Fairness in Water Consumption Experiments: Understanding Burden-Sharing Preferences and Conservation Beliefs

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Abstract

The increasing impacts of climate change have intensified water insecurity, posing significant challenges for major cities in developing countries. Cape Town, South Africa, experienced its most severe drought in four centuries, highlighting the vulnerability of urban water systems to prolonged shortages. Although the city has since recovered, concerns regarding long-term water security persist. Addressing these challenges necessitates a comprehensive approach that integrates both demand and supply management strategies. A critical component of effective policy design is an understanding of public preferences regarding the distribution of responsibility for water conservation, ensuring that burden-sharing mechanisms are both equitable and sustainable. This study is among the first to apply experimental methods to examine equity preferences for urban water conservation in a developing country, bridging a gap in the literature. Using a sample of 315 Cape Town residents, the study investigates how beliefs, policy preferences, and how cultural theory of risk shape fairness and burden-sharing preferences for water use. Key findings show that low-endowment players favoured principles that minimised individual contributions, such as the equal water use principle. High-endowment players demonstrated more complex patterns, with preferences influenced by education and policy attitudes. Burden-sharing principles did not significantly influence high-endowment players contributions in the first stage of the experiment. Similarly, the cultural theory of risk principles did not significantly impact contributions in the first stage of the experiment but emerged as important determinants of preferences in the second stage, with individualism and egalitarianism playing key roles. The study highlights the need for water conservation policies that reflect socioeconomic diversity and fairness norms to foster cooperation and equity.

Keywords: Cape Town drought, water conservation, burden-sharing, cultural theory of risk

1. Introduction

Climate change presents diverse and far-reaching risks to cities, their economies, societies, and ecosystems. These risks are particularly acute in developing countries, where rapid population growth exacerbates exposure to climate vulnerabilities. Among the most pressing challenges is water insecurity, as growing populations deplete natural resources and stretch drinking water supplies (Islam & Winkel, 2017). In water-scarce areas, the increasing variability in weather patterns, unpredictable rainfall, and rising temperatures make managing water supplies exceptionally difficult.

Cape Town, one of South Africa's largest cities, experienced its most severe drought in over a century in 2018, driven by global climate change (City of Cape Town, 2021). The crisis brought the city perilously close to "Day Zero," when dam levels fell below 22% of capacity, and water supplies for residential and commercial use faced imminent shutdown (Visser et al., 2021). While the drought was largely attributable to climatic conditions, rapid population growth, inadequate investment in water supply infrastructure, and high dependence on rainfall exacerbated the crisis (Muller, 2018). In response, the City of Cape Town implemented various demand-side management strategies, including stringent water restrictions, tariff escalations, media campaigns, and behavioural nudges (Visser & Brühl, 2018; Parks et al., 2019). Supply-side measures, such as groundwater extraction and temporary desalination plants, supplemented these efforts (Visser et al., 2021).

At the peak of the crisis in 2018, Level 6B water restrictions were enforced, capping individual water usage at 50 litres per day—more than a 50% reduction from pre-crisis consumption levels (City of Cape Town, 2018). This was just enough to meet the World Health Organisation's (WHO's) recommended minimum for daily water use. Comparatively, other global cities such as Sydney, Brasilia, and Los Angeles consume far more water per capita, underscoring the severity of Cape Town's situation (International Water Association, 2020). While the city has since recovered from the crisis, ongoing water scarcity challenges persist due to structural and environmental factors. Climate patterns in the region have shifted toward drier and warmer winters, and rainfall levels remain below historical averages (CSAG, 2022).

Cape Town's experience is not unique. Many rapidly growing cities in developing countries face similar water security challenges, where climate change and population pressures strain water supply systems (UN-Water, 2020). As water scarcity intensifies globally, policymakers must develop water management strategies that balance conservation goals with the realities of urban growth and resource limitations. Effective policy design requires understanding how urban residents respond to conservation measures and what drives cooperation in shared resource settings.

The Cape Town drought also highlighted significant inequalities in access to water. Low-income households were disproportionately impacted, often struggling to meet water restrictions due to larger household sizes and limited access to alternative water sources. The city provides subsidised water to indigent households, but households just above the indigent threshold face considerable challenges. These households often accumulate high levels of municipal debt and pay higher effective rates for water than wealthier households with smaller household sizes (Damons, 2022). Wealth inequality, compounded by unequal access to resources, poses significant challenges to the equitable management of water conservation policies. Addressing these disparities requires an understanding of how different socioeconomic groups perceive and respond to policies that involve burden-sharing of water conservation responsibilities.

Problem statement and relevance

Efforts to manage water scarcity often overlook the complexity of socioeconomic inequalities and cultural diversity, resulting in policies that fail to garner widespread public support or participation. Existing literature on equity principles and burden-sharing in climate change negotiations provides valuable theoretical insights but lacks application to water conservation, a context where resource use dynamics and individual incentives differ significantly (Lange, Vogt & Ziegler, 2007; Carlsson et al., 2013). For example, unlike global climate change policies, water conservation policies must account for immediate household needs, localised inequalities, and the diverse socio-cultural contexts of urban residents.

This study addresses this gap by applying well-established equity principles, such as the polluter-pays and equality principles, to the urban water conservation context. Using an experimental approach, the study examines how Cape Town residents from diverse socio-economic backgrounds perceive and select burden-sharing principles for water conservation. By doing so, it offers valuable insights into the behavioural and cultural factors that shape cooperation and perceptions of fairness in the management of shared resources during times of crisis.

Research objectives

This research aims to evaluate the perceptions of fairness and burden-sharing among Cape Town residents during a hypothetical drought scenario. Specifically, it investigates:

1. How low- and high-income households differ in their preferences for burden-sharing principles related to water conservation.
2. How cultural theory of risk influence these preferences, accounting for cultural values such as egalitarianism, individualism, fatalism, and hierarchy.
3. How these insights can inform the design of equitable and effective water conservation policies that address ongoing challenges in Cape Town and other water-scarce regions.

Contribution and overview of the paper

This study builds on the work of Milinski et al. (2008) and Tavoni et al. (2011) by using threshold public goods games to model water conservation as a shared resource challenge. Participants are given an initial endowment that they can choose to allocate to either a private or public account. Contributions to the public account are presented as efforts to conserve water, with the objective of lowering overall water consumption by half to prevent future droughts (this is referred to as the threshold point). If participants' collective public contributions meet or surpass the threshold point, they are multiplied by a specific coefficient and then distributed equally among the players. This type of game is described by Marks and Croson (1998) as a continuous public goods game. The participants are made aware that water conservation is advantageous for the whole city, and the return from the public account is a representation of the benefits that arise from reducing water consumption, such as mitigating the possibility of a "Day Zero" situation where the city encounters water scarcity. No return is given to the players from the public account if the total public contributions fail to reach the threshold point.

The initial design of the experiment considered imposing a personal cost on participants if the threshold was not met, similar to the approach used by Brick and Visser (2015). This was intended to reflect the real-world consequences of inadequate water conservation, where each player must allocate funds from their private account to adapt to shortages. Lower-endowment players, in particular, would be disproportionately affected, as they may lack the financial means to invest in water storage solutions such as tanks or boreholes and may need to travel long distances to access water.

However, including this personal cost would have introduced complex instructions and calculations, potentially making the experiment less accessible to lower-income and less-educated participants. To ensure clarity and ease of understanding for all participants, the experiment was simplified by omitting the personal cost. This adjustment also improved the external validity of the study, ensuring that the findings remain relevant across diverse socioeconomic and educational backgrounds.

To test the effects of earned status versus random luck, two treatment groups were created: earned and random. In the earned treatment participants were allocated to either a high or low-endowment player based on the neighbourhood they reside in, whereas in the random treatment participants were randomly allocated to a household type.

In Part 1 of the experiment, players had the flexibility to decide how many tokens to contribute to the public account from their endowment. In Part 2, contributions were structured according to three burden-sharing principles, each specifying a fixed amount that both high- and low-endowment players had to contribute. As a result, contributions to the public account varied between low- and high-endowment players depending on the selected burden-sharing principle. For example, the equal water storage principle, which required all players to contribute the same absolute amount, had the highest token contribution requirement for low-endowment players, while the equal water usage principle required the highest token contribution from high-endowment players.

Overall, the results indicate that low-endowment players prioritise minimising their contributions, consistently favouring burden-sharing principles such as equal water use that require the smallest sacrifice. In contrast, high-endowment players exhibit more complex decision-making patterns, influenced by factors such as education and policy attitudes. Both high and low-endowment players also demonstrate a preference for the proportional water use principle. Burden-sharing principles did not significantly influence high-endowment players token contributions in the first stage of the experiment. Similarly, the cultural theory of risk principles did not significantly impact contributions in the first stage of the experiment but emerged as important determinants of preferences in the second stage, with individualism and egalitarianism playing key roles.

This paper is organised as follows: An analysis of the literature is provided in Section 2, while a description of the sample is presented in Section 3. Section 4 outlines the design of the experiment. Section 5 presents the methodology. A summary of the results is presented in Section 6, while a conclusion is discussed in Section 7.

2. Literature review

Theoretical principles of equity and burden-sharing

The equitable distribution of resources is a central concern in addressing shared challenges, particularly in the context of climate change. This literature review explores the concept of fairness in water consumption experiments, focusing on burden-sharing preferences and conservation beliefs. It is essential to understand how individuals perceive and act upon their responsibility for the conservation of collective resources, such as water allocation, as it impacts the common good.

In the realm of climate change negotiation, Heyward (2007) identifies various equity principles that can inform decisions on addressing global challenges (equity, responsibilities, and capacity). Under equity, Heyward recognises three distinct categories:

1. Egalitarianism: All human beings are entitled to an equal share of the common good.
2. Sovereignty (or historic entitlements): Respecting the status quo or historical rights to resources.
3. Comparability: Equal efforts must be committed to, considering differences in marginal abatement costs to ensure comparable contributions.

These aspects of equality are pertinent to the principles investigated in our study: equal water use, proportional water use, and equal water storage (covered in section 4.3).

Lange et al. (2010) define four major equity principles in the context of climate change negotiations that correlate strongly with Heyward's (2007) earlier principles. Introducing four core principles: egalitarian, sovereignty, polluter-pays, and ability-to-pay. The sovereignty principle emphasises maintaining the status quo of past consumption. Underscoring that individuals who have consumed more in the past should contribute or save more, regardless of their resource endowments. Meanwhile, the polluter-pays principle complements the proportional water use principle by suggesting that those with higher water consumption should contribute more. Furthermore, Lange et al.'s (2010) ability-to-pay principle finds parallels in Heyward's (2007) notion of capacity, which refers to the extent to which actors are able to address climate challenges and is shaped by factors such as wealth, technology, institutions, skills, infrastructure, and competing domestic pressures, particularly in the context of Cape Town's water scenario and the significance of indigent status (the provision of an allocation of 6.5kl of free water per month based on certain criteria).

While these theoretical frameworks are valuable for framing equity in resource allocation, they are often applied in macro-level contexts such as international climate negotiations, making their applicability to individual decision-making less clear. Additionally, they assume rational behaviour, neglecting the role of social norms, cultural values, and behavioural biases in shaping preferences. These limitations highlight the need for experimental studies that examine how individuals interpret and act on these principles in real-world contexts. This study addresses these gaps by applying equity principles to an experimental setting that reflects the lived experiences of Cape Town residents, capturing the nuances of their socioeconomic and cultural diversity.

Water conservation differs from other public goods problems in several ways. First, it requires immediate action, as water shortages demand urgent household-level responses, whereas global climate policies involve long-term commitments. Second, its impacts are localised, meaning that while climate change mitigation has global benefits, water conservation primarily affects local communities, making perceptions of fairness and responsibility more salient. Third, whereas water conservation depends on individual household behaviours, which are influenced by financial constraints, social norms, and risk perceptions (Koop, Van Dorssen & Brouwer, 2019), national climate policies are determined at the governmental level.

These differences mean that fairness norms in water conservation may diverge from those observed in broader climate change policies, as individuals face more immediate and direct trade-offs. This study addresses these gaps by applying equity principles to an experimental setting that reflects the lived experiences of Cape Town residents, capturing the nuances of their socioeconomic and cultural diversity.

Empirical evidence on burden-sharing and fairness

Brick and Visser (2015) designed an experiment based on these equity principles to examine the extent to which they reflect self-interested behaviour. In their experiment, Brick and Visser (2015) separated the concept of the polluters pay principle into the "historical polluters pay principle" and the "future polluters-pay principle." The historical polluters-pay principle places the primary responsibility on countries with a history of high emissions while the future polluters-pay principle puts the responsibility on emerging countries that are likely to have higher emissions in the future. A key finding of their study is that individuals' preferences are influenced by self-interest. Several studies, including Hammar and Jagers (2007) and Groh and Ziegler (2018), have analysed how the costs are shared among households within the framework of national climate change policies. In the literature, there seems to be strong support for the polluters-pay principle when it comes to domestic burden sharing of costs (Hammar & Jagers, 2007; Groh & Ziegler, 2018), whilst Brännlund and Persson (2012) observe a tendency towards a progressive allocation of policy costs based on the ability-to-pay principle.

Other literature examines fairness in the context of bankruptcies, where individuals or corporations are unable to repay their debts to creditors. The principles in insolvency are how the liquidation value of a firm should be distributed. Although this is a different context to climate change, the liquidity principles identified in this literature have links to the burden-sharing principles identified in climate change negotiations. The fairness principles identified in the bankruptcy literature are the proportionality principle, the equal losses principle, and the equal awards principle (Cappelen et al., 2019). The main finding of this study is the strong support for the principle of proportionality and almost no support for the equal awards principle. Notably, Cappelen et al. (forthcoming) applied the egalitarian, sovereignty, and equal losses principle to water burden-sharing principles among 3000 COCT residents,[1] revealing substantial variation in respondents' burden-sharing views. This study builds on Cappelen et al. (forthcoming), which applied these principles to water burden-sharing among 3,000 Cape Town residents. While that study provided valuable insights into equity preferences, it lacked experimental validation, relying instead on survey-based methods. By conducting an in-field experiment, this study refines and contextualises these findings, offering a more granular understanding of how fairness norms translate into behaviour.

[1] The burden-sharing principles were assessed using hypothetical scenarios in a survey context.

Goodhart and Schoenmaker (2009) explore potential ex-ante methods that could have been employed for distributing the financial burden during a banking crisis in Europe. Two mechanisms were identified: *generic* burden sharing, and *specific* burden sharing. *Generic* burden sharing entails the creation of a general fund financed by participating countries, with each contributing a share proportional to their relative economic strength, typically measured by gross domestic product (GDP). This approach allocates financial responsibility based on economic capacity but faces challenges, such as political reluctance to engage in cross-border fiscal transfers. On the other hand, *specific* burden-sharing targets only the countries where the problem bank operates, aligning contributions with actual exposure to the issue. While more targeted, this method faces complexities in accurately determining a country's share based on the problem bank's business activities within its borders.

These studies highlight the complexity of socio-demographic factors in shaping burden-sharing views. For instance, Cappelen et al. (forthcoming) examine the impact of the 2018 drought on these views. During this drought, a majority of respondents favoured the proportional principle, but this preference shifted in future drought scenarios, suggesting a potential tendency to place a greater burden on poorer and lower-consuming households. Gender differences and the influence of education levels on principle preferences further emphasise the role of demographics in shaping these views (Cappelen et al., forthcoming).

Behavioural drivers of cooperation in public goods

Water conservation poses a public goods dilemma, as its benefits are shared collectively while the costs are borne individually. This creates opportunities for free riding, where individuals contribute less than their fair share (Brekke & Stenman, 2008; Hasson, Löfgren & Visser, 2010). Behavioural economics highlights the importance of social preferences, conditional cooperation, and inequity aversion in overcoming this challenge. Fehr and Gächter (2000) demonstrate that individuals are more likely to cooperate when they believe others will do the same, reflecting a preference for reciprocity. Similarly, Fehr and Schmidt (1999) emphasise the role of fairness in motivating contributions, with individuals often incurring personal costs to reduce inequality.

Numerous studies have established a relationship between individuals' behaviours and their attitudes, perceptions, and beliefs (Ajzen & Fishbein, 1980; Ajzen, 2005). Individuals typically make decisions based on a combination of self-interest and their perceptions of fairness, as highlighted by research such as that of Almås et al. (2010) and Brick and Visser (2015). Fehr and Schmidt (1999) note a general tendency for individuals to exhibit a strong aversion to inequality, often driven by a sense of fairness. These varying perspectives on redistribution and fairness highlight the balance between individualism and the common good in resource allocation.

Research indicates that people's attitudes toward regulation significantly influence their behavioural responses to public policies (Syme et al., 2000). Cappelen, Haaland, and Tungodden (2018) find that differences in attitudes towards progressive taxation are largely driven by differences in fairness preferences or 'equity efficiency' preferences rather than beliefs around the compliance of others. Hence, a crucial matter to consider is the perception of the citizens regarding the equitable allocation of the economic responsibility for reducing water usage within households, which refers to their inclinations towards various burden-sharing principles.

Public support for government policies, especially in environmental conservation, hinges on attitudes toward water pricing and allocation policies (Syme et al., 2000). Trust in government and perceived collective efficacy influence attitudes toward water policies (Clark and Finley, 2007; Corral-Verdugo et al., 2007; Thaker et al., 2019;). Distrust in institutions or the belief that water authorities are doing enough can result in a decreased motivation to conserve, leading to higher water consumption (Corral-Verdugo et al., 2007). Similarly, beliefs that individual households won't significantly impact water resources, or that water conservation methods are unreliable, can significantly affect household water conservation (Adams et al., 2013).

While these studies provide important insights into the motivations behind cooperative behaviour, they often assume homogeneous preferences, neglecting how socio-economic and cultural differences shape decision-making. For instance, lower-income households may prioritise survival over fairness, leading to lower contributions, while higher-income households may contribute more out of altruism or social signalling. This study addresses these limitations by explicitly examining how income levels and cultural values influence water conservation decisions, offering a more comprehensive understanding of public goods behaviour in unequal societies.

Cultural theory of risk and water conservation

Understanding the role of cultural values and norms in shaping the responses to water conservation and burden-sharing cannot be overstated. The cultural theory of risk provides a framework for understanding how cultural values influence perceptions of fairness and cooperation. Douglas and Wildavsky (1982) and Rayner (1992) categorise cultural orientations into four types: egalitarianism (preference for equality), individualism (emphasis on autonomy), hierarchy (respect for authority), and fatalism (acceptance of external control). These orientations shape how individuals perceive risks and responsibilities, influencing their willingness to cooperate in public goods scenarios (Slovic et al., 2004).

When examining water conservation, the cultural theory of risk can help explain why different groups prioritise certain burden-sharing principles. Egalitarians, for example, may favour equal water use, while individualists may prefer proportional principles that align contributions with consumption levels, ensuring minimal government intervention (Oltedal et al., 2004; Kahan et al., 2010). Hierarchy-oriented individuals may support strict regulations, such as enforced water rationing, as they trust institutions to manage resources effectively. In contrast, fatalists, who believe water scarcity is beyond their control, may show weaker compliance with conservation policies, as they see little benefit in adjusting their behaviour (Marris et al., 1997). These cultural dimensions highlight why different communities interpret fairness in water conservation differently and why some policies may receive more public support than others.

Previous studies have shown that social and economic factors shape individuals' perceptions of fairness and risk (Marris et al., 1997; Oltedal et al., 2004; Kahan et al., 2010). Unlike global climate agreements, where burden-sharing is largely mediated at the governmental level, water conservation policies directly affect households, making cultural perceptions of fairness especially important for compliance and public cooperation.

Limitations of existing literature

While extensive literature examines equity principles in climate change contexts (Lange, Vogt & Ziegler, 2007; Lange et al., 2010; Carlsson et al., 2013; Brick & Visser, 2015; Brick, Hoven & Visser, 2016), there is a notable gap in studies eliciting preferences for burden-sharing principles specifically within water conservation. This study fills this gap by applying well-established equity principles, such as the polluter-pays principle, equality principle, and ability-to-pay principle, to the context of water consumption. Unlike climate negotiations, which focus on global, long-term commitments often mediated at a national level, water conservation decisions occur at a localised and immediate level where household behaviour directly impacts resource availability. This difference introduces unique dynamics, including the conflict between personal gain and shared benefits, the immediacy of trade-offs, and the significant impact of economic and cultural diversity on fairness norms.

