood of a future drought, with poor respondents, and those with primary or secondary education having lower odds of believing that a future drought was likely.

INTRODUCTION

In 2018, Cape Town faced the harsh reality of anthropogenic climate change as the metropole experienced the worst drought in four centuries, which lasted three years. During this time provincial dam levels dropped to unprecedented lows, leading to the enactment of severe demand-side management strategies to decrease the city's overall water consumption. These strategies, in combination with a multitude of different programmes and tactics, successfully reduced water consumption, and have been the key drivers in allowing the dam levels to recover. While total rainfall in Cape Town has increased somewhat over the last three years, it is well below the historical long-term average suggesting that the challenge of insufficient water supply is far from over. At the same time, South Africa is one of the most unequal countries in the world and this pervasive inequality is reflected in the realm of water service delivery and governance, which was further highlighted by the Cape Town drought. Within this context, the South African government faces the challenge of designing policies that fairly account for differential burden-sharing and distribution of rights and responsibilities, concerning water conservation efforts and payment for basic services and infrastructure.

Through partnering with the Water Research Commission (WRC) and the SA/Norway joint research programme on ocean research (SANOCEAN), the Environmental Policy Research Unit (EPRU) has investigated various aspects of water use throughout the City of Cape Town (COCT). The research was conducted across a representative sample of over 3 000 residents from COCT to help provide useful information on behavioural levers for policymakers to help mitigate future crises and to assist in shaping new policies. The work builds on previous research that investigated how water demand and payment during the Cape Town water crisis varied across households' income levels and found large variation, in consumption, between these groups, and the hypothesis that a portion of this variation could be explained by people's beliefs and social norms around conforming to consumption restrictions. By eliciting residents' beliefs about water policy and water consumption a more targeted and equitable approach may be taken that is effective at adjusting different groups' social norms to achieve common goals.

MISPERCEPTIONS ABOUT WATER CONSUMPTION DURING THE DROUGHT

Through reporting on how much water was actually used versus perceived use, both before and after the drought researchers were able to determine that there is a large misperception about the actual amount of water consumed by rich and poor households during the 2018 drought and in 2020, in Cape Town. This misperception is true even for respondents within their own income brackets, particularly in high-income households where perceived usage was much higher than actual usage (Figure 1). Figure 1 highlights how almost all respondents believed that rich households consumed significantly more than poor households during the drought. Interestingly, the misperceptions about water consumption during the drought were larger among poor and uneducated individuals.