This study builds on existing literature by employing an in-field economic experiment with 315 Cape Town residents, moving beyond the hypothetical choice experiments on student samples often used in prior studies. By engaging participants from diverse socioeconomic backgrounds, this study enhances external validity and captures the nuanced interplay between fairness norms, and economic constraints. Additionally, cultural and socioeconomic diversity is often overlooked, leading to a lack of understanding of how fairness norms vary across groups. By integrating the cultural theory of risk, this research further allows for an exploration of how individual perceptions of risk and cooperation influence water conservation preferences, which differ significantly from broader climate change negotiations. In doing so, this research provides actionable insights for designing equitable and culturally relevant water conservation policies that reflect the lived realities of diverse communities.

3. Sample

The sampling strategy and design were led by the survey company Ask Afrika, ensuring accurate randomisation and representativeness, with sampling weights developed accordingly. The sample was stratified by income group and ward, and a proportionate sample was randomly selected from each stratum. The sample was derived from participants of the Cappelen et al. (forthcoming) survey, focusing on individuals with secondary education or higher.

Table 1 provides an overview of the sample statistics. A total sample of 315 subjects were interviewed from different areas around Cape Town. Women comprised the majority of the sample, accounting for 70% of participants. The average age of respondents was 51 years. [2] In terms of financial status, approximately half of the participants classified their family's financial situation as lower income, while 16% identified as upper income.

In addition to demographic characteristics, the study also captures participants' beliefs about household water consumption, which form an important explanatory variable in the analysis. The high-income consumption belief variable represents players' estimates of high-endowment individuals' monthly water usage in January 2023 (refer to Appendix A2, Section C, Questions 13 and 14). On average, players estimated 13.15 kl, which is 5.33 kl (27%) lower than the actual consumption of 18.48 kl. Similarly, the low-income consumption belief variable reflects players' estimates of low-endowment individuals' water use, with an average estimate of 8.40 kl, 3.72 kl (31%) lower than their actual consumption of 12.12 kl. Both estimates suggest that players underestimated water consumption, possibly due to expectations that water-saving behaviours persisted after the 2018 drought. Figures B1 and B2 in Appendix B provide further details on these perceptions.

Soft and hard policies are defined based on the actions the City of Cape Town could take to manage water shortages. In a previous study by Cappelen et al. (forthcoming), participants

[2] A midpoint (average age) was calculated for each age bracket. The mean age is based on these midpoint values.

rated their agreement with these actions on a scale from 0 (completely disagree) to 10 (completely agree). The full set of questions is provided in Appendix C.[3]

Hard policies involved enforcing stricter controls such as water restrictions (Question 1), increasing tariffs (Question 4), and reducing water pressure (Questions 5 and 6). Soft policies included measures like educating residents on water conservation (Question 2) and using water bills to inform them of their usage (Question 3).

The mean values of 6 for hard policies and 7.11 for soft policies suggest that, on average, participants showed moderate agreement with stricter enforcement measures but expressed slightly stronger support for softer, educational approaches to managing water shortages.

Table 1. Sample statistics

Variable	**Subjects (n= 315)**
Gender	
Male	0.30
Female	0.70
Highest level of education completed	
Grade 12 (Matric)	0.34
Secondary education	0.48
Tertiary education	0.19
Age	
18-24	0.05
25-34	0.12
35-44	0.22
45-64	0.48
65+	0.12
Family's financial situation (annual household income)	
Lower income (<=R140 100)	0.49
Middle income (R140 101- R490 850)	0.36
Upper income (>R490 850)	0.16
Average monthly income	
R0 – R4,999	0.37
R5,000 – R9,999	0.14
R10,000 – R14,999	0.08
R15,000 – R19,999	0.02
R20,000 – R24,999	0.03
R25,000 – R29,999	0.03
R30,000 – R34,999	0.03
R35,000 – R39,999	0.01
R40,000+	0.04

[3] The sample used in this experiment is a subset of the participants from the original study on policy preferences conducted by Cappelen et al. (forthcoming).

Variable	**Subjects (n= 315)**
Refuse	0.24
Consumption beliefs	
High-endowment consumption beliefs	13.51
Low-endowment consumption beliefs	8.40
Cultural theory of risk[4]	
Hierarchy	4.01
Individualism	4.18
Egalitarianism	4.10
Fatalism	4.14
Policy preferences	
Hard policies	6.00
Soft policies	7.11

4. Experiment

The experiment in this study employs a threshold public goods game with a future drought scenario to investigate strategic applications of burden-sharing principles. It is designed to unveil behavioural patterns tied to resource sharing and decision-making under uncertain conditions. The design, inspired by Brick and Visser (2015), Brekke et al. (2017), Cartwright et al. (2019), and Cappelen et al. (forthcoming), also integrates a choice between burden-sharing principles. This approach facilitates an in-depth understanding of participant behaviour and preferences in both continuous and discrete decision-making environments. The instructional materials provided to participants are in Appendix A.

The study acknowledges the inherent diversity among individuals in terms of wealth, water consumption habits, and susceptibility to drought impacts, recognizing that these variations may complicate discussions on equitable burden distribution. Therefore, the experiment incorporates this heterogeneity into its design (discussed in section 4.2). The outcomes will highlight the most popular water-sharing principle among different income groups, and how the nature of their endowment influences their decisions. The subsequent section provides a concise overview of the experimental design.

4.1 Design

Each group consists of n players, with each participant receiving y_i tokens. Participants allocate these tokens between a private account, which represents their own water use, and a public account, which represents the city's water storage. The number of tokens participant i allocates to the public account is denoted as c_i, while the total contributions to the public account from all group members are represented by g_j.

If the total contribution g_j meets or exceeds a predefined threshold T, each token in the public account provides a return of a_i to every group member, where $0 < a_i < 1$. Tokens kept in the private account yield a return of β_i, where β_i=1. The earnings of participant i are therefore given by:

[4] Hierarchy, Individualism, Egalitarianism, and Fatalism (refer to Appendix A2, Section E, Questions 23).

$$\pi_i = \beta_i(y_i - c_i) + a_i(g_j), \qquad \text{if} \quad g_j \geq T$$

If the group's contribution to the public account, g_j, falls short of the threshold T, participants within that group do not gain any returns from their investments in the public account ($a_i = 0$). In this case, participant i's earnings are:

$$\pi_i = \beta_i(y_i - c_i), \qquad \text{if } g_j < T$$

4.2 Parameters and framing

Each group consists of 4 players: 2 players from high-endowment households and 2 players from low-endowment households.

Water usage of low and high-income households

The water allocations used in the experiment were based on pre-drought water consumption levels and were derived from the average consumption of households in the 1st and 5th income quintiles. High-income households correspond to the 5th quintile, while low-income households correspond to the 1st quintile.

In the period December 2014 – April 2015, before the major drought in Cape Town (2018), high-income households in the top quintile consumed an average of 37.05 kl of water per month whereas low-income households consumed 19.07 kl on average per month.[5] After the drought in January 2021, high-income households consumed an average of 18.29 kl of water per month whereas low-income households consumed 14.25 kl on average per month.[6]

Endowments

Similar to the approach used by Brick and Visser (2015), this experiment accounts for heterogeneity among participants considering differences in wealth, historical and projected future water use, and vulnerability to future water crises. These differences are accounted for in the experimental design by adjusting endowments based on income levels, with high-endowment players receiving more tokens than low-endowment players.

High-income players are allocated 36 tokens, while low-income players receive 20 tokens**.** From this point forward, players allocated 36 tokens are referred to as high-endowment players, whereas those allocated 20 tokens are referred to as low-endowment players**.**

The endowments were based on pre-drought household water consumption levels **(**36 kl for high-income and 20 kl for low-income households).[7] Using post-drought consumption levels would have resulted in water allocations below 6 kl per month in the burden-sharing principle section, which is below the minimum recommended level set by the World Health Organization (WHO). [8]

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[5] Brick, Martino and Visser. 2017. Behavioural Nudges for Water Conservation: Experimental Evidence from Cape Town

[6] City of Cape Town data.

[7] Pre-drought water consumption values were slightly rounded (37.05 kl to 36 kl and 19.07 kl to 20 kl) to avoid unnecessary complexity in calculations and ensure a more intuitive experimental design.

[8] The (WHO) recommends a minimum of 20 to 50 litres of water per person per day to meet basic needs such as drinking, sanitation, and hygiene. This amounts to 600 to 1,500 litres per person per month, meaning that household consumption

City's water storage

Participants allocate their endowments between a private and a public account, with the public account representing the city's water storage and the private account reflecting the individual's personal own water use.

The private and public accounts were framed in the following way:

You can either: keep tokens for your household's own water needs; give some tokens to the city's water storage; or keep some tokens for your household and give some to the city's water storage.

When making your choice it is important to remember to save enough tokens for your household's **OWN WATER USE.**

Keeping tokens for your household's water use only benefits your own household.

So, each token kept for your own water use means that the token is yours.

Giving to the City's WATER STORAGE

Giving tokens to the City's WATER STORAGE helps to possibly make sure that there's enough water stored in dams for the entire season. You can only do this by lowering your **OWN USE** to save water.

This might mean changing your habits to use less water (like shorter showers) and using water-efficient technologies, such as low-flow showerheads, or other water sources (like water tanks).

Each token you give to the City's water storage decreases your water token budget by one.

The benefits of giving to the City's water storage are shared with all your group members.

The total amount contributed by the group to the city's water storage (public account) (g_j) is increased by a factor of 1.5 and then shared equally among all members, resulting in a_i = 0.375.

Target

In terms of the framing participants are told that Cape Town is facing a severe drought, and to make sure there's enough water stored for everyone, total water consumption (total water use) needs to be reduced by **half.**

This is to ensure that there will be enough water stored in dams to provide the City with water for the entire season. Each participant must decide the portion of their endowment to allocate to the public account, aiming to collectively meet the group's contribution target.

Each group is tasked with reducing water consumption by 56 kilolitres, requiring a collective contribution of at least 56 tokens ($g_j \geq 56$) to the public account, which represents the city's water storage.

below 6 kilolitres (6,000 litres) per month may fall short of these minimum requirements, depending on household size (Crouch, Jacobs, & Speight, 2021).

Meeting the target

If a group achieves the reduction target ($g_j \geq$ T), the tokens in the city's water storage (public) account are increased by a factor of 1.5 and then distributed equally among all group members, regardless of individual contributions. Additionally, participants retain any tokens they allocated to their personal water use (private) account. The city's water storage account yields returns (a_i) that represent the communal advantages of decreased water usage, particularly in mitigating drought impacts. These advantages are a reduced probability of running out of water. The advantages derived from the city's water storage are distributed equally among all players, with tokens in the water storage account being divided equally among the four group members, regardless of individual contributions.

Failure to meet the target

If the target is not achieved, the framing dictates that there will not be enough water stored in dams for a future drought. In this scenario, players do not gain the communal advantages associated with sufficient contributions to the city's water storage, such as reduced climate variability/decreased chance of a drought (i.e. sufficient water stores in the dam), thus there is no return from contributing to the city's water storage: a_i = 0.

4.3 Treatments and burden-sharing principles

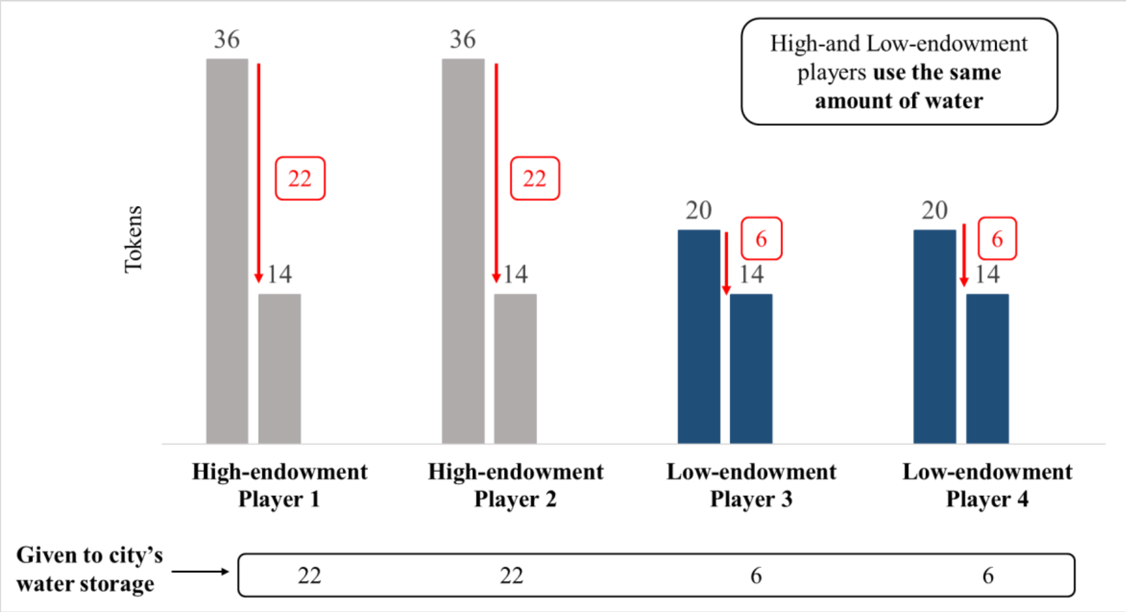
In the first treatment (which will be referred to as "EARNED"), participants are allocated to either a high or low-endowment player based on the respondent's actual income classification and must choose one of three equity principles, each corresponding to a specific token contribution towards the city's water storage. The second treatment, referred to as "RANDOM," follows the same structure as the first, except that participants are randomly allocated to either a high or low-endowment player, regardless of their income classification.

Players were allocated to either the earned or random treatment group; therefore, they only played the game once.

The three burden-sharing principles, adapted from Lange et al. (2007, 2010) are as follows:

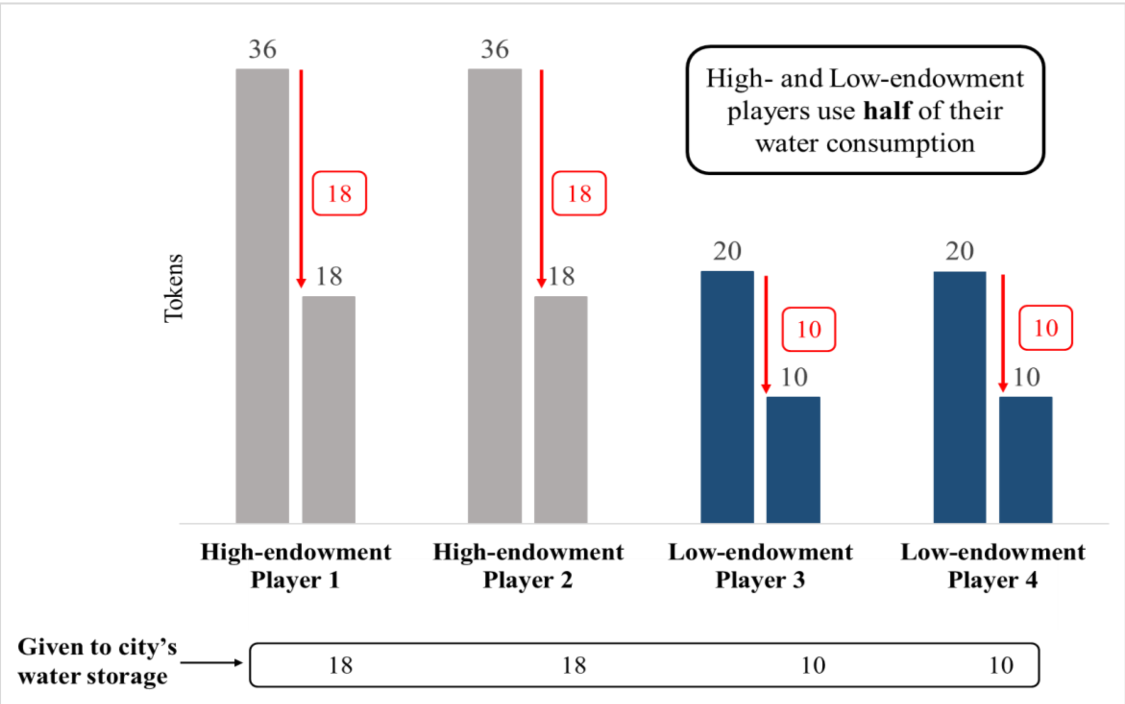
(1) Equal water use: All players **consume** the same amount of water. Therefore, each player has the <u>same number of tokens for their own water use</u>. This translates into high and low-endowment players contributing **22** and **6** tokens respectively to the city's water storage (Figure 1).

Figure 1. Equal water use



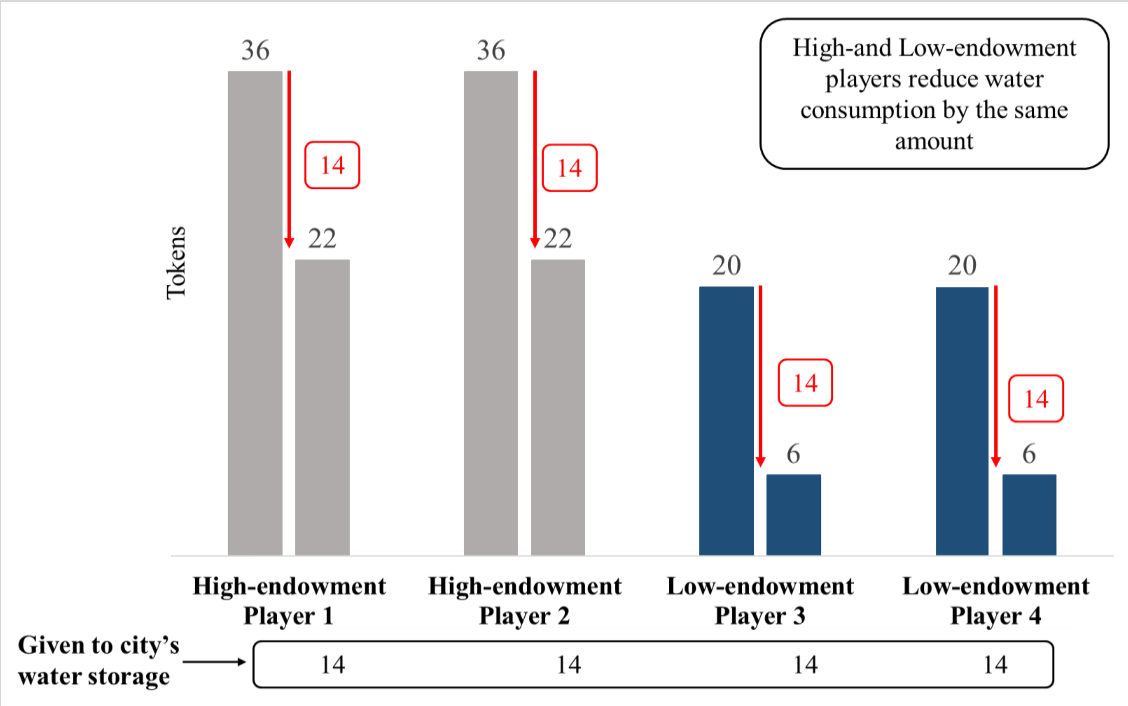
(2) Proportional water use: All players reduce their water consumption by 50%. Therefore, all players contribute the **same percentage** of their tokens towards the city's water storage. This translates into high and low-endowment players contributing **18** and **10** tokens respectively to the city's water storage (Figure 2).

Figure 2. Proportional water use



(3) Equal water storage: All players contribute the **same number of tokens (14 tokens) towards** the city's water storage (Figure 3). This principle is the reverse of equal water use.

Figure 3. Equal water storage



The ranking of equity principles, determined by token contributions to the public good for each player, is as follows:

High-endowment player: Equal water use > Proportional water use > Equal water storage

Low-endowment player: Equal water storage > Proportional water use > Equal water use

Table 2 below illustrates the number of tokens that need to be contributed to the city's water storage, for each player (high and low endowment), under each burden-sharing principle.

Table 2. Contributions to the city's water storage under each burden-sharing principle

		High-endowment	Low-endowment
Equal water use	Given to City	22	6
	Kept for Own Use	14	14
Proportional water use	Given to City	18	10
	Kept for Own Use	18	10
Equal water storage	Given to City	14	14
	Kept for Own Use	22	6

To ensure that the experiment accounted for participants' varying education levels, all participants were provided with five examples to clarify the decision-making process. Additionally, they had the option to review three more detailed examples. All examples are available in Appendix A1.

4.4. Equilibria and social optimum

4.4.1 Part 1

In Part 1 of the game, players decide how many tokens to contribute directly to the city's water storage (i.e. public account).

Nash equilibrium

The Nash equilibrium occurs when all players contribute nothing ($c_i = 0$) to the public account, resulting in a total contribution of:

$$(g_j = 0)$$

In this case:

- The group fails to meet the threshold ($g_j < T$), and no returns are generated from the public account.
- Each player retains their full endowment in the private account, maximising their private payoff:

  $\pi_i = \beta_i y_i$, where $y_i = 36$ (high-endowment players) or $y_i = 20$ (low-endowment players.

This equilibrium arises because contributing any amount to the public account does not increase a player's payoff unless the threshold is met. Since players cannot guarantee that others will contribute enough, their best response is to retain their entire endowment.

Social optimum

The social optimum maximises the total group payoff (W), which is the sum of all players' payoffs:

$$W = \sum_{i=1}^{n} \pi_i = \sum_{i=1}^{n} [\beta_i(y_i - c_i) + a_i g_i . 1(g_j \geq T)]$$

To reach the social optimum, the group must collectively meet or surpass the threshold ($g_j \geq T$). This occurs when all players contribute their entire endowment to the public account:

$$c_i = y_i \qquad \text{for all } i$$

Under this strategy:

- High-endowment players contribute $ci = 36$ tokens each
- Low-endowment players contribute $ci = 20$ tokens each
- Total contribution: $gi = 36 + 36 + 20 + 20 = 112$, which far exceeds the threshold ($T = 56$).

The resulting payoff for each player is:

$$\pi_i = a_i g_j$$

In this case:

- Total group welfare is maximised because g_j generates the highest possible returns from the public account.

- However, this outcome requires full cooperation, which is unlikely to occur in the absence of external enforcement or coordination mechanisms.

Table 3. Comparison between Nash equilibrium and social optimum

Outcome	Contributions	Total contributions	Payoff	Threshold met?
Nash equilibrium	$c_i = 0$ *(all players)*	$g_j = 0$	$\pi_i = \beta_i y_i$	No
Social optimum	$c_i = y_i$ *(all players)*	$g_j = 112$	$\pi_i = a_i g_j$	Yes

4.4.2. Part 2

In Part 2 of the game, players do not decide how many tokens to contribute directly. Instead, they choose one of three burden-sharing principles (as discussed in section 4.3) which determine their contributions to the city's water storage.

As in Part 1, players aim to maximise their payoffs (π_i) based on the total group contribution (g_j) and the threshold ($T = 56$).

The contributions under each principle are predefined, so a player's decision revolves around choosing the principle that maximises their payoff, given the decisions of others.

In Part 2, the Nash equilibrium depends on the principle combinations chosen by players. Efficient Nash equilibria occur when the group's total contributions meet or exceed the threshold ($g_j \geq 56$). Inefficient Nash equilibria arise when the group fails to meet the threshold ($g_j < 56$).

Inefficient Nash equilibrium

An inefficient Nash equilibrium occurs when all players select the principle that minimises their individual contributions, regardless of the group's ability to meet the threshold. This leads to:

- High-endowment players: Choose equal water storage, contributing $c_i = 14$ (as it requires the least from their endowment).
- Low-endowment players: Choose equal water use, contributing $c_i = 6$ (as it requires the least from their endowment).

Total Contribution:

$g_j = 14 + 14 + 6 + 6 = 40$, which is below the threshold ($T = 56$).

Outcome:

- The group fails to meet the threshold, and no returns are generated from the public account ($\alpha_i = 0$).
- Each player retains only the private benefit from their remaining endowment:

$\pi_i = \beta_i(y_i\text{-}c_i)$

This represents a classic free-riding scenario where no individual has an incentive to contribute more unilaterally, resulting in inefficiency.

Efficient Nash equilibria

Efficient Nash equilibria occur when players coordinate their principle selection to meet the threshold $(gj \geq 56)$ while maximising their individual and group payoffs. For example:

- High-endowment Player 1: Chooses equal water use $(c_i = 22)$.
- High-endowment Player 2: Chooses proportional water use $(c_i = 18)$.
- Low-endowment Player 1: Chooses equal water storage $(c_i = 14)$.
- Low-endowment Player 2: Chooses proportional water use $(c_i = 10)$.

Total contribution: $g_j = 22 + 18 + 14 + 10 = 64$, which exceeds the threshold and ensures efficient returns from the public account.

Social optimum

The social optimum in Part 2 remains the allocation that maximises total group welfare (W) by ensuring the threshold is met and group contributions are distributed equitably. This can be achieved under any of the burden-sharing principles, provided all players choose the same principle.

4.5 Procedures

The study's research protocol received approval from the Commerce Research Ethics Committee. Prior to data collection, informed consent was obtained from all participants in line with ethical requirements. With these protocols in place, the primary objective of the study was to investigate the behavioural patterns associated with resource sharing, particularly in the context of water consumption. The study aimed to reach 400 residents of Cape Town, drawing insights from a representative sample of the population. In the end, 315 residents participated in the study. The sample consisted of respondents who lived at the residence associated with the account number and were responsible for paying the municipal bill. The author obtained the list of account numbers and bills from the City of Cape Town. Tenants who did not pay the municipal account bill, as well as landlords who did not live in the residence linked to the account number, were excluded. To ensure the integrity of the responses, participants were reassured of the strict confidentiality and anonymity protocols in place. Their choices, predictions, and feedback remained undisclosed and anonymous.

Ask Afrika facilitated the payment distribution to participants, determining the amounts based on their personal contributions as well as the collective decisions of their group members. These groups were not formed in person; rather, participants completed the survey individually, with their responses later combined to simulate group interactions. Participants were guaranteed a base payment of R50 ($2.60) for their participation, with the potential to earn additional amounts ranging from R0 to R627 ($0 to $32.70), depending on their choices and the decisions of others in their group. Payments were made in the form of vouchers from either Shoprite or Takealot, which were distributed approximately three weeks after survey completion.

Upon the completion of all treatments, participants took a comprehensive survey capturing their demographic information, household water use habits, and attitudes toward water conservation and management. The survey included questions about their age, education, household income, water usage behaviours, willingness to pay for additional water infrastructure, and personal views on various social and economic issues. A portion of the survey explored the cultural theory of risk, examining how cultural and societal orientations influenced risk perceptions in water resource management. The survey placed particular emphasis on monthly water use and bills, with questions focusing on water usage during pre-drought, drought, and in 2023 when the survey was conducted. Participants also had the opportunity to earn additional rewards for accurately estimating the water consumption of both high- and low-income households during these periods (refer to Appendix A2). This provided a comprehensive understanding of the interplay between culture, economics, and water resource management in Cape Town.

5. Methodology

This study employs regression analysis to assess how individual characteristics, cultural beliefs, and policy preferences influence both token contributions in Part 1 and burden-sharing choices in Part 2 of the experiment. The choice of regression models is based on the nature of the dependent variables in each part of the experiment.

In Part 1, the dependent variable is the proportion of tokens contributed to the city's water storage. An Ordinary Least Squares (OLS) regression is used as an approximation to examine how different factors influence contribution behaviour. This approach allows for a straightforward interpretation of how socioeconomic characteristics, cultural beliefs, and policy attitudes impact public goods contributions.

In Part 2, the dependent variable is the burden-sharing principle selected, which is a categorical variable with three options (equal water use, proportional water use, and equal water storage). Given the categorical nature of the outcome, a multinomial logistic regression is used to evaluate how the independent variables influence players' preferences for burden-sharing rules. This method is appropriate for modelling choices between multiple unordered categories, as it allows for comparisons between the different burden-sharing principles while accounting for the role of individual characteristics.

Table 4 summarises the regression models, dependent and independent variables, and their alignment with the research objectives.

Table 4. Summary of regression models and research objectives

Analysis	Method	Dependent variable	Independent variables	Research objective
Part 1: Token contributions	OLS Regression	Proportion of tokens contributed	Burden-sharing principles, annual household income, gender, education, age, household consumption beliefs, cultural characteristics (hierarchy, individualism, egalitarianism, and fatalism),	Examine how socioeconomic and cultural factors influence contributions to public goods.

Analysis	Method	Dependent variable	Independent variables	Research objective
			and policy preferences	
Part 2: Burden-sharing preferences	Multinomial logistic regression	Chosen burden-sharing principle (equal water use, proportional water use, equal water storage)	Token contributions, annual household income, gender, education, age, household consumption beliefs, cultural characteristics, and policy preferences	Understand preferences for burden-sharing principles and their determinants.

Variables included in the regression analysis

The regression models include a range of explanatory variables to examine the factors influencing contributions in Part 1 and burden-sharing preferences in Part 2. These variables encompass burden-sharing preferences, proportion of token contributions, annual household income, gender, education, age, household consumption beliefs, cultural characteristics, and policy preferences.

Annual household income is categorised into lower, middle-, and upper-income groups based on self-reported income, using thresholds from the neighbourhood lifestyle index:

- Lower income: R140 100 or less
- Middle income: Between R140 101 and R490 850
- Upper income: Greater than R490 850

To account for perceptions of water consumption, two variables are included:

- High-income consumption belief represents players' estimates of the monthly water usage of high-endowment individuals in January 2023.
- Low-income consumption belief reflects players' estimates of the monthly water consumption of low-endowment individuals in January 2023.

Cultural characteristics are measured using responses to Question 23 (Section E) of the survey in Appendix A2, which captures participants' alignment with four cultural worldviews: hierarchy, individualism, egalitarianism, and fatalism.

Policy preferences are drawn from a previous study by Cappelen et al. (forthcoming), where participants rated their agreement with different actions the City of Cape Town could take to manage water shortages.[9] Responses were recorded on a 0 to 10 scale (0 = completely disagree, 10 = completely agree). The full set of policy preference questions is provided in Appendix C.

These actions were categorised as either hard or soft policies. Hard policies involved stricter regulatory measures, such as implementing water restrictions (Question 1), increasing tariffs (Question 4), and reducing water pressure (Questions 5 and 6). In contrast, soft policies focused on encouraging behavioural change through information and awareness, including educating residents on water conservation (Question 2) and using water bills to provide feedback on usage (Question 3).

By employing these regression models, the study aims to provide insights into how individual characteristics, fairness perceptions, and cultural values influence public goods contributions and burden-sharing preferences, ultimately informing the design of equitable and effective water conservation policies.

6. Results

6.1 Experimental results

This section will present the results for Part 1, where participants had to indicate the number of tokens they would like to contribute to the city's water storage, and Part 2 where participants had to select a burden-sharing principle. Overall, average rand earnings, including the participation fee for high and low-income participants, are R351.01 ($19.64) and R337.20 ($18.87), respectively.

Earned vs Random Treatments

The lack of significant differences in contributions to the public good and burden-sharing preferences between the Earned and Random treatments (as shown in Appendix D, Table D1 and Table D2) indicates that the method of income assignment, whether random or based on the neighbourhood index, did not influence players' behaviour in this context. Similarly, the results in Table D3 and Table D4 in Appendix D show minimal differences in average token contributions and the percentages at which different burden-sharing principles were selected by high- and low-endowment players.

As a result, the analysis proceeds by pooling the results across treatments and focusing solely on differences between high- and low-endowment players.

6.1.1 Part 1 - Contributions to the city's water storage

In Part 1 of the game, players decide how many tokens from their endowment to contribute directly to the city's water storage (i.e., the public account). High-endowment players receive 36 tokens, while low-endowment players receive 20 tokens. On average, high-endowment participants contribute 16.20 tokens, while low-endowment participants contribute 13.78 tokens. The contributions of high- and low-endowment players differ significantly (Mann-Whitney, $p = 0.00$).

Figures 4 and 5 present the frequency distribution of tokens contributed to the public account (city's water storage), showing how many high- and low-endowment players contributed 1 token, 2 tokens, and so on. The dashed red lines indicate the token contributions required under

[9] As outlined in the procedure section, the sample used in this experiment is a subset of the participants from the Cappelen et al. (forthcoming) study.

each burden-sharing principle: equal water use (EWU), proportional water use (PWU), and equal water storage (EWS).

High-endowment players generally contribute more tokens, with notable peaks observed at 20, 18, and 36 tokens. The most frequent contribution occurs at 20 tokens, which falls between the proportional water use and equal water use principles, with 29.41% of high-endowment players contributing this amount. The second most common contribution aligns with the proportional water use principle (18 tokens), with 19.12% of players selecting this amount. Additionally, a substantial proportion of high-endowment players contribute all their tokens (36), with 11.76% making a full contribution to the public account.

Low-endowment players exhibit a wider spread of contributions, with notable peaks at 5, 10, and 20 tokens. The most common contribution is 10 tokens, which aligns with the proportional water use principle, with 47.49% of low-endowment players selecting this amount. A smaller peak is observed at 5 tokens, just below the equal water use principle, with 14.53% of players contributing at this level. A notable proportion of low-endowment players (15.64%) contribute their full endowment (20 tokens).

Overall, while contributions vary, most of the frequent contribution levels closely align with the burden-sharing principles, with proportional water use being the most consistent across both player groups.

Figure 4. High-endowment players: frequency of token contribution to the public account (city's water storage)

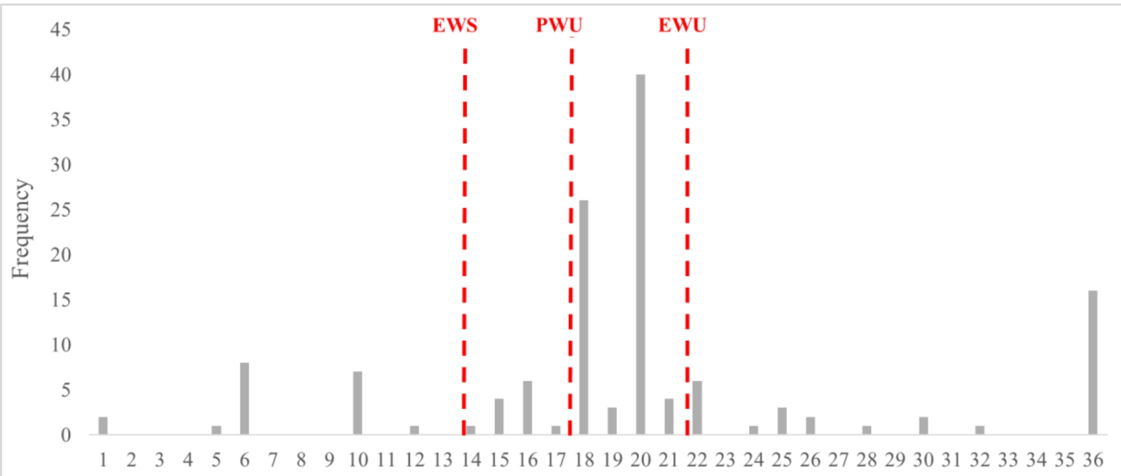
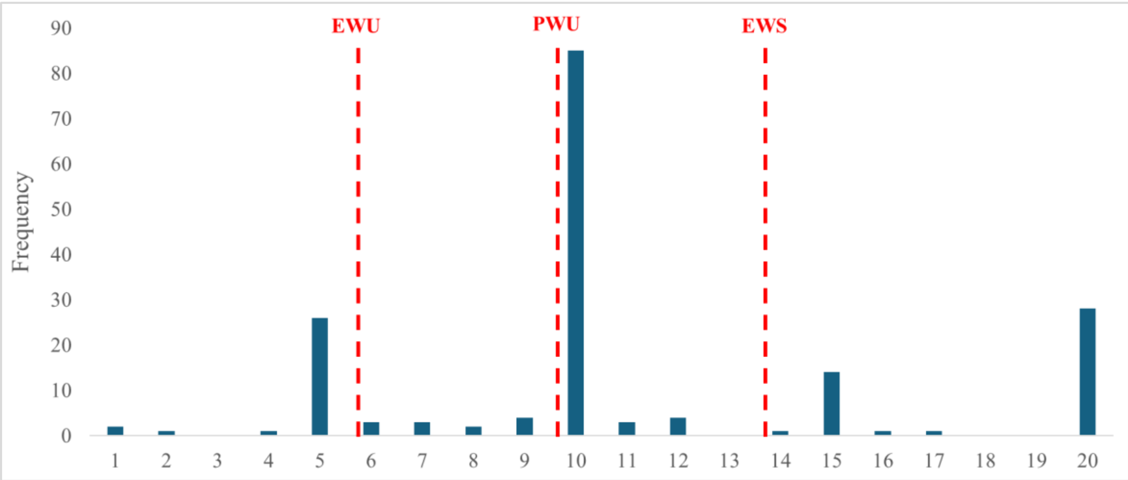


Figure 5. Low-endowment players: frequency of token contribution to the public account (city's water storage)



Meeting the target

Across all groups, 27% failed to reach the target. [10] On average, high-endowment players contribute just under half of their endowment, whereas low-endowment players contribute more than half of their endowment.

6.1.2 Part 2- Selection of burden-sharing principle

In Part 2 of the game, players do not decide how many tokens to contribute directly. Instead, they choose one of three burden-sharing principles (section 4.3) which determine their contributions to the city's water storage. The choice of principle reflects how players believe the conservation burden should be distributed.

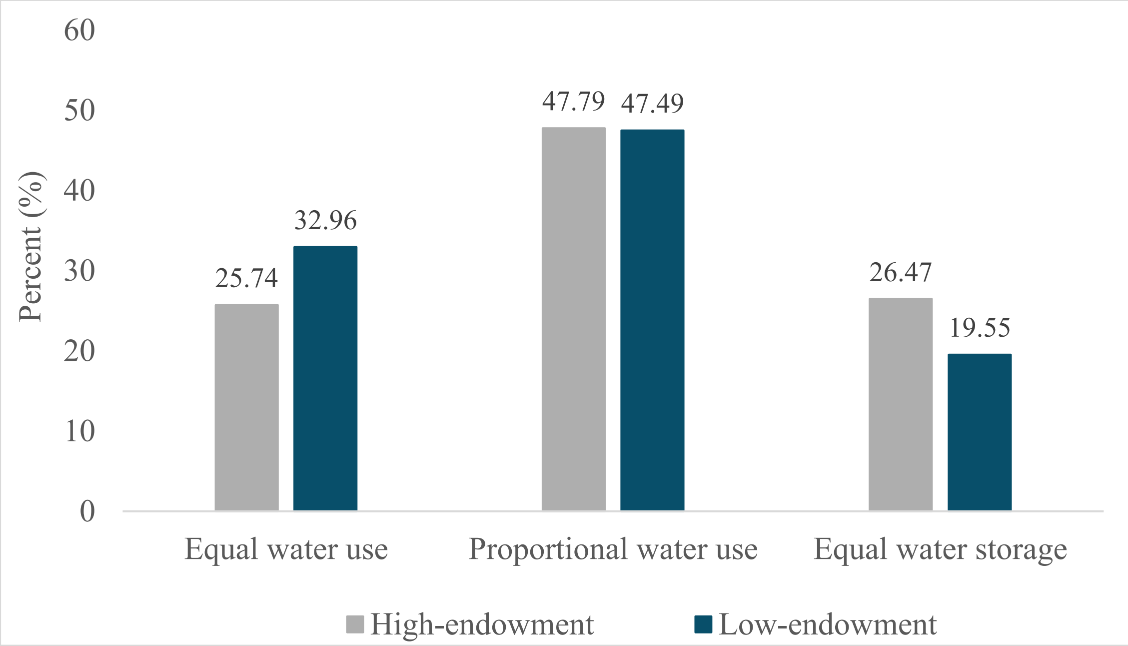
Existing literature suggests that individuals tend to prefer burden-sharing principles that align with their self-interest. Lange et al. (2010) and Carlsson et al. (2013) argue that self-interested behaviour often guides the application of equity principles, a finding consistent with broader empirical research on self-self-interested biases (Babcock & Loewenstein, 1997; Brekke & Johansson-Stenman, 2008). If self-interest drives decisions in this experiment, high- and low-endowment players are expected to select the burden-sharing principle that requires the smallest contribution from them.

- For high-endowment players, the equal water storage principle requires the lowest contribution (14 tokens), leaving them with 22 tokens for personal use.
- For low-endowment players, the equal water use principle minimises their burden, requiring only 6 tokens and leaving them with 14 tokens for personal use (see Table 2).