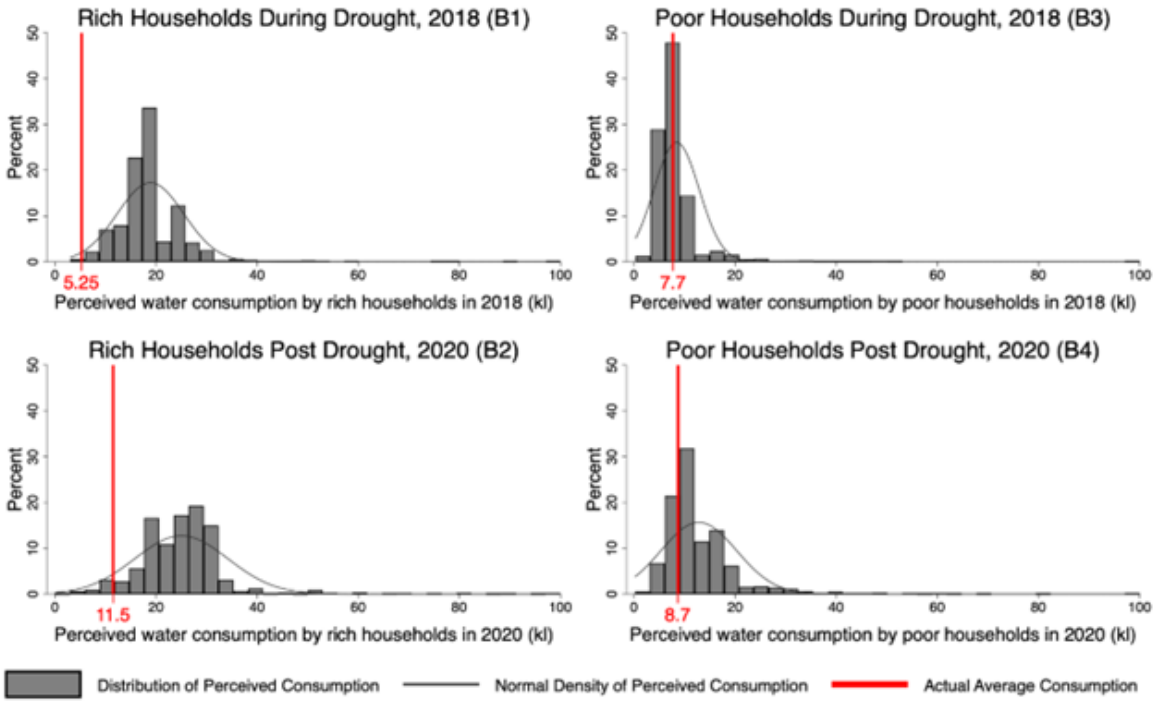


Figure 1: Perceived (grey histogram) vs actual water use (red line) of rich and poor households in 2018 and 2020

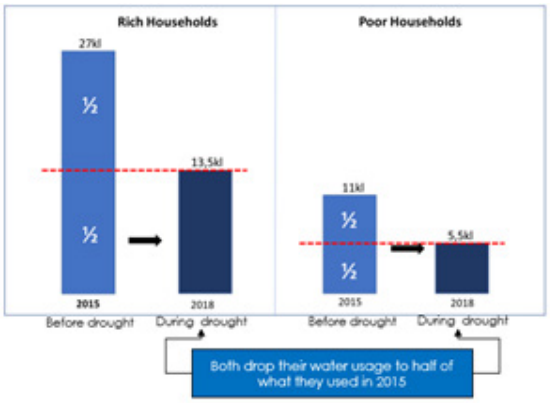
WATER CONSUMPTION AND BURDEN-SHARING

During the 2016-2018 drought across Cape Town water consumption needed to be reduced by half, which called into question: how do you distribute this reduction in water consumption across different households? This was referred to as "burden-sharing" or fairness and the preferences of both high- and low-income households would help inform policy-makers dealing with this question. The survey elicited the preferences for respondents' burden-sharing preferences in the context of the Cape Town drought. Respondents were told that during the Cape Town drought from 2016-2018 residents had to halve their water consumption. They were then provided with three rules and asked to select the rule which they believed was the fairest way to distribute this reduction in water consumption (Figure 2). The rules provided were as follows:

- **Equal consumption (Rule 1)**: All households, regardless of income levels, must reduce their water consumption to 9.5 kilolitres (kL)/month
- **Proportional reduction (Rule 2)**: All households must reduce their monthly water consumption by half
- **Equal Reduction (Rule 3):** All households must reduce their monthly water consumption by 9.5kL/month. Note that this would leave some people having to consume hardly any or no water every month.

Rule 1

Rule 2



Rule 3

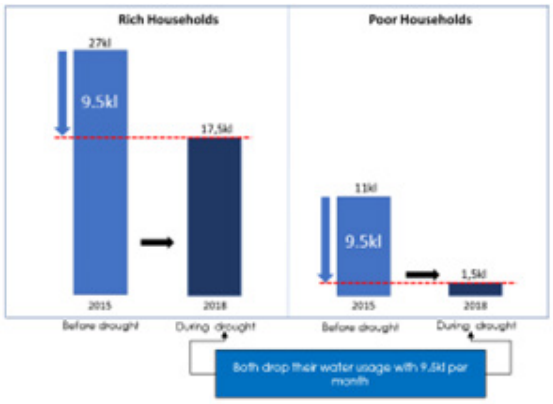


Figure 2: Three water use rules, presented to residents, to achieve the 50% reduced in total water usage during the drought in Cape Town in 2016 – 2018. Rule 1 indicates a scenario where high-income households should have reduced their water usage to the same level as the low-income households during the drought, rule 2 indicates a scenario where high-income and low-income households should have reduced their water usage in the same proportion during the drought, and rule 3 indicates a scenario where high-Income and low-Income households should have reduced their water usage by the same amount during the drought

There was also a range of opinions in the burden-sharing views of respondents. Many respondents preferred a proportional reduction in consumption (Rule 2). However, surprisingly 13% and 25% of the sample selected the equal reduction rule (Rule 3) for during the drought and for a future drought respectively (Figure 3). This places most of the burden of the reduction in water consumption on poor and low-consuming households. On average respondents that believed rich households consumed significantly more than poor households during the drought were more likely to select the equal consumption rule

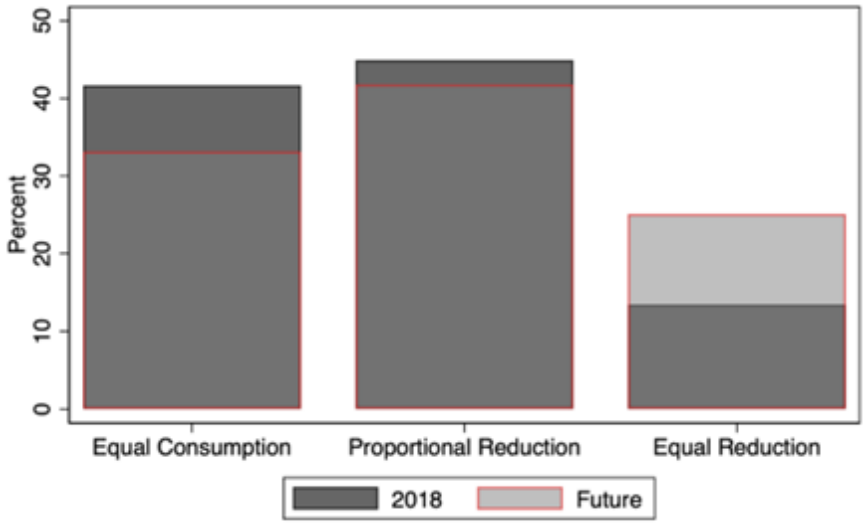


Figure 3: Distribution of fairness, or "burden-sharing", preferences of respondents for the three different rules (equal consumption – rule 1, proportional reduction – rule 2 and equal reduction – rule 3). Dark grey indicates preferences for the 2018 drought and light grey indicates preferences for future droughts.

IMPACT OF PROVIDING ACCURATE INFORMATION

The objective of the interventions was to investigate whether updating the beliefs of respondents would influence their burden-sharing and policy preferences during a future drought. Residents were provided with accurate information on high- and low-income household water use, information on the increasing likelihood of a future drought, both water use and future drought information, or no information (control group). Respondents were asked to provide their fairness preferences for the distribution of burden-sharing in the event of a future drought. They were provided with the same three rules as above. Providing different types of information can have marked effects on people's behaviour towards or away from the public good of water conservation during a drought. Many studies have connected people's behaviours with their beliefs, perceptions, and attitudes. People have been found to make decisions based on their level of self-interest and what they think is fair (Almås et al., 2010; Brick and Visser, 2015).

Behavioural treatments have small effects on burden-sharing or policy preferences. However, providing future drought information did increase the odds of choosing the equal consumption rule as compared to those in the control group. Interestingly, prompting individuals with actual consumption information increased their preference to prioritise their households over the city. While providing both consumption and drought information decreased respondents' preference to prioritise their household over Cape Town.

POLICY VIEWS AND PREFERENCES

Respondents were asked on a scale of 0-10 (0 represents "Completely Disagree" and 10 represents "Completely Agree") how they felt about six different policies that the COCT could be implemented during a drought to reduce water consumption to lessen the likelihood of severe water shortages. The policies ranged from harsh to light and were to: legally force people to use less water, spend money to educate people on how to use less water, use water bills to show people how much they're consuming to encourage lower water use, increase tariffs for everyone, reduce everyone's water pressure, and reduce specific high consuming neighbourhoods' water pressure.

People's policy preferences were centred around the targeted and soft policy scenarios. This included education, showing people exactly how much they are consuming, and targeted water pressure reductions. When it came to the idea of raising tariff rates as a viable method of dealing with consumption levels 17% of respondents disagreed that this would be a viable option (Figure 4). This was a particularly strong response especially when compared to the next most disagreed with policy of legally restricting people's water which only 5% of respondents disagreed with. Behavioural treatments overall did not have much effect however, consumption information increased the odds of agreeing with legally restricting water. Drought information, on the other hand, increased the odds of respondents agreeing with targeted pressure reductions and agreeing with educating people compared to the control group. Information on the true levels of consumption of rich and poor households increased the odds of agreeing more with legal water restrictions compared to control (Figure 4).

Overall people with lower levels of education had lower odds of agreeing with any of the policies compared to people with higher levels of education. Those who earn less than R5 000 per month had higher odds of agreeing with any of the policies and thus are more pro-regulation than higher-income earners. Additionally, women had higher odds of agreeing with increasing tariff rates and both types of water pressure reductions.