[10] 25 out of 93 groups. This figure includes fictitious players, who were added only because the sample did not yield a perfect balance between high- and low-income respondents. To complete the partnership groups, fictitious partners were constructed using typical answers observed within the two groups, with values based on the most common responses at the time of the experiment. This adjustment was made solely to enable accurate calculation of group payouts. These fictitious players were not included in any of the reported results and therefore did not affect the analysis. Excluding these players results in 28% (18 out of 64) of groups that did not meet the target.

Figure 6 shows the percentage of high-endowment and low-endowment players who selected each burden-sharing principle within their respective groups.

Figure 6. Choice of burden-sharing principle, by player type (%)



High-endowment participants

Although the equal water storage principle would allow high-endowment players to retain the most tokens (22 tokens), only 26.47% of high-endowment players choose this option, which requires a contribution of 14 tokens to the city's water storage Instead, the majority (47.79%) select the proportional water use principle, which requires a higher contribution of 18 tokens, leaving them with 18 tokens for their own personal use. The equal water use principle, which demands the largest contribution from high-endowment players (22 tokens) and leaves them with the fewest tokens for personal use (14 tokens), is chosen by 25.74%, a share nearly identical to that of the equal water storage principle.

These results suggest that high-endowment players do not fully align with self-interest, as a significant proportion select burden-sharing principles that impose higher contributions on themselves. Their preference for the proportional water use principle may indicate a tendency to prioritise fairness or proportionality over maximising personal token use.

Low-endowment participants

A similar trend is observed among low-endowment players. The majority of low-endowment players (47.49%) select the proportional water use principle, requiring a contribution of 10 tokens to the city's water storage, leaving them with 10 for personal use. Interestingly, the equal water use principle—which minimises their burden (6-token contribution, leaving 14 tokens for personal use)—is the second most preferred choice (32.96%) rather than the majority preference. The equal water storage principle, which requires the largest contribution (14 tokens, leaving only 6 for personal use), is chosen by the fewest low-endowment players

(19.55%). This is expected, as it places a greater burden on low-endowment players, making it less appealing for them to contribute more to the city's water storage.

Statistical comparison

A Chi-Square test of independence (Table 5) shows no statistically significant difference in the selection of burden-sharing principles between high- and low-endowment players ($p = 0.224$). This suggests that factors beyond endowment level-such as education, household income, or cultural beliefs, may influence participants' choices. These potential influences are further examined in the regression analysis presented in the next subsection.

Table 5. Test for differences in burden-sharing selection

Comparison group	Chi^2 stat	P value
High vs Low-endowment players	2.994	0.224

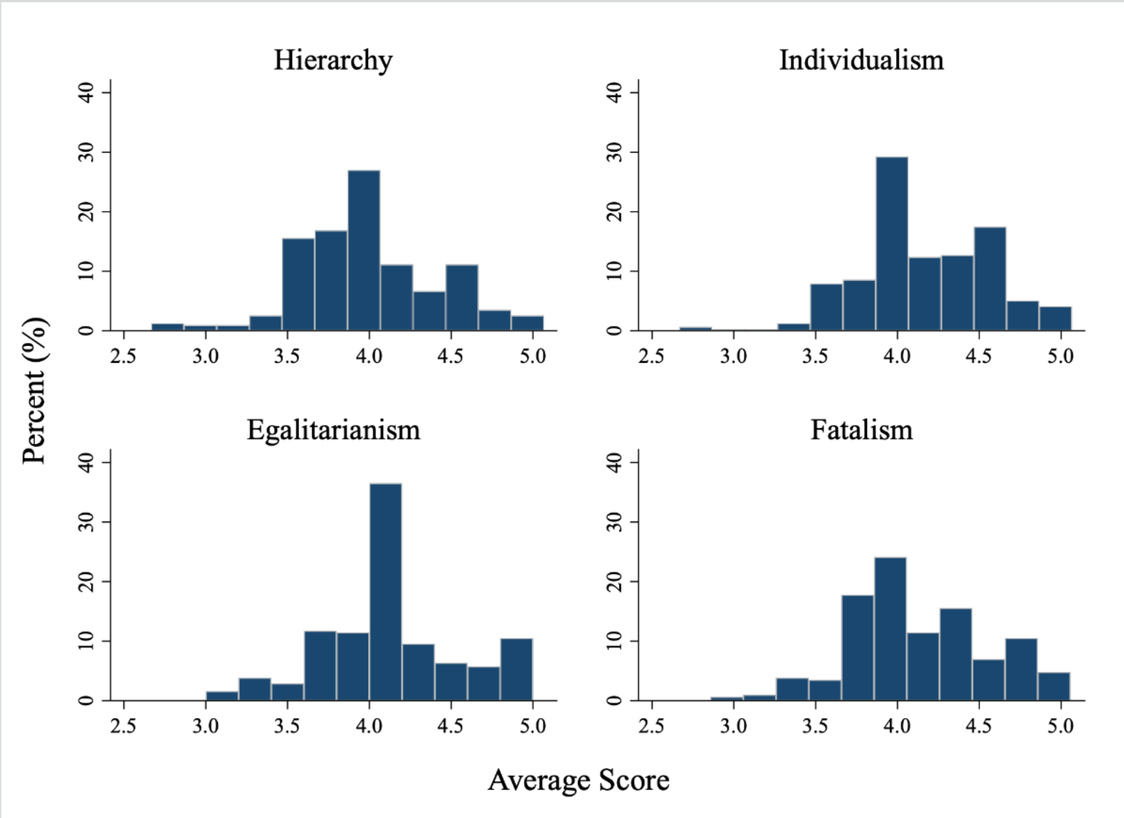
6.1.3 Cultural theory of risk

Apart from beliefs around fairness, cultural beliefs may also influence behaviour when it comes to water savings.

Figure 7 presents histograms illustrating the distribution of responses to cultural belief statements across four quadrants: hierarchy, individualism, egalitarianism, and fatalism. These questions can be found in Appendix A.2 (questions 23.1-23.5). A score of 1 indicates strong disagreement and 5 indicates strong agreement.

The consistent scoring between 3 and 5 across all four quadrants of cultural beliefs—hierarchy, individualism, egalitarianism, and fatalism—indicates a general trend towards agreement or alignment in respondents' cultural orientations. These results suggest a remarkable uniformity in cultural attitudes among the surveyed individuals, regardless of their specific cultural predispositions. Whether valuing clear principles and leadership (hierarchy), endorsing personal freedom and initiative (individualism), advocating for social equality and justice (egalitarianism), or acknowledging the unpredictability of life's events (fatalism), respondents consistently expressed high levels of agreement with the statements presented.

Figure 7. Participant cultural theory of risk belief distribution



6.2 Regression Analysis

6.2.1 Part 1 - Contributions to the city's water storage

The relationship between player type (high-endowment in column 1 vs low-endowment in column 2) and token contributions is assessed using an ordinary least squares (OLS) regression analysis. The results are displayed in Table 6 below.

The dependent variable is expressed as a proportion of tokens contributed in Part 1 of the experiment, rather than absolute token contributions, to account for differences in players' endowments. This ensures that contributions are measured relative to what each player has available, allowing for a more meaningful comparison of generosity and burden-sharing behaviour across player types. Results based on the absolute number of tokens contributed as the dependent variable can be found in Appendix E (Table E1).

High-endowment players

The regression results from Part 1 provide limited evidence of a significant relationship between token contributions and burden-sharing principle preferences selected in Part 2. For high-endowment players, choosing the equal water use principle in Part 2 compared to the baseline equal water storage principle decreases the portion of tokens contributed to the city's water storage, this result is however not statistically significant ($p = 0.922$). Similarly, choosing the proportional water use principle (compared to equal water storage) in Part 2 decreases the portion of tokens contributed to the city's water storage and is also not significant ($p = 0.593$). This lack of significance suggests that high-endowment players' contributions in Part 1 are less driven by explicit considerations of burden-sharing principles, unlike those of low-endowment players (discussed below).

However, policy preferences significantly influence the contributions of high-endowment players in Part 1. Players who favour hard policies contribute, on average, 2.7% more of their endowment compared to those who do not ($p<0.05$). This suggests a stronger commitment to conservation measures among players who support stricter water-saving interventions.

Interestingly, gender also plays a role: male high-endowment players contribute 8.2% less of their endowment compared to females ($p<0.10$). This disparity may reflect differing attitudes toward fairness or resource conservation between genders.

Gender also plays a role in contribution decisions, with male high-endowment players contributing 8.2% less of their endowment compared to females **(**$p<0.10$**).** This finding aligns with Brick, Visser and Burns (2012)**,** who found that female fishers are more likely to comply with fisheries regulations than their male counterparts. In the context of this experiment, female high-endowment players contribute more to the public account, which may similarly reflect a greater tendency toward cooperative behaviour and compliance with shared resource management.

Low-endowment players

For low-endowment players, the OLS regression in Table 6 shows a significant association between the equal water use principle and lower token contributions in Part 1 ($p<0.01$) compared to those choosing equal water storage, the base category. Players who ultimately chose the equal water use principle in Part 2 contributed 15% less of their endowment in Part 1 compared to those choosing the baseline principle, equal water storage. This aligns with the design of the equal water use principle, which requires the smallest contribution (6 tokens), enabling players to retain the majority of their endowment (14 tokens) for personal use.

This tendency is reflected in Figure 5, where a notable concentration of low-endowment players contributes 5 tokens, closely aligning with the equal water use principle. This behaviour suggests that low-endowment players gravitate toward principles that minimise their individual burden, even when given the opportunity to contribute freely.

In contrast, selecting the proportional water use principle in Part 2, which requires a moderate contribution of 10 tokens, does not significantly reduce contributions in Part 1 compared to the baseline principle, equal water storage. This indicates that low-endowment players who prefer the proportional water use principle are more willing to contribute at moderate levels than those who ultimately choose equal water storage. Figure 5 supports this finding, with the largest peak of contributions for low-endowment players occurring at 10 tokens, directly aligning with the proportional water use principle.

Table 6. Part 1- OLS regression results for high and low-endowment players

	(1) High-endowment	(2) Low-endowment
Burden-sharing principle chosen in Part 2:		
(Equal water storage base)		
Proportional water use	-0.033	-0.068
	(0.051)	(0.051)
Equal water use	-0.009	-0.150***
	(0.054)	(0.054)
Family's financial situation (annual household income):		
(Low-income base):		
Middle-income	-0.068	0.033
	(0.051)	(0.042)
Upper-income	0.033	0.044
	(0.058)	(0.098)
Male	-0.082*	0.076*
	(0.045)	(0.041)
Highest level of education completed:		
(Grade 12 base)		
Secondary education	-0.027	0.010
	(0.046)	(0.043)
Tertiary education	-0.042	-0.092
	(0.050)	(0.066)
Age (years):		
(25-35 base)		
18-24	0.066	-0.103
	(0.092)	(0.108)
36-44	-0.023	-0.040
	(0.064)	(0.069)
45-64	0.001	-0.077
	(0.060)	(0.059)
65+	0.011	-0.054
	(0.083)	(0.078)
Household consumption beliefs:		
High-endowment consumption beliefs	0.004	-0.001
	(0.003)	(0.003)
Low-endowment consumption beliefs	-0.007	-0.002
	(0.005)	(0.006)
Cultural theory of risk:		
Hierarchy	-0.005	-0.017
	(0.055)	(0.054)
Individualism	-0.023	0.031
	(0.060)	(0.063)
Egalitarianism	0.080	0.019
	(0.052)	(0.053)
Fatalism	0.004	-0.066
	(0.059)	(0.052)
Policy preferences:		
Hard policies	0.027**	-0.007
	(0.012)	(0.011)
Soft policies	-0.016	-0.012
	(0.011)	(0.010)
Constant	0.512*	0.878***
	(0.272)	(0.276)

	(1) High-endowment	(2) Low-endowment
Observations	136	179
R-squared	0.196	0.112

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

6.2.2 Part 2- Selection of burden-sharing principle

The relationship between player type (high-endowment in column 1 vs low-endowment in column 2) and the burden-sharing principles selected is examined through a multinomial logistic regression. The results are displayed in Table 7 below. A multinomial logistic regression is used because the dependent variable (the chosen burden-sharing principle) is categorical with three unordered options (equal water use, proportional water use, and equal water storage). This method allows for the analysis of how different factors influence the probability of selecting each principle, with equal water storage set as the base category for comparison.

Explanatory variables incorporated into the model include the proportion of tokens contributed in Part 1 of the experiment, annual household income, gender, education, age, household consumption beliefs, cultural characteristics (hierarchy, individualism, egalitarianism, and fatalism), and policy preferences. Results where absolute token contributions are used instead of proportions can be found in Appendix F (Table F1).

It is important to note that the coefficients from the multinomial logistic regression are not directly interpretable as probabilities. Instead, they should be understood in terms of their sign and statistical significance. A positive and significant coefficient indicates that an increase in the corresponding variable raises the likelihood of selecting that burden-sharing principle relative to the base category, while a negative and significant coefficient suggests the opposite. Non-significant coefficients indicate that the variable does not have a meaningful effect on the choice of principle. In this way, the results highlight which socioeconomic, behavioural, and cultural factors influence the choice of burden-sharing principles. The interpretation focuses on whether these factors increase or decrease the likelihood of selecting a principle relative to the base category, rather than on the exact size of the probability change.

High-endowment players

The multinomial logistic regression results for high-endowment players in Part 2 reveal that their choice of burden-sharing principles is significantly influenced by their education and policy preferences, and cultural values, rather than their contributions in Part 1. Players with secondary education experienced a 1.655 increase in the log of odds of selecting the equal water use principle compared to the baseline equal water storage principle ($p<0.05$). This suggests that moderately educated players favour egalitarian fairness, even though equal water use requires the highest contribution (22 tokens) from high-endowment players. Additionally, players with stronger egalitarian values are significantly less likely to select the proportional water use principle compared to equal water storage ($p<0.05$). This negative association indicates that high-endowment players who prioritise strict egalitarian fairness may perceive proportional water use, which scales contributions with endowment, as less desirable because it does not enforce absolute equality in contributions.

Unlike low-endowment players, high-endowment players' contributions in Part 1 (as a proportion of their endowment) do not significantly influence their principle selection in Part 2, suggesting that their initial decisions are less connected to their later preferences for burden-sharing principles. Figure 4 illustrates the wide dispersion of contributions among high-endowment players in Part 1, with notable peaks at 18 tokens (in line with the proportional water use principle), 20 tokens (almost in line with equal water use), and 36 tokens, where players contribute their full endowment. This distribution reflects the heterogeneity in motivations among high-endowment players: while some align with formal burden-sharing principles, others appear to contribute out of altruism or personal responsibility, independent of explicit fairness principles.

Low-endowment players

The multinomial logistic regression results for Part 2 reinforce the patterns observed in Part 1 for low-endowment players. Players who contribute a smaller proportion of their endowment in Part 1 are significantly more likely to choose the equal water use principle over the baseline equal water storage principle in Part 2 ($p<0.01$). This suggests a consistent preference for principles that minimise their individual contribution, as equal water use requires only 6 tokens, the smallest contribution of the three burden-sharing principles.

Additionally, players with stronger individualistic values are significantly more likely to choose equal water use and proportional water use over equal water storage. This suggests that low-endowment players with individualistic tendencies prefer burden-sharing principles that do not impose equal absolute contributions but instead adjust based on available resources.

The findings from Part 1 and Part 2 show that low-endowment players consistently aim to minimise their individual burden while selecting fairness principles that reflect their values. Their contribution decisions in Part 1 closely align with their burden-sharing choices in Part 2, indicating a consistent approach to resource allocation.

Table 7. Part 2: Multinomial logistic regressions for high and low-endowment players

	(1) High-endowment	(2) Low-endowment
Equal water use		
Part 1 token contribution (as a proportion of endowment)	-0.256	-2.972***
	(1.230)	(1.137)
Family's financial situation (annual household income: *(Low-income base):*		
Middle-income	-0.502	1.425**
	(0.717)	(0.609)
Upper-income	0.844	1.450
	(0.879)	(1.251)
Male	0.822	0.840
	(0.780)	(0.543)
Highest level of education completed: *(Grade 12 base)*		
Secondary education	1.655**	-0.350
	(0.708)	(0.568)
Tertiary education	0.473	-1.695*

	(1) High-endowment	(2) Low-endowment
	(0.791)	(0.985)
Age (years): *(25-35 base)*		
36-44	-1.315	-0.465
	(0.940)	(0.924)
45-64	-0.980	-0.579
	(0.820)	(0.914)
65+	-0.992	-1.204
	(1.280)	(1.114)
Household consumption beliefs:		
High-endowment consumption beliefs	-0.047	-0.002
	(0.047)	(0.033)
Low-endowment consumption beliefs	0.010	-0.113
	(0.095)	(0.078)
Cultural theory of risk:		
Hierarchy	-0.246	-0.666
	(0.749)	(0.738)
Individualism	0.868	1.616*
	(0.813)	(0.847)
Egalitarianism	-0.378	-0.140
	(0.904)	(0.696)
Fatalism	-0.994	-0.150
	(0.844)	(0.610)
Policy preferences:		
Hard policies	-0.238	0.022
	(0.164)	(0.157)
Soft policies	0.349**	-0.141
	(0.160)	(0.126)
Constant	1.812	0.345
	(4.045)	(3.469)
Proportional water use		
Part 1 token contribution (as a proportion of endowment)	-0.622	-1.198
	(1.193)	(0.934)
Family's financial situation (annual household income: *(Low-income base):*		
Middle-income	1.084	0.758
	(0.686)	(0.595)
Upper-income	2.468***	1.498
	(0.873)	(1.194)
Male	-0.460	-0.104
	(0.763)	(0.498)
Highest level of education completed: *(Grade 12 base)*		
Secondary education	0.808	-0.493
	(0.671)	(0.564)
Tertiary education	0.354	-0.656
	(0.743)	(0.755)

	(1) High-endowment	(2) Low-endowment
Age (years):		
(25-35 base)		
36-44	-1.001	-1.857**
	(0.797)	(0.835)
45-64	-1.355*	-0.908
	(0.780)	(0.760)
65+	-0.262	-0.993
	(1.195)	(0.897)
Household consumption beliefs:		
High-endowment consumption beliefs	-0.014	-0.032
	(0.038)	(0.033)
Low-endowment consumption beliefs	0.041	-0.051
	(0.081)	(0.070)
Cultural theory of risk:		
Hierarchy	0.396	0.394
	(0.676)	(0.703)
Individualism	0.601	1.859**
	(0.807)	(0.904)
Egalitarianism	-1.617**	-0.739
	(0.768)	(0.629)
Fatalism	1.065	-0.879
	(0.841)	(0.627)
Policy preferences:		
Hard policies	-0.406**	0.085
	(0.161)	(0.148)
Soft policies	0.655***	-0.114
	(0.156)	(0.110)
Constant	-3.426	1.231
	(3.671)	(3.586)
Observations	127	172
Pseudo R2	0.213	0.142

Note: Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The equal water storage principle serves as the base category. The number of observations in Part 2 is lower compared to Part 1 regressions, as individuals aged 18–24 were excluded. This age group was removed because its small sample size (7 individuals for low-endowment players and 9 for high-endowment players) significantly inflated some results.

7. Discussion and conclusion

This study aimed to investigate the preferences for burden-sharing principles among Cape Town residents in the context of water conservation, focusing on how beliefs, policy preferences, and the cultural theory of risk influence these preferences. Through experimental techniques, the research explored endowment status on water-saving behaviours, as well as the fairness perceptions surrounding water consumption during times of drought. The findings contribute to the growing literature on equity principles and public goods, revealing distinct patterns of behaviour between high- and low-endowment players in their contributions to the public account and their preferences for burden-sharing principles. The results highlight how economic constraints, social preferences, and fairness norms interact to shape cooperative decision-making in resource-scarce contexts. While cultural theory of risk perceptions did not significantly influence contributions in Part 1, they emerged as important factors in Part 2, providing insights into how cultural preferences can shape cooperative decision-making in resource-scarce contexts.

Discussion

The behaviour of low-endowment players demonstrated a consistent pattern across both parts of the experiment. In Part 1, low-endowment players who contributed a smaller proportion of their endowment to the public account were more likely to choose the equal water use principle in Part 2, which required the smallest contribution (6 tokens). This reflects a strong preference for minimising their individual burden, consistent with self-serving equity principles observed in previous studies (Babcock & Loewenstein, 1997; Brekke & Johansson-Stenman, 2008). Additionally, individualism significantly increased the likelihood of choosing both the equal water use and proportional water use principles. The least favoured principle, equal water storage, required the largest contribution (14 tokens) and was chosen by only 19.55%, reflecting its incompatibility with their financial constraints.

For high-endowment players, the relationship between contributions in Part 1 and burden-sharing preferences in Part 2 was less consistent. While they generally contributed more tokens on average, their choices of burden-sharing principles in Part 2 were influenced by factors such as education, policy preferences, and cultural values rather than their contributions in Part 1. Players with secondary education were significantly more likely to choose the equal water use principle over the equal water storage principle, suggesting a preference for egalitarian fairness even at a personal cost. Similarly, players who favoured soft policies were more likely to select the proportional water use principle over equal water storage. This is particularly notable for high-endowment players, as the equal water storage principle requires the lowest contribution (14 tokens) compared to proportional water use (18 tokens) and equal water use (22 tokens). Choosing a principle that demands a higher personal contribution suggests that factors beyond self-interest, such as fairness concerns, influence decision-making. These findings align with the broader literature on social preferences, which suggests that higher-income individuals may exhibit pro-social behaviour driven by altruism or fairness concerns, even when it results in higher contributions (Fehr & Schmidt, 1999; Cappelen et al., 2019).

Egalitarianism negatively influenced the likelihood of selecting the proportional water use principle compared to equal water storage, indicating that high-endowment players with stronger egalitarian values may perceive proportional water use, which scales contributions with endowment, as less desirable because it does not enforce absolute equality in contributions. The lack of a clear relationship between Part 1 token contributions and Part 2 burden-sharing preferences among high-endowment players suggests that their decision-making may be shaped by a combination of intrinsic motivations and strategic consideration.

The observed deviation from Nash equilibrium predictions in both groups provides further evidence that participants' behaviour was influenced by factors beyond pure self-interest. Behavioural economics offers insights into this divergence, emphasising the roles of conditional cooperation, where individuals are willing to contribute if they believe others will do the same, and inequity aversion, which drives a desire to minimise unequal outcomes even at personal cost (Fehr & Gächter, 2000; Katuščák & Miklánek, 2022). These findings echo previous work by Milinski et al. (2008) and Tavoni et al. (2011), which demonstrated that social preferences play a crucial role in public goods games. The results suggest that fairness and perceived responsibility can outweigh purely self-interested motives, particularly for low-endowment players seeking to minimise their burden and high-endowment players demonstrating pro-social tendencies.

Cultural theory of risk perceptions did not significantly influence token contributions in Part 1 of the experiment, it played a more prominent role in Part 2, shaping burden-sharing preferences in meaningful ways. Individualism and egalitarianism, in particular, emerged as important factors. High-endowment players with stronger egalitarian values were less likely to select proportional water use over equal water storage, likely because proportional water use does not require both groups to contribute the same amount, whereas equal water storage ensures that both contribute 14 tokens. This finding contrasts with previous studies (Cox, Lobel & McLeod, 1991; Zhou et al., 2015) that identified cultural beliefs as significant predictors of cooperative behaviour in all decision-making contexts. The experimental framing, which emphasised practical considerations such as resource constraints and fairness, may have muted the influence of cultural biases in Part 1 but allowed them to emerge in Part 2, where players were explicitly asked to evaluate fairness in burden-sharing. This highlights the importance of context in shaping decision-making in cooperative scenarios.

Policy implications

The results have important implications for the design of water conservation policies in unequal societies. First, policymakers should consider the financial constraints faced by low-endowment households, ensuring that water-saving measures do not disproportionately burden the poor. In particular, existing indigent support programmes warrant closer attention, especially in assessing whether subsidised water volumes remain adequate during times of drought or water scarcity. Adjusting these provisions can help protect vulnerable households while maintaining overall conservation goals. Second, recognising that higher-endowment groups in this sample exhibit more pro-social behaviour in water use during times of crisis, policymakers can leverage fairness norms to encourage voluntary contributions to public goods, such as water-saving initiatives or investments in infrastructure. Finally, since high-endowment players' contributions and burden-sharing preferences were not strongly related but were influenced by their support for soft or hard policies, conservation strategies could incorporate both approaches to encourage water-saving behaviour. Public awareness campaigns and personalised usage feedback could appeal to those who favour voluntary conservation efforts, while tariff adjustments and water restrictions may be necessary to drive behaviour change among those who respond to enforced measures. By emphasising the effectiveness of different policy approaches, policymakers can design interventions that align with the diverse values and preferences shaping conservation decisions.

Limitations

While this study provides important insights, several limitations highlight opportunities for future research. First, the sample is not fully representative of Cape Town's population, particularly groups without access to municipal water or those in informal settlements. Expanding the sample to include these populations could improve the generalisability of the findings. Second, the use of self-reported data for household income, cultural values, and policy preferences may introduce response bias, as participants might overestimate or underestimate their circumstances or provide socially desirable answers. Future studies could complement self-reported data with objective measures to enhance accuracy.

Additionally, the decision to omit a personal cost for failing to meet the public good threshold simplified the experiment for lower-income and less-educated participants but removed a key incentive that could have provided a more realistic decision-making context, particularly for low-endowment players. Introducing a structured but low-risk penalty in future experiments could help capture how participants balance individual costs against collective benefits in real-world scenarios.

The experiment also focused on static decision-making, capturing a single instance of contribution and principle preference. In practice, water conservation is a dynamic process where behaviour evolves over time based on group feedback and changing conditions. Incorporating dynamic decision-making scenarios in future research could provide a more comprehensive understanding of how preferences evolve over time in response to changing water scarcity conditions. Finally, while cultural factors were included in the analysis, they were not significant predictors of behaviour in Part 1. However, in Part 2, Egalitarianism and Individualism emerged as significant factors. This suggests that the structured nature of the experiment may have limited the overall influence of cultural factors in individual decision-making. Future research could explore alternative methods, such as qualitative approaches or longitudinal designs, to better assess the role of cultural influences.

Conclusion

This study provides novel experimental evidence on how fairness norms, cultural values, and socioeconomic diversity shape burden-sharing preferences in water conservation. It demonstrates how economic constraints, and social preferences influence cooperative behaviour during water scarcity, offering actionable insights for policymakers in water-scarce regions. While the cultural theory of risk perceptions did not significantly influence token contributions in Part 1 of the experiment, they emerged as important factors in Part 2, with individualism and egalitarianism shaping burden-sharing preferences in meaningful ways. These findings highlight how fairness perceptions, shaped by cultural values, influence burden-sharing preferences even if they do not directly drive individual contributions.

Additionally, low-endowment players consistently sought to minimise their personal burden, while high-endowment players exhibited more complex and varied decision-making patterns influenced by education, policy preferences, and fairness norms. The findings underline the need for nuanced, equity-focused policies that balance fairness and efficiency, ensuring broad participation in water conservation efforts.

Future research could explore how cultural and social norms evolve over time in response to sustained resource scarcity and examine the effectiveness of tailored policy interventions in promoting equitable burden-sharing in diverse contexts.

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Appendix A. Experiment and survey materials

- There were four treatment groups in the experiment: EARNED high-income, EARNED low-income, RANDOM high-income and RANDOM low-income. The instructions are the same for all treatment groups except for slight nuances which are indicated in the instructions below.
- Participants were shown graphics (included in the instructions) to aid their understanding of the game.
- In the experiment, participants are referred to as high- or low-income players. However, in the analysis and presentation of the results within the paper, these groups are described as high-endowment and low-endowment players, respectively.

A1. Experiment instructions/script

We're a team from the Environmental Policy Research Unit at the University of Cape Town. We're studying how to reduce water use in the case of future droughts.

You will be in **groups of four** households, including you and three others. Each group **has 2 High-income and 2 Low-income households.** The experimenters know who your group members are, but you won't learn this during or after the game.

All your responses are confidential, and your name won't be linked to this study.

You will earn a participation fee of R50, and you can **earn more based on your choices and others in your group**. This could range from R0 to R627. We'll talk about earnings as tokens during the game, which will later be converted to rands where **1 token equals R5**.

Your group includes players from across Cape Town.
This means that we can't pay you right after you finish the questionnaire because we need to get all your group members input first.
After we've calculated your total income, we'll give you your payment as a Shoprite or Takealot voucher, which we'll discuss at the end.

This research has two parts and a short survey. We have worked out that this should take about one hour to finish. But there is no time limit.

If you have any questions, ask the assistant with you during this process. Again, **thanks for participating!**

Please note that although there have been floods in Cape Town in the past month, climate change is a reality.
This means that the Western Cape will experience more droughts in the future, like the 2016-2018 drought.
It is expected that an El Niño will occur in 2024. This means we might face another drought.
Therefore, the city should already start planning on how to manage water going forward.

Remember you are playing this game in **groups of four** households, including you and three others.

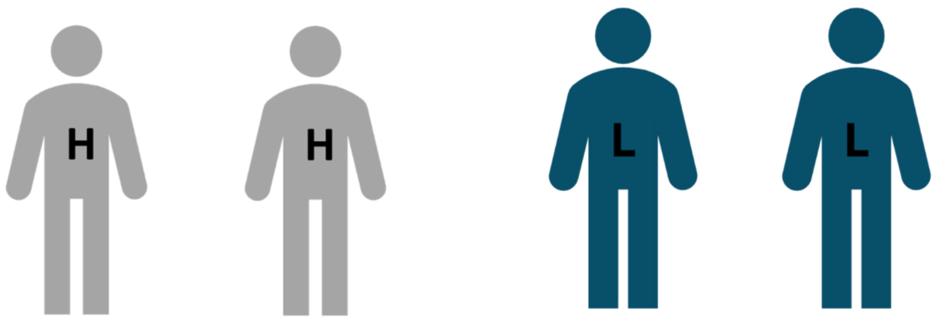
Each group **has 2 High-income and 2 Low-income households,** and Everyone in your group is given the same information to help make their decisions.

→ **You will act as a household** making **decisions about your water use.**

→ Experiment played in **groups**: **four households** in each group.

→ Each group is made up of:

2 HIGH-income households **and** **2 LOW-income households.**



This experiment explores how a city's **total available water** is best and most fairly used during a drought.

We understand that income inequality is a complex matter and wish to clarify that high and low incomes in this game are simply a feature of the experiment. This doesn't reflect any judgments about individuals or communities' values.
In our game, we've divided households into two types:

- **High-income households,** which have more appliances like showers, baths, and washing machines, and may have outdoor water needs like a garden or a swimming pool.

- **Low-income households,** which have smaller homes with fewer appliances, and perhaps a small or no garden.

For EARNED treatment:
You've been given a **water budget** for this experiment. Each household's **water budget** is based on the wealth of the neighbourhood it belongs to, where some neighbourhoods are **High-income,** and others are **Low**-income.
Your whole groups budgets are based on the wealth of their neighbourhoods.

For RANDOM treatment:
You've been given a **water budget** for this experiment. Each household's **water budget** is based on a random draw. Think of this as completely based on luck.
Your whole groups water budgets are also based on luck.

For EARNED high-income players:
For this game, you are a high-income household.
Think of this water budget as reflecting your household's **real earnings**
Remember that your household type will **remain the same** throughout the experiment.

For EARNED low-income players:
For this game, you are a low-income household.
Think of this water budget as reflecting your household's **real earnings**
Remember that your household type will **remain the same** throughout the experiment.

For RANDOM high-income players:
For this game, you are a high-income household.
Think of this as completely based on **LUCK.**
Remember that your household type will **remain the same** throughout the experiment.

For RANDOM low-income players:
For this game, you are a low-income household.
Think of this as completely based on **LUCK.**
Remember that your household type will **remain the same** throughout the experiment.

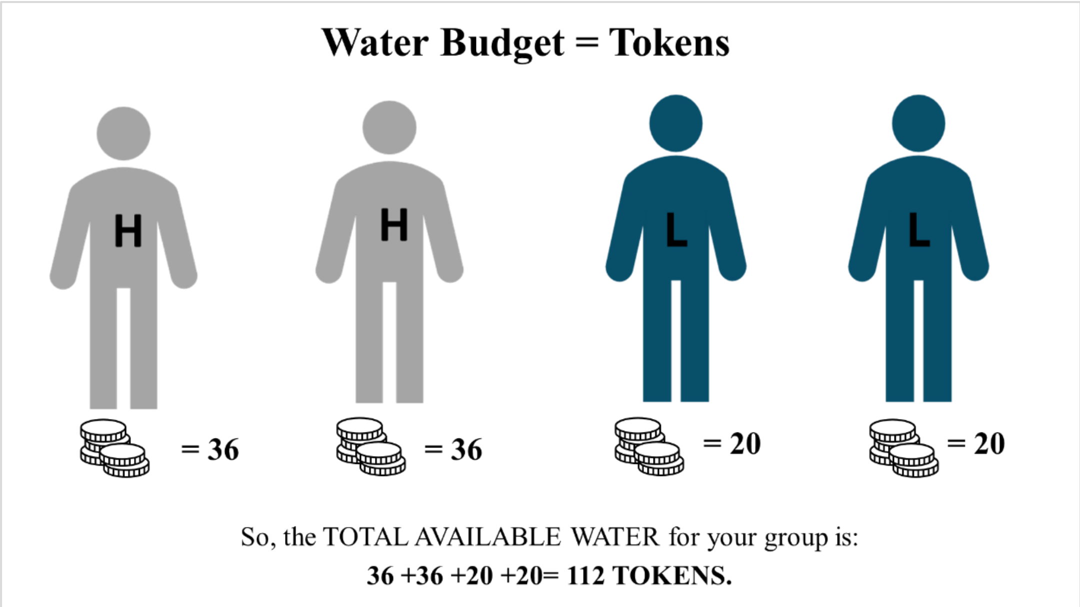
In these games, your group will always be made up of four players: two high-income and two low-income households.
You all have a set of water tokens to play the games with. The high-income will always start with 36 tokens and the low-income players will always start with 20 tokens.
This means that there are a total of 112 tokens in your group.

For EARNED high-income players: In this game, you are a high-income household because you live in a mostly middle-higher-income neighbourhood. For the whole game you will start with a water budget of 36 tokens.

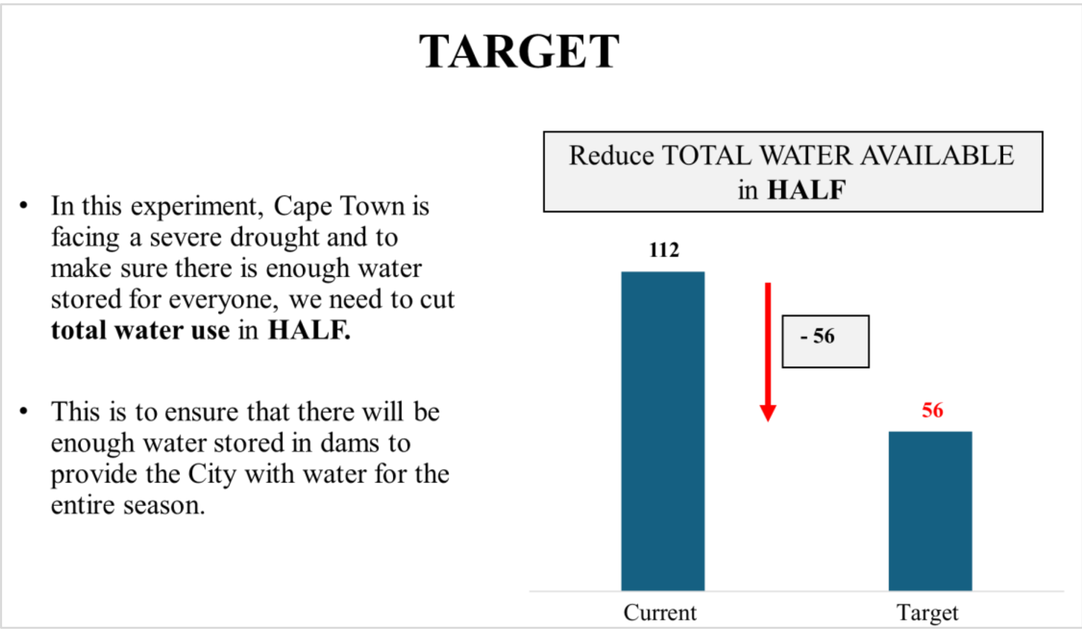
For EARNED low-income players: In this game, you are a low-income household because you live in a mostly low-middle income neighbourhood. For the whole game you will start with a water budget of 20 tokens.

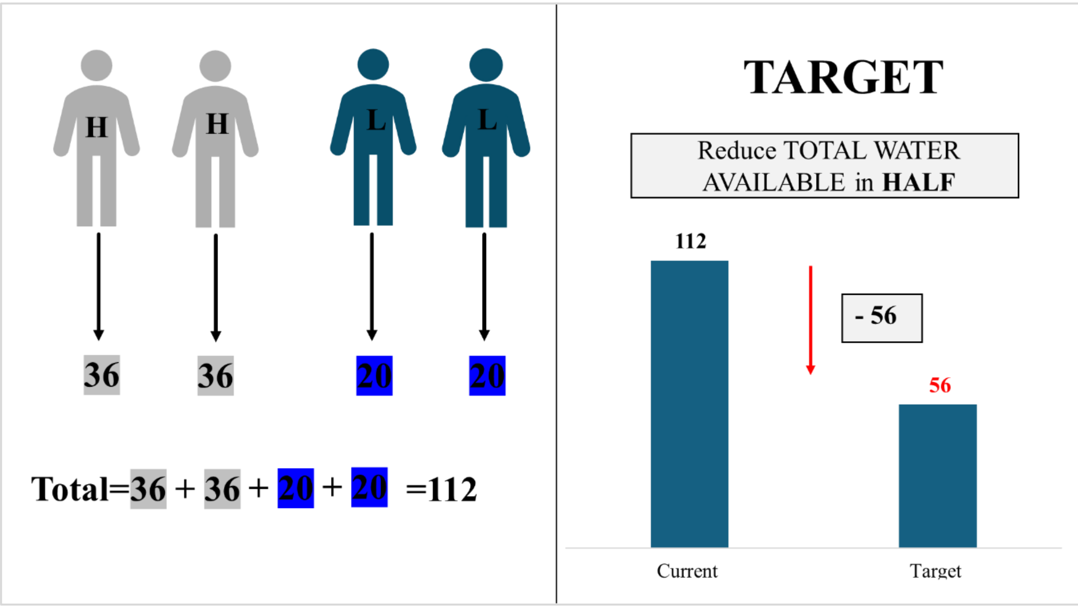
For RANDOM high-income players: In this game, you are a high-income household. This is based entirely on LUCK. For the whole game you will start with a water budget of 36 tokens.

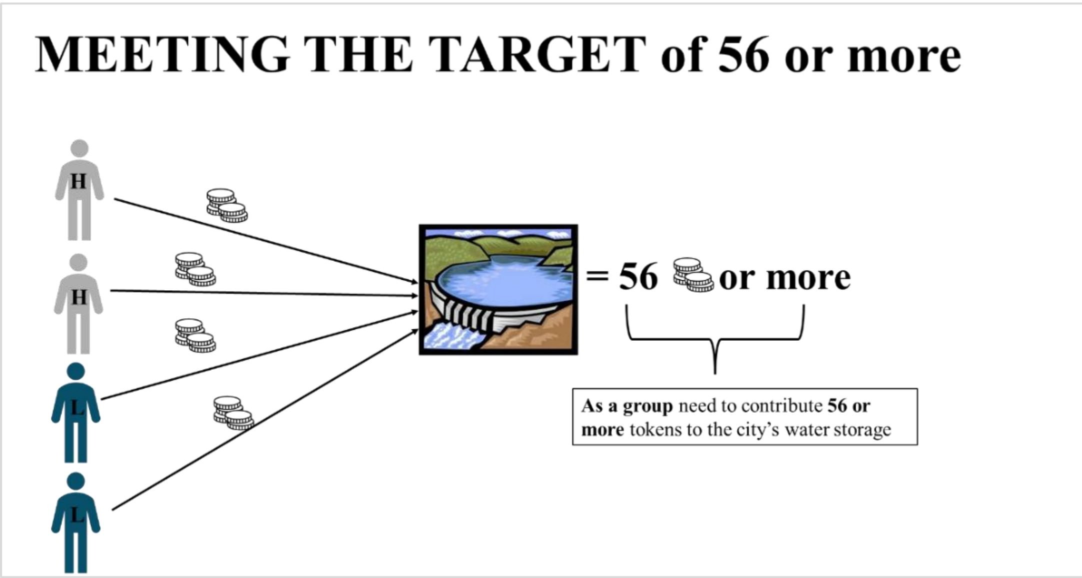
For RANDOM low-income players: In this game, you are a low-income household. This is based entirely on LUCK. For the whole game you will start with a water budget of 20 tokens.