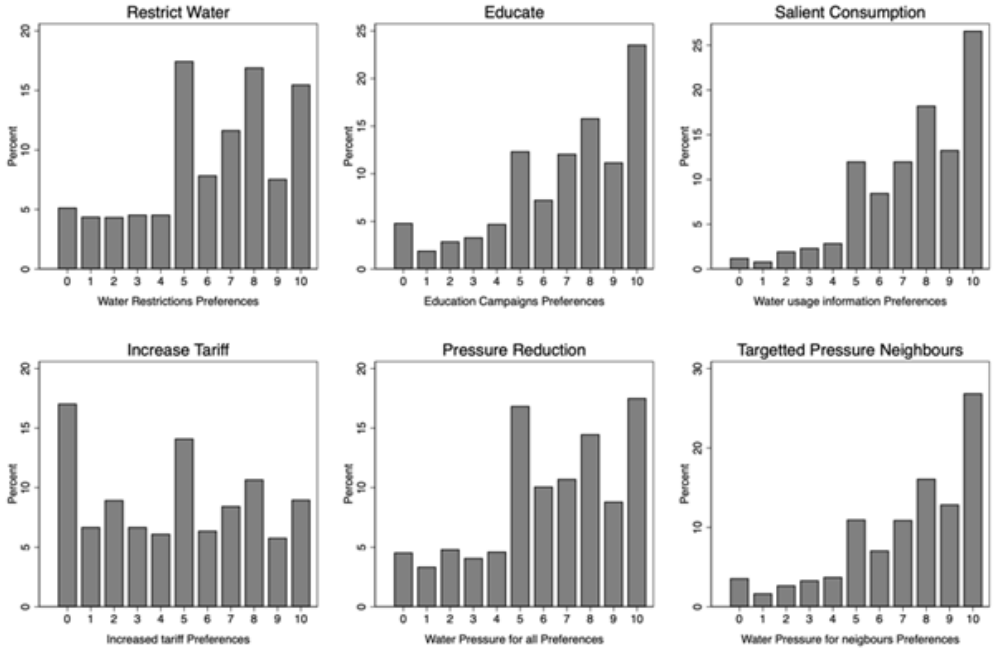


Figure 4: Attitudes on a scale of 0-10 (0 represents "Completely Disagree" and 10 represents "Completely Agree") towards the six different policies presented.

CONCLUSION

Insights gained through this investigation into the beliefs and perceptions of water consumption of Cape Town residents have relieved large misperceptions about the actual water consumption patterns of rich and poor households during and after the 2018 Cape Town drought. These misperceptions are larger among poor respondents with lower levels of education. We find some effects of updating beliefs on burden-sharing preferences.

- Surprisingly, 13% and 25% of the sample selected the equal reduction rule for during the drought and for a future drought respectively, which places most of the burden of the reduction in water consumption on poor and low-consuming households. On average respondents that believed rich households consumed significantly more than poor households during the drought were more likely to select the equal consumption rule.
- Burden-sharing preferences were found to not affect actual water consumption during and after the drought. Further examining the effects of providing respondents with different types of information. Which is information on the true levels of water consumption in Cape Town, information on the increasing likeliness of a future drought in Cape Town, or both sets of information. However, it should be noted that this may not be truly representative of COCT residents overall as this data only reflected that of a sample of 481 households that provided valid account numbers.
- Different information treatments had broadly little effect on most policy preferences, but consumption information did increase respondents' likeliness to prioritize their household over the COCT and providing both sets of information led to the opposite effect.
- Within a subset of respondents (481 households that provided us with valid account numbers), it was found that in 2018 people with primary or secondary education consumed significantly more water than those with higher levels of education. In 2020, respondents that chose the equal consumption rule consumed just under 2kL/month less than those that did not choose that rule.
- Additionally, it was found that women tend to agree with increasing tariff rates and both total pressure reductions and targeted pressure reductions compared to men.
- People who earn less than R5000/month were found to be more likely to agree with water regulation policies than those people earning more than R5000/month.
- People with lower levels of education tend to be less likely to agree with regulatory approaches than those with higher levels of education.

Overall, our data suggests that poorer and less educated individuals are more likely to have misperceptions about water consumption and the likelihood of future droughts and are more likely to support policies that place the burden of reduction on poorer households. Providing information about actual consumption and the likelihood of future droughts can slightly alter these views, but more work is needed to fully understand and address these misperceptions. This study highlights the need for better education and communication strategies to address misconceptions and promote pro-social attitudes during water scarcity events.

This science brief is based on the outcomes of the WRC project no. C2019/2020-00096 titled 'Water conservation, beliefs and fairness preferences in collective burden-sharing'.