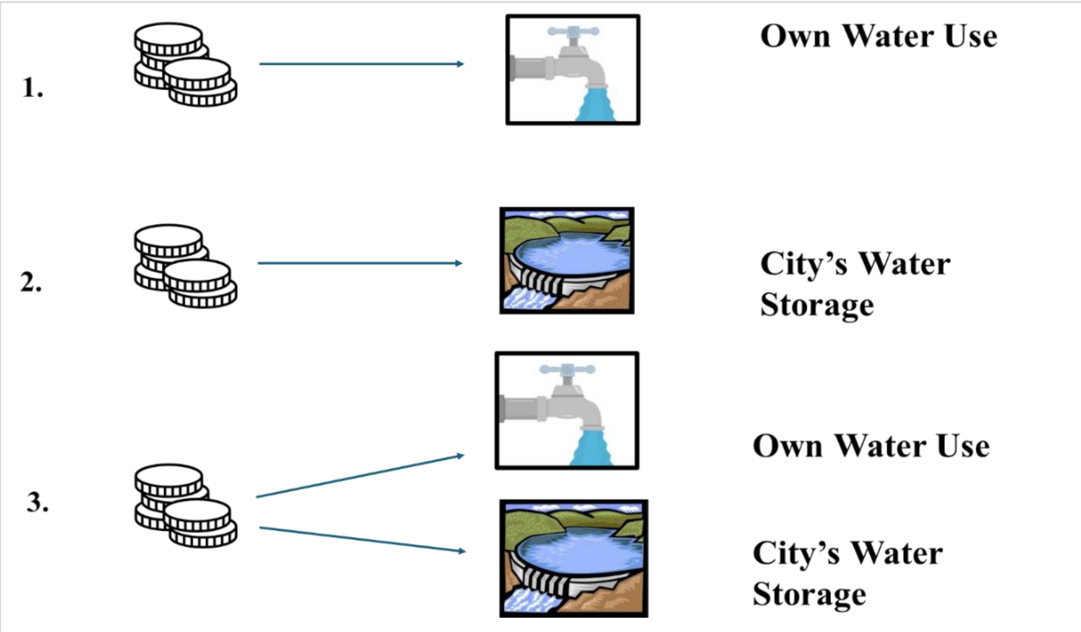
This experiment is about Cape Town facing a severe drought, and to make sure there's enough water stored for everyone, we need to reduce **total water use** by half.
This is to ensure that there will be enough water stored in dams to provide the City with water for the entire season.
Reducing the total water available by half means that both high-income and both low-income players must choose how much of their starting water tokens they want to give up to get to the target of 56 water tokens.
Next, we will discuss how you can go about doing this.







In order to reduce the total tokens from 112 to 56, you will need to decide how to use your water budget tokens.
You can either: keep tokens for your household's own water needs; give some tokens to the city's water storage; or keep some tokens for your household and give some to the city's water storage.



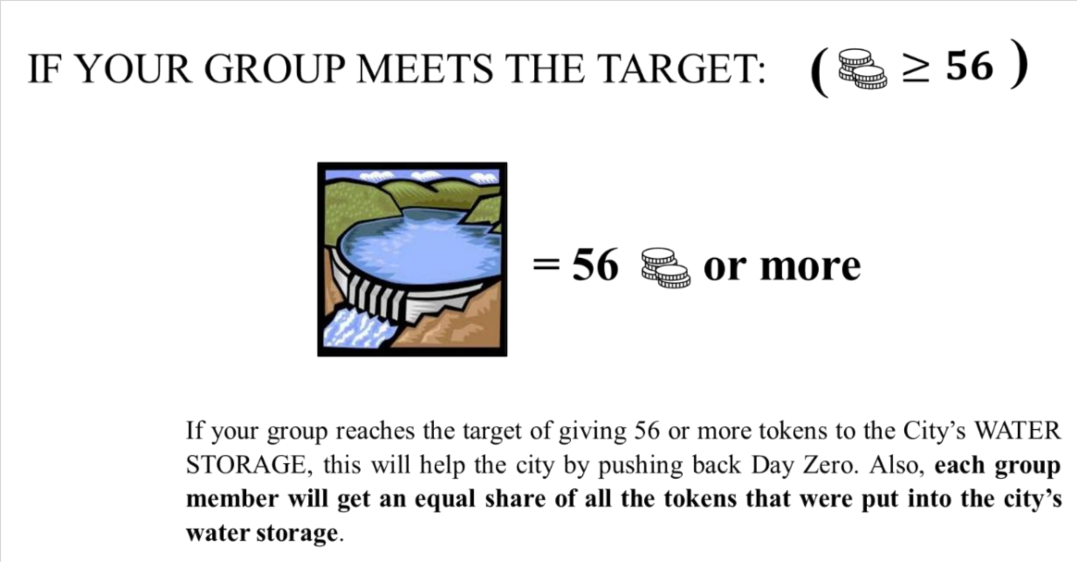
When making your choice it is important to remember to save enough tokens for your household’s **OWN WATER USE.**
Keeping tokens for your household’s water use only benefits your own household.
So, each token kept for your own water use means that the token is yours.

By giving tokens to the City’s WATER STORAGE you help to possibly make sure that there’s enough water stored in dams for the entire season.
You can only do this by lowering your **OWN USE** to save water.
Each token you give to the City’s water storage decreases your household's water token budget by one.
The benefits of giving to the City’s water storage are shared with all your group members.

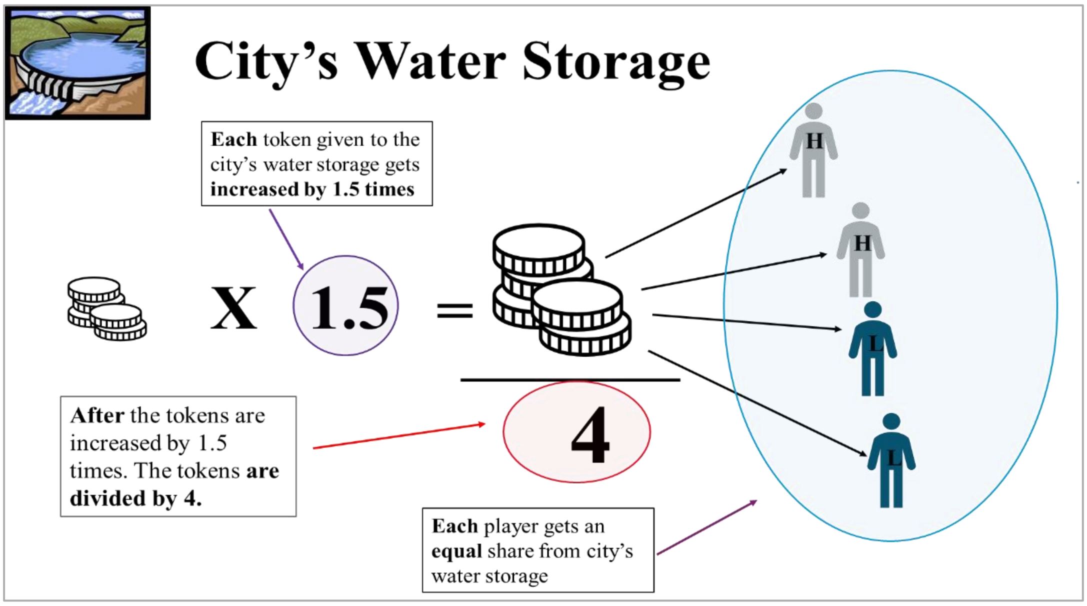
Meeting the target level of giving 56 or more tokens to the city’s water storage helps to make sure that there is enough water for the entire season.
Running out of water will cause many issues for you and the rest of the City of Cape Town.
The more water we put into the City’s water storage, the better off we all are.

Your group needs to reduce its total water use by half. **This means that out of the 112 water tokens your group has, 56 or more tokens should go towards the City’s water storage.** The rest of your own water tokens are for you to use for your household’s own water use.

If everyone in your group gives enough to the City’s water storage to reach 56 or more tokens, this will help to make sure that there will be enough water for the entire season.
After meeting the target, each group member will get an **equal share** of all the tokens that were put into the city’s water storage.

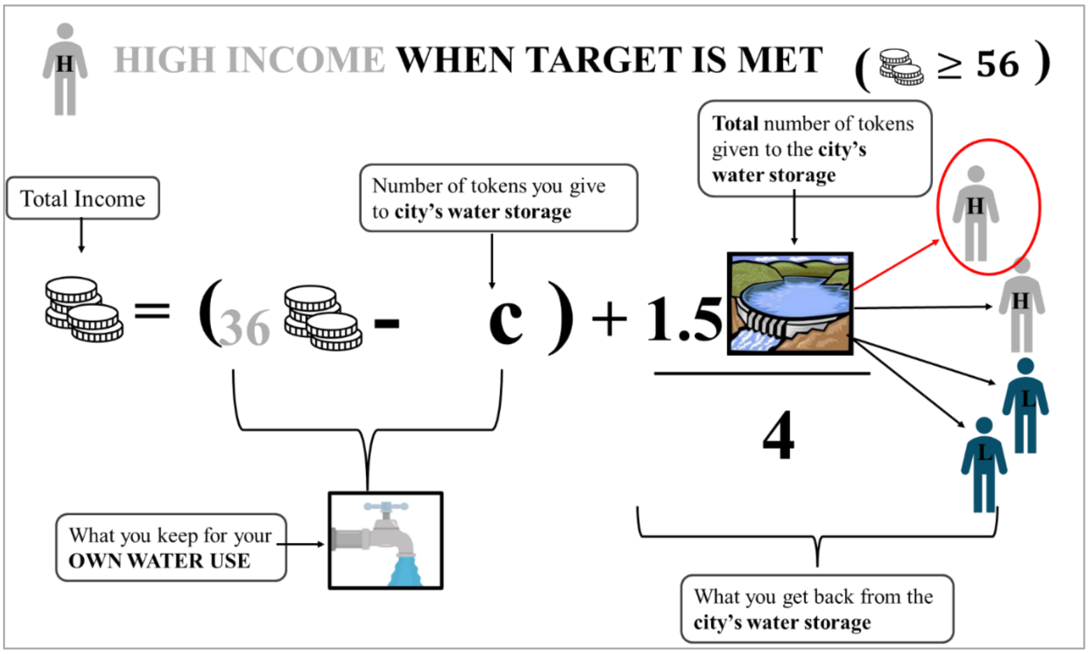


Let's explain how the city's water storage works if your group meets the target of giving 56 or more tokens.
After giving 56 or more water tokens to the city's water storage, those tokens are increased by 1.5 times and then they are shared equally among all four households. This is done no matter how much each household gives to the city's water storage as long as 56 or more water tokens are given.

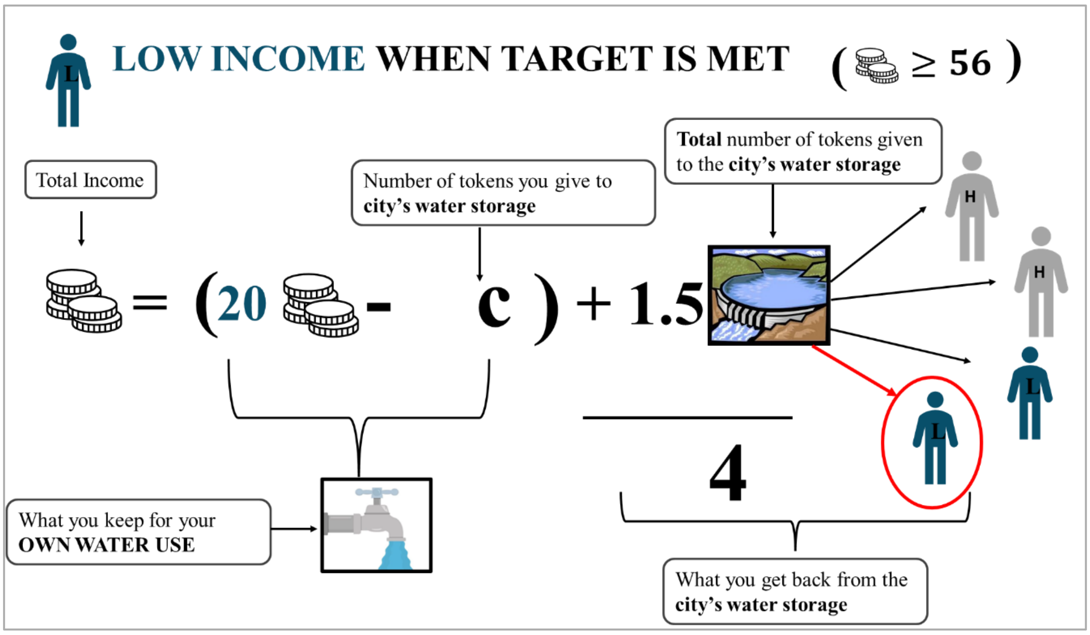


In Part 1 of the game, your group needs to reduce your total 112 water tokens in half to meet the target. That means your group needs to give 56 or more water tokens in total to the city's water storage.
Later, we'll ask you how many water tokens you'd like to give, if any, to the City's water storage.

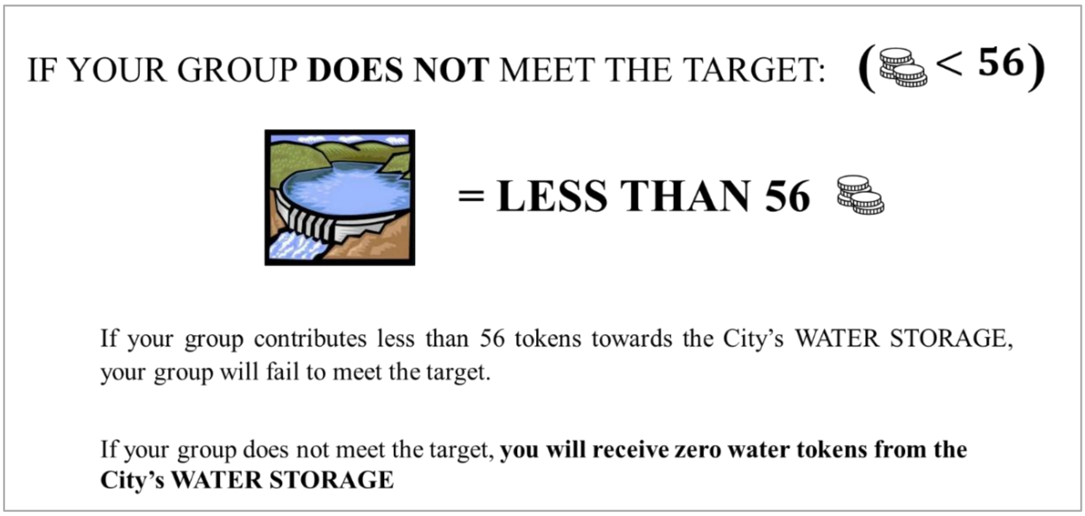
For high-income players (both EARNED and RANDOM treatments): If your group reaches the target of together giving 56 or more tokens. Then your total income is worked out as follows. Your total income is the tokens you kept for your household's own water use. Which is your starting 36 tokens minus the tokens you have given to the city's water storage. Plus, an equal share of the tokens your group has given to the city's water storage. Importantly, these tokens in the city's water storage are increased by 1.5 times before being shared equally between you and your group members.

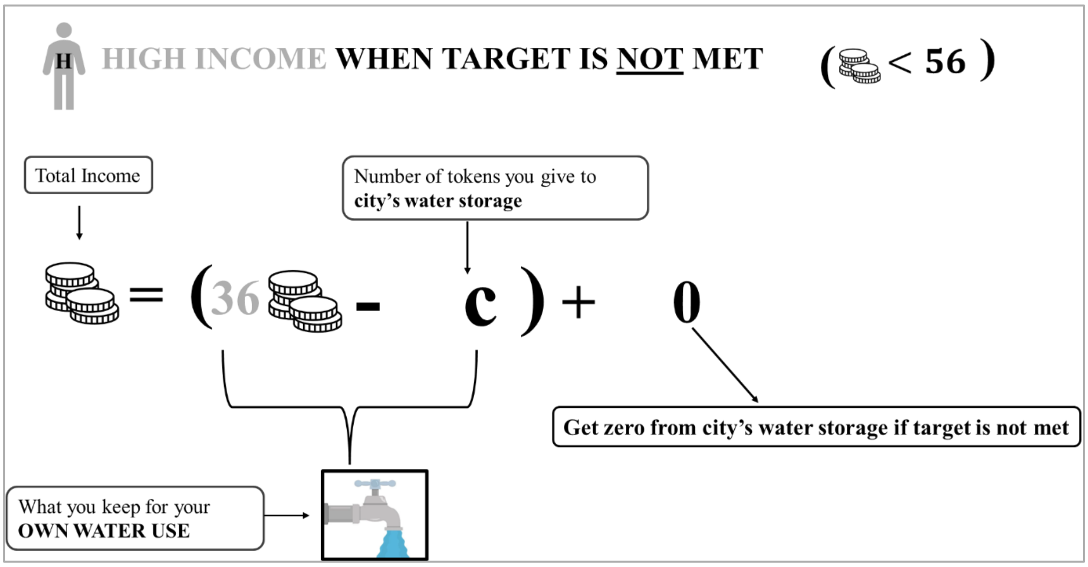


For low-income players (both EARNED and RANDOM treatments): If your group reaches the target of together giving 56 or more tokens. Then your total income is worked out as follows. Your total income is the tokens you kept for your household's own water use. Which is your starting 20 tokens minus the tokens you have given to the city's water storage. Plus, an equal share of the tokens your group has given to the city's water storage. Importantly, these tokens in the city's water storage are increased by 1.5 times before being shared equally between you and your group members.

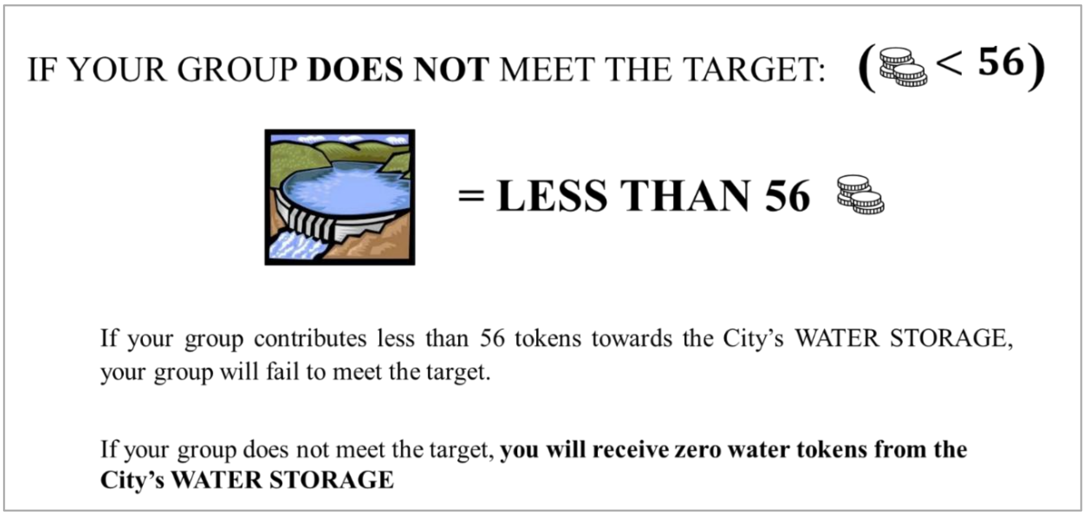


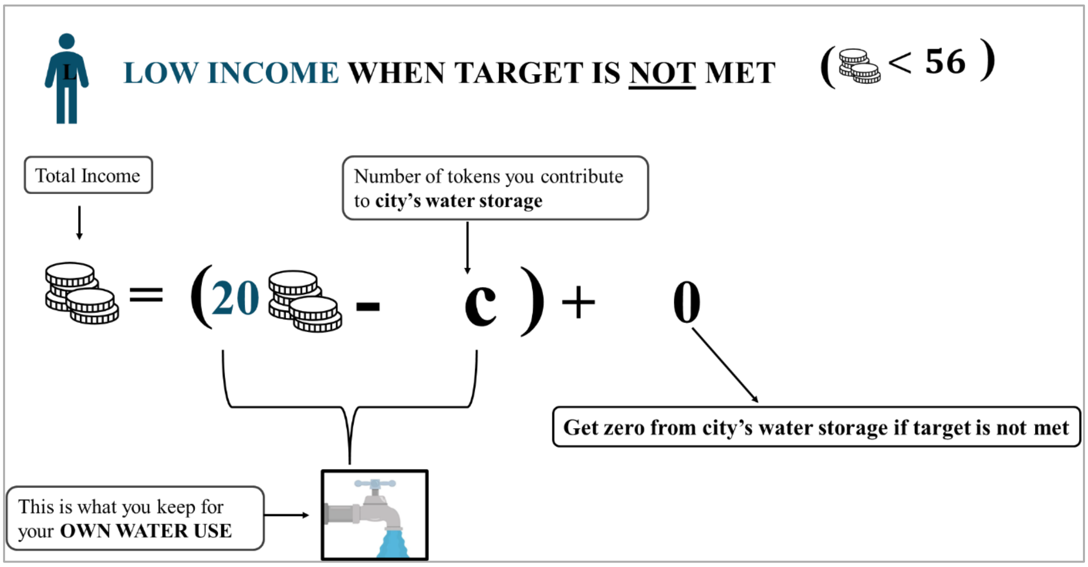
For high-income players (both EARNED and RANDOM treatments): If your group DOES NOT reach the target of together giving 56 or more tokens. Then your total income is worked out as follows. Your total income is the tokens you kept for your household's own water use. Which is your starting 36 tokens minus the tokens you have given to the city's water storage. Plus, zero tokens. This is because your group failed to give enough tokens to the city's water storage.





For low-income players (both EARNED and RANDOM treatments): If your group DOES NOT reach the target of together giving 56 or more tokens. Then your total income is worked out as follows. Your total income is the tokens you kept for your household's own water use. Which is your starting 20 tokens minus the tokens you have given to the city's water storage. Plus, zero tokens. This is because your group failed to give enough tokens to the city's water storage.



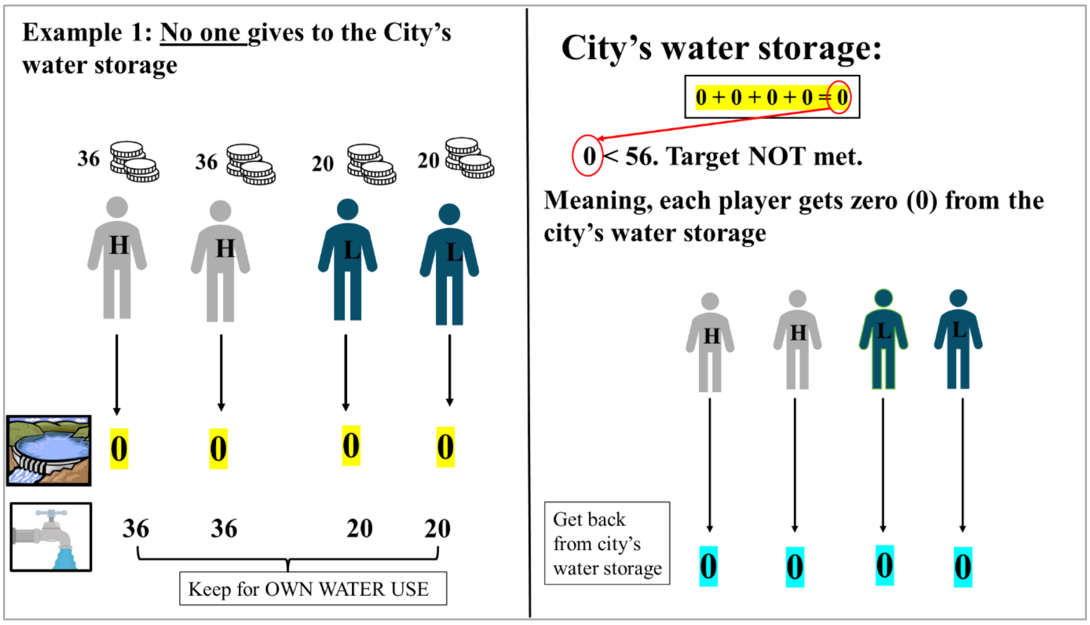


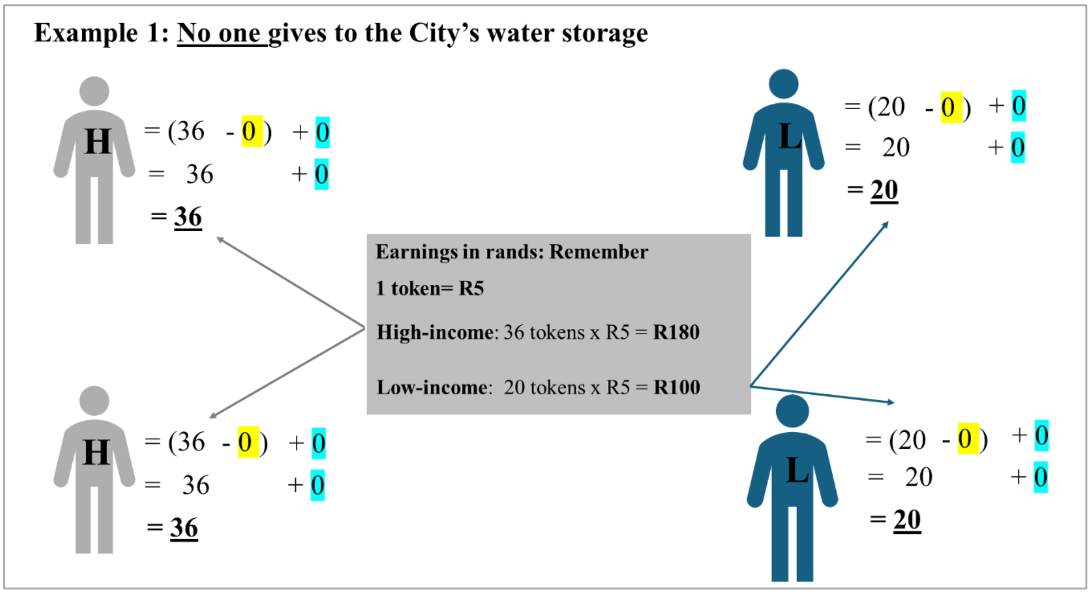
Each player in your group decides how many of its water tokens to give to the City's water storage. **Remember, if together your group gives 56 or more tokens, it's a win**.
Simply, you need to balance your household's own water needs (how many water tokens you'll need for your own water use) with the city's need for water storage during a drought.
You can either:

(i) Keep all of your water tokens for your household's own water use and give nothing to the city's water storage.
(ii) You could decide to not use any water tokens for your household and instead give all of your tokens to the city's water storage.
(iii) You could decide to keep some tokens for your household's own water use and give the rest to the city's water storage. It's up to you to decide the split.

Let's look at example one now. In this case, no one gives any tokens to the City's water storage. This means that each high-income player keeps all their 36 tokens and each low-income player keeps all their 20 tokens.
This means that nothing goes to the city's water storage and the target of giving 56 or more tokens is NOT met. As we learnt before, by failing to meet the target each player gets zero tokens back from the city's water storage.

Let's now work out how much each player will receive in this example where no one gives any tokens to the city's water storage.
The high-income players have 36 tokens and are given nothing to the city's water storage. This means that at the end they still have 36 tokens.
The low-income players have also kept all their 20 tokens. Meaning that they still have 20 tokens.
To work out what this means in Rands we need to remember that 1 token equals 5 rand. So, the high-income players 36 tokens are multiplied by 5 rand to equal 180 rand each. The low-income players 20 tokens are also multiplied by 5 rand. Meaning that each low-income player will get 100 rand.





Note: Pictures like the above were done for all the examples discussed below.

Let's now look at the second example. In this case, every player gives all their tokens to the City's water storage.

This means that each high-income player gives all their 36 tokens, and each low-income player also gives all 20 of their tokens. So, they all keep nothing for their households' own use.

This means that the city's water storage now has 112 tokens, which is more than the 56 needed to meet the target. So, the 112 tokens are multiplied by 1 point 5 times which equals 168 tokens. These 168 tokens are then split equally in four ways, meaning that each household gets back 42 tokens each from the city's water storage.

Let's now work out how much each player will receive in the second example, where everyone gives all their tokens to the city's water storage.

The high-income players had 36 tokens and gave all 36 to the city's water storage. Since the target was met, they received the 42 tokens back from the city. Meaning that at the end they have 42 tokens.
The low-income players had 20 tokens and also gave all their 20 tokens to the city's water storage. Again, since the target was met, they also got an equal share, and so they also got 42 tokens from the city.
Working out what this means in rands we again need to remember that 1 token equals 5 rand. So, the high-income players 42 tokens are multiplied by 5 rand to equal 210 rand each. This is the same for the low-income players who also get 210 rand.

SHORT EXAMPLES

Let's quickly look at some more examples.
In our third example, high-income players give all their tokens to the city's water storage, but low-income players give none. Together, they've given 72 tokens. That means they reached the goal. So, the city gives back more tokens, and each player gets 27 tokens. In rands, high-income players each get 135 rand, while low-income players each get 235 rand.

Now, let's move on to the fourth example. Here, high-income players don't give any tokens, and low-income players give all their tokens. Together, they've given 40 tokens, which isn't enough to reach the goal. So, you don't get any tokens back from the city's water storage. That leaves high-income players each with 180 rand, but low-income players don't get any money.

Last, in the fifth example, both high-income players give 20 tokens each, and one low-income player also gives 20 tokens. But the other low-income player doesn't give any tokens. Together, they've given 60 tokens, so they reached their goal. The city gives back more tokens, and each player gets 22.5 tokens. That means high-income players each get 192 rand and 50 cents. The first low-income player gets 112 rand and 50 cents, while the other low-income player gets 212 rand and 50 cents.
If you want to go deeper into these examples, just let the assistant know. They can show you a video that goes through them, just like we did for the first two examples.

CONTINUED LONG EXAMPLES

Let's now look at the third example. In this case, the high-income players give all their tokens to the City's water storage and the low-income players give nothing.
This means that each high-income player gives all their 36 tokens. But each low-income player gives none of their 20 tokens. So, high-income players keep nothing for their households' own use and low-income players keep all their tokens for their own use.
This means that the city's water storage now has 72 tokens, which is more than the 56 needed to meet the target. So, the 72 tokens are multiplied by 1 point 5 times which equals 108 tokens. These 108 tokens are then split equally in four ways, meaning that each household gets back 27 tokens each from the city's water storage.

Let's now work out how much each player will receive in the third example where high-income players give all their tokens and low-income players give none of their tokens.

The high-income players give all 36 of their starting tokens to the city's water storage. Since the target was met, they got those 27 tokens from the city. This means that they end up with 27 tokens.
The low-income players have kept all their starting 20 tokens. Since the target was met, they also got the 27 tokens from the city. Meaning that they end up with a total of 47 tokens each.
Working out what this means in rands we again need to remember that 1 token equals 5 rand. So, the high-income players 27 tokens are multiplied by 5 rand to equal 135 rand each. For the low-income players, 47 tokens are also multiplied by 5 rand. Meaning that each low-income player will get 235 rand.

Let's look at the fourth example now. In this case, the high-income players give no tokens, and the low-income players give all their tokens to the City's water storage.
This means that each high-income player keeps all 36 of their tokens, and each low-income player keeps none of their starting 20 tokens.
The number of tokens given to the city's water storage is 40, which means that the target is NOT met. As we learnt before, by failing to meet the target each player gets zero tokens back from the city's water storage.

Let's now work out how much each player will receive in the fourth example.
The high-income players have kept all 36 tokens and given nothing to the city's water storage. This means that at the end they still have 36 tokens. Since the target was NOT met, players get nothing from the city.
The low-income players have kept none of their 20 tokens. Meaning that they have no tokens and get no tokens from the city either.
Working this out in Rands, remembering that 1 token equals 5 rand. We see that high-income players have 36 tokens which are multiplied by 5 rand to equal 180 rand each. While the low-income players have zero tokens and so get zero rand.

Looking at the fifth example. Here all players give 20 tokens except one low-income player who gives nothing to the city's water storage.
In this case, each high-income player gives 20 tokens and keeps 16 tokens for their household's own use. The one low-income player gives all 20 of their tokens and keeps none for their own use. While the other low-income household gives nothing and keeps all 20 tokens for their household's own use.
This means that the city's water storage now has 60 tokens, which is more than the 56 needed to meet the target. So, the 60 tokens are multiplied by 1 point 5 times which equals 90 tokens. These 90 tokens are then split equally in four ways, meaning that each household gets back 22.5 tokens each from the city's water storage.

Let's now work out how much each player will get in the fifth example.
The high-income players have 36 tokens and give 20 tokens to the city's water storage. They get 22 point 5 tokens from the city's water storage. So, they have 16 plus 22 point 5 tokens which means that they end up with 38 point 5 tokens.
The one low-income player gave all 20 tokens to the city's water storage while the other low-income player kept all 20 tokens for their own household use. Since the target was met, both low-income players also got 22.5 tokens. This means that in the end, the one low-income player gets 22.5 tokens, and the other low-income player gets 42.5 tokens.
So, working out what this means in Rands, remember that 1 token equals 5 rand. The high-income players 38.5 tokens are multiplied by 5 rand to equal 192 rand and 50 cents each. The first low-income players' 22 point 5 tokens are multiplied by 5 rand, meaning that they get 112

rand and 50 cents. While the other low-income player has their 42.5 tokens multiplied by 5 rand for a total of 212 rand and 50 cents.

For high-income players (both EARNED and RANDOM treatment):
We've now finished the first part. Now, it's time for you to answer two questions.
First, we'll ask you how many of your 36 water tokens you want to give to the city's water storage as a high-income player.
Next, we're going to ask what you think the others in your group will give to the city's water storage. You'll need to give two answers for this question. First, tell us what you think the other high-income player will give. Then, tell us what you think the average of the two low-income players will give.
Your answer can be a little off, but not too far. It can be up to 10 percent higher or lower than the real answer. Let's look at an example. If the other high-income player gives 20 tokens, your answer can be anywhere from 18 to 22 tokens and still be correct. If the two low-income players give an average of 10 tokens, your answer can be from 9 to 11 tokens and still be right.
And here's the bonus. You'll get a 10-rand bonus for each correct answer. So, you could earn an extra 20 rand if you get both answers right.

For low-income players (both EARNED and RANDOM treatment):
We've now finished the first part. Now, it's time for you to answer two questions.
First, we'll ask you how many of your 20 water tokens you want to give to the city's water storage as a low-income player.
Next, we're going to ask what you think the others in your group will give to the city's water storage. You'll need to give two answers for this question. First, tell us what you think the other low-income player will give. Then, tell us what you think the average of the two high-income players will give.
Your answer can be a little off, but not too far. It can be up to 10 percent higher or lower than the real answer. Let's look at an example. If the other low-income player gives 10 tokens, your answer can be anywhere from 9 to 11 tokens and still be correct. If the two high-income players give an average of 20 tokens, your answer can be from 18 to 22 tokens and still be right.
Here's the bonus. You'll get a 10-rand bonus for each correct answer. So, you could earn an extra 20 rand if you get both answers right.

For EARNED high-income players:
Now, please fill out Decision Sheet 1.
Remember that you are a high-income household with 36 water tokens, which is based on the average income of the neighborhood that you live in.
You are trying to reduce the total number of tokens from 112 to 56 tokens. You must decide how many of your own 36 tokens you want to give to help reach this target.
Think carefully about how many tokens you want to keep and how many you want to give to the city's water storage.
The is no right or wrong answer and it is very important to make your own decision.
Your payout depends on both your choices and the choices of your group members. So, think carefully before making your choice. Remember, every water token you receive is worth R5.

For EARNED low-income players:
Now, please fill out Decision Sheet 1.
Remember that you are a low-income household with 20 water tokens, which is based on the average income of the neighborhood that you live in.

You are trying to reduce the total number of tokens from 112 to 56 tokens. You must decide how many of your own 20 tokens you want to give to help reach this target.
Think carefully about how many tokens you want to keep and how many you want to give to the city's water storage.
The is no right or wrong answer and it is very important to make your own decision.
Your payout depends on both your choices and the choices of your group members. So, think carefully before making your choice. Remember, every water token you receive is worth R5.

For RANDOM high-income players:
Now, please fill out Decision Sheet 1.
Remember that you are a high-income household with 36 water tokens, which is based entirely on luck.
You are trying to reduce the total number of tokens from 112 to 56 tokens. You must decide how many of your own 36 tokens you want to give to help reach this target.
Think carefully about how many tokens you want to keep and how many you want to give to the city's water storage.
The is no right or wrong answer and it is very important to make your own decision.
Your payout depends on both your choices and the choices of your group members. So, think carefully before making your choice. Remember, every water token you receive is worth R5.

For RANDOM low-income players:
Now, please fill out Decision Sheet 1.
Remember that you are a low-income household with 20 water tokens, which is based entirely on luck.
You are trying to reduce the total number of tokens from 112 to 56 tokens. You must decide how many of your own 20 tokens you want to give to help reach this target.
Think carefully about how many tokens you want to keep and how many you want to give to the city's water storage.
The is no right or wrong answer and it is very important to make your own decision.
Your payout depends on both your choices and the choices of your group members. So, think carefully before making your choice. Remember, every water token you receive is worth R5.

We are now moving on to the second part.
In this part, your goal is still to give 56 or more tokens to the city's water storage to win. The difference in this part is that there are three water-sharing principles that you can choose from to reduce the total available water by half.
In this part, you must choose one water-sharing principle to reach the target.

For EARNED high-income players:
For this game, you are a high-income household.
Think of this water budget as reflecting your household's **real earnings**
Remember that your household type will **remain the same** throughout the experiment.

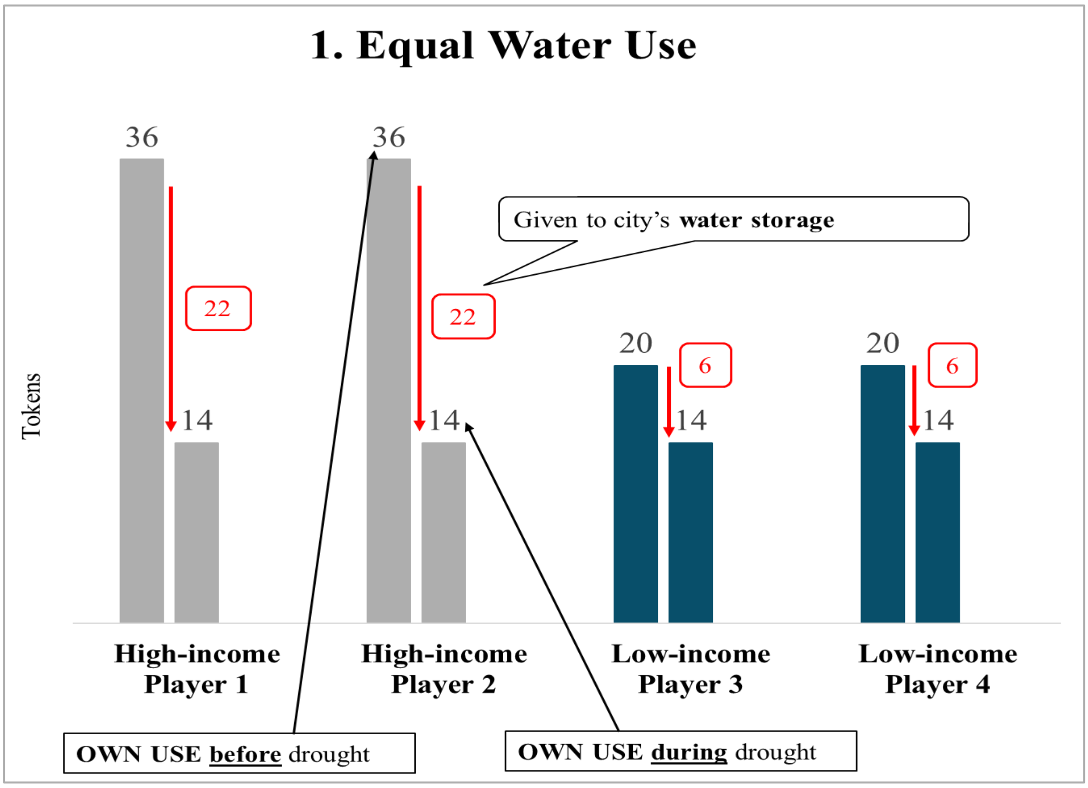
For EARNED low-income players:
For this game, you are a low-income household.
Think of this water budget as reflecting your household's **real earnings**
Remember that your household type will **remain the same** throughout the experiment.

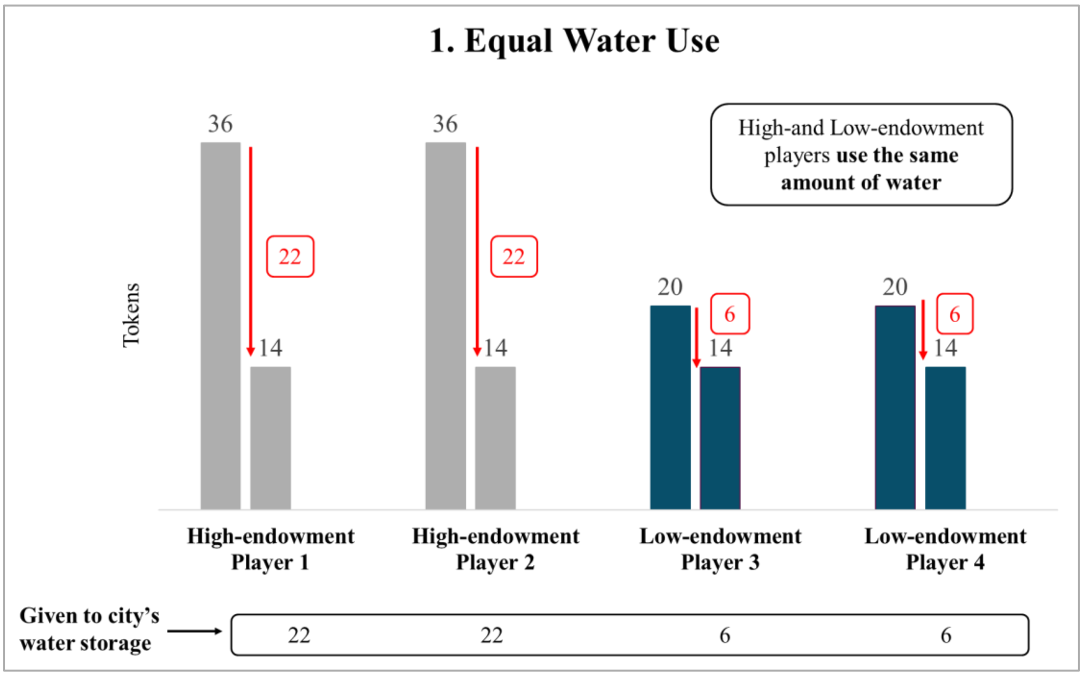
For the RANDOM high-income player:
For this game, you are a high-income household.
Think of this as completely based on **LUCK.**
Remember that your household type will **remain the same** throughout the experiment.

For the RANDOM low-income player:
For this game, you are a low-income household.
Think of this as completely based on **LUCK.**
Remember that your household type will **remain the same** throughout the experiment.

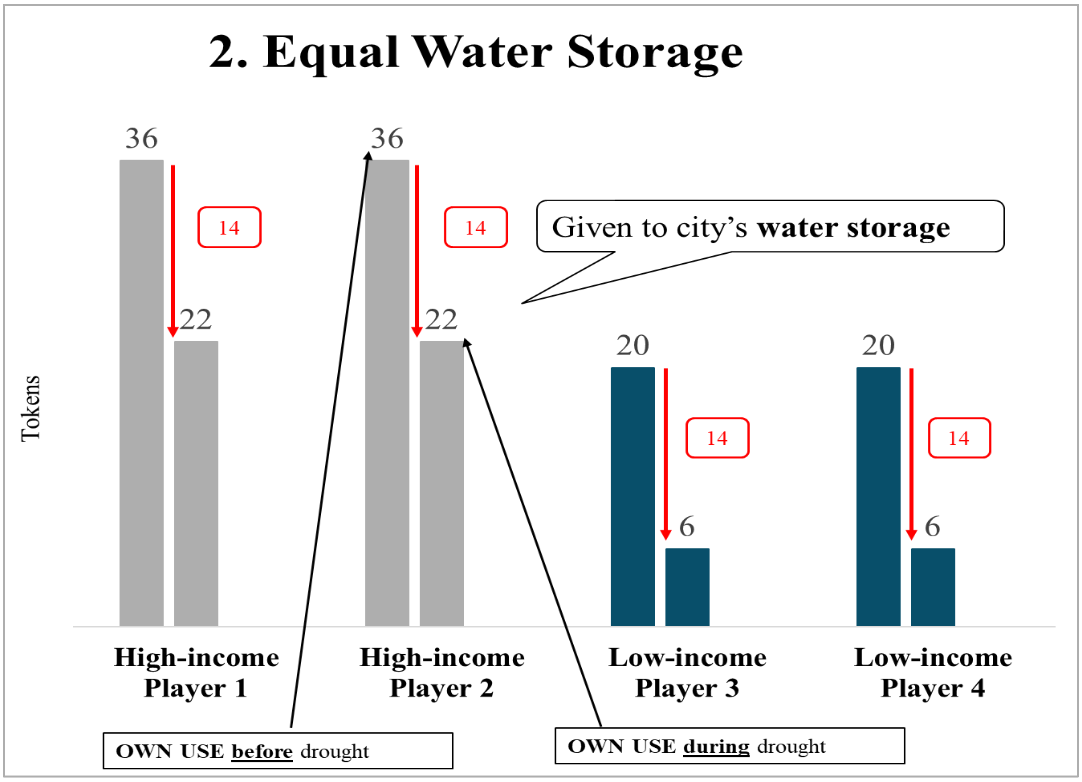
Let's now look at the first principle. This is the "Equal Water Use" principle.
Where, as before, each high-income player has 36 tokens, and each low-income player has 20 tokens.

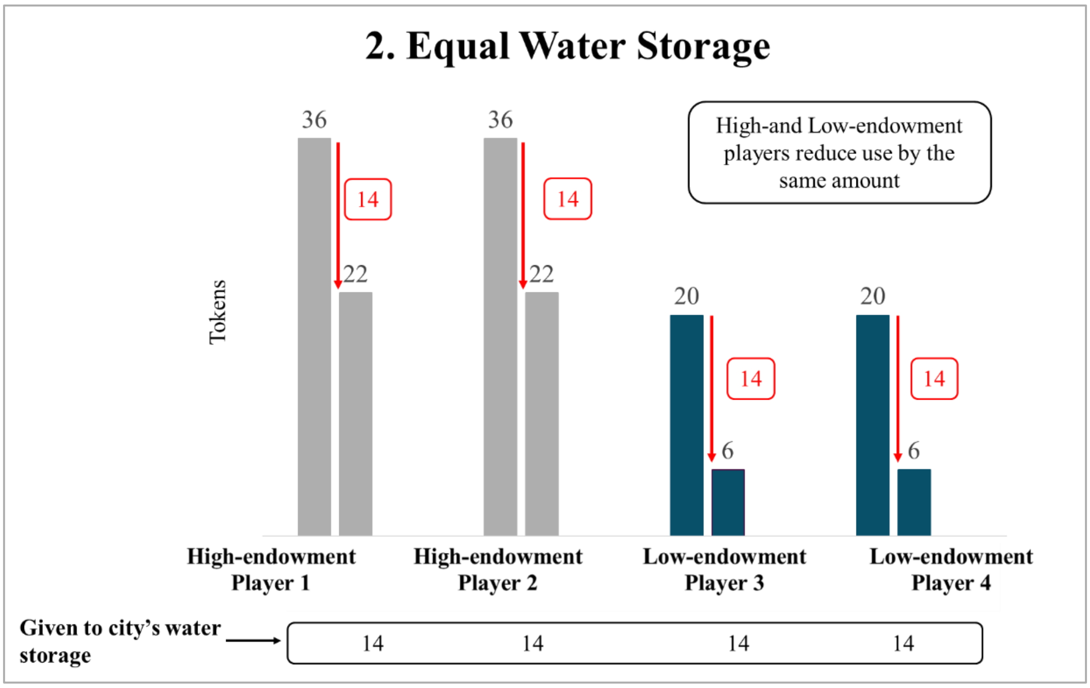
Choosing this principle means that all players must reduce their water use to the same amount. For high-income players, this means that they must give 22 tokens to the city's water storage and keep 14 tokens for their own water use. While for low-income players this means that they must give 6 tokens to the city's water storage and keep 14 tokens for their own water use. Here you can see that high-income households each give 22 tokens and low-income households each give 6 tokens to the city's water storage.



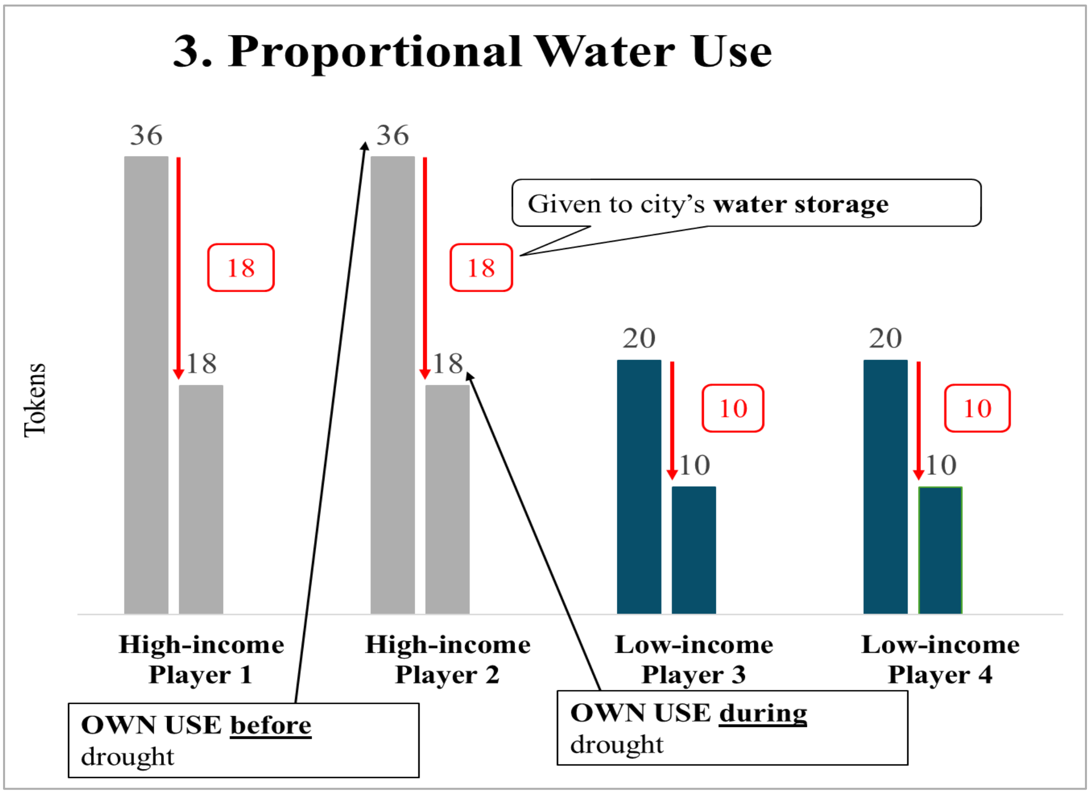


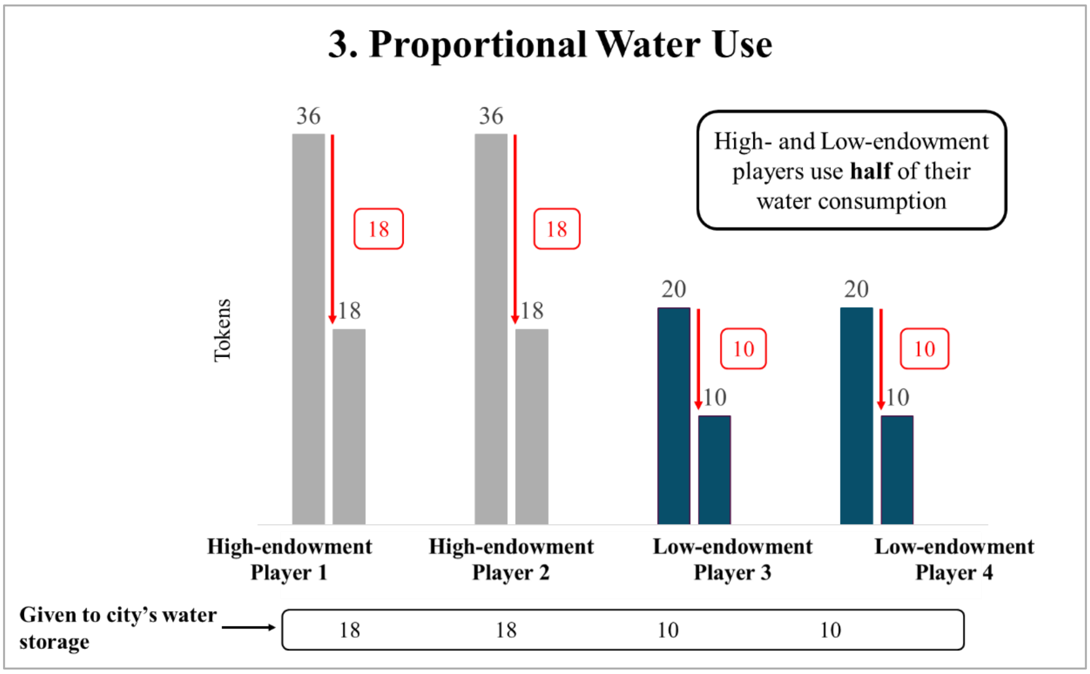
Now, let's look at the second principle. This is the "Equal Water Storage" principle.
As before, high-income players have 36 tokens, and low-income players have 20 tokens.
The difference here is that all players must reduce their water use BY the same amount. This means high-income players must give 14 tokens each to the city's water storage. So, high-income players keep 22 tokens for their own water use. Because players must reduce water use by the same amount, low-income players must also give 14 tokens to the city's water storage. Meaning, that low-income players keep 6 tokens for their own water use.
Here you can see that all households each give 14 tokens to the city's water storage.





Now, let's look at the third principle. This is the "Proportional Water Use" principle.
As before, high-income players have 36 tokens, and low-income players have 20 tokens.
This principle means that all players must reduce their water use BY HALF. So, high-income players must give 18 tokens each to the city's water storage. Meaning, that high-income players keep 18 tokens for their own water use. Because all players must reduce water use by half, low-income players must give 10 tokens to the city's water storage. So, low-income players keep 10 tokens for their own water use.
Here you can see that high-income households each give 18 tokens and low-income households each give 10 tokens to the city's water storage.



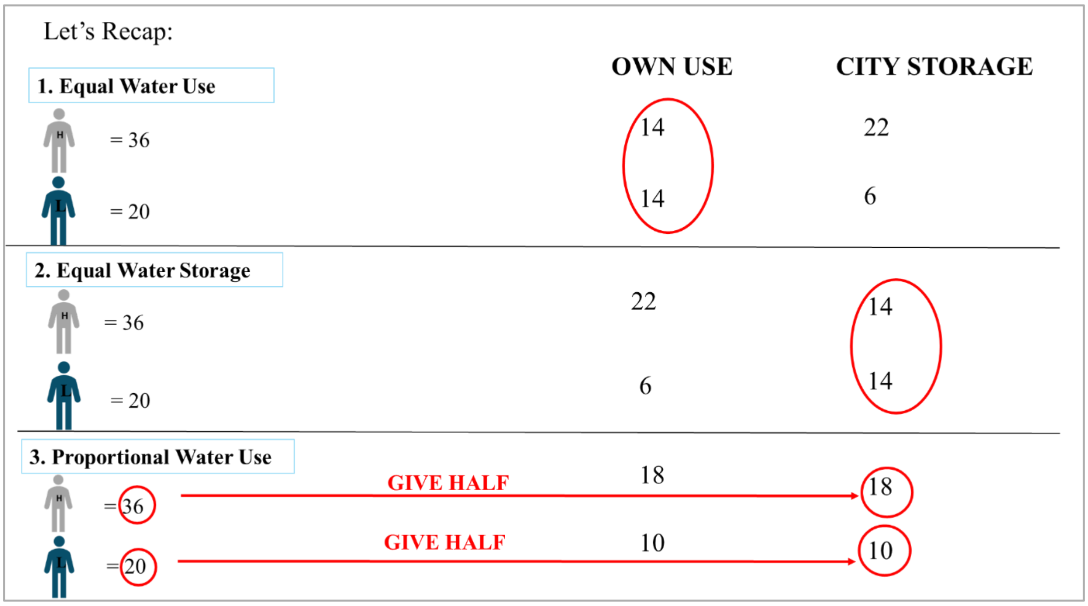


Let's now recap those three principles.
There are two places where your water tokens can go. Either your household's OWN WATER USE or the City's water storage.

In the **Equal Water Use** principle, the high-income households have 36 water tokens and the low-income households have 20 water tokens. All households must **keep** 14 water tokens and give the rest to the City's water storage. This means high-income households give 22 water tokens to the City's water storage and low-income households give 6 water tokens to the city's water storage.

In the **Equal Water Storage** principle, the high-income households have 36 water tokens and the low-income households have 20 water tokens. All households must **give** 14 water tokens to the City's water storage and keep the rest. This means high-income households keep 22 water tokens for their own use and low-income households keep 6 water tokens for their own use.

In the **Proportional Water Use** principle, the high-income households have 36 water tokens and the low-income households have 20 water tokens. All households must reduce their water tokens by half. This means high-income households keep 18 water tokens for their own use and give 18 tokens to the City's water storage. Low-income households keep 10 water tokens for their own use and give 10 water tokens to the city's water storage.



Importantly, if everyone chooses the same principle, the target will always be met. If the target is met, you will win the game.

For high-income players (both EARNED and RANDOM treatment):
We've now finished the second part. Now, it's time for you to answer two questions.
First, we'll ask which water-sharing principle you want to use as a high-income player to meet the target.

Next, we want to know what you think the others in your group picked for their water-sharing principle. You'll need to give two answers for this one. First, tell us what principle you think the other high-income player picked. Either Equal Water Use, Equal Water Storage, or Proportional Water Use. Then, tell us what principle you think the two low-income players picked. They might have both picked the same principle, which is the same as the first three options. For example, they could have both picked the Equal Water Use principle. Or, they might have picked different principles, and here options 4, 5, and 6 show those different choice options. For example, one might pick the 'Equal Water Use' principle, and the other might pick the 'Equal Water Storage' principle, which is option 4. You need to tell us what you think they picked by choosing one of these 6 options.
And don't forget, there's a bonus! You'll get a 10-rand bonus for each correct answer. So, you could earn another 20 rand if you get both answers right.

For low-income players (both EARNED and RANDOM treatment):
We've now finished the second part. Now, it's time for you to answer two questions.
First, we'll ask which water-sharing principle you want to use as a low-income player to meet the target.

Next, we want to know what you think the others in your group picked for their water-sharing principle. You'll need to give two answers for this one. First, tell us what principle you think the other low-income player picked. Either Equal Water Use, Equal Water Storage, or Proportional Water Use. Then, tell us what principle you think the two high-income players picked. They might have both picked the same principle, which is the same as the first three options. For example, they could have both picked the Equal Water Use principle. Or, they might have picked different principles, and here options 4, 5, and 6 show those different choice options. For example, one might pick the 'Equal Water Use' principle, and the other might pick the 'Equal Water Storage' principle, which is option 4. You need to tell us what you think they picked by choosing one of these 6 options.
And don't forget, there's a bonus! You'll get a 10-rand bonus for each correct answer. So, you could earn another 20 rand if you get both answers right.

For EARNED high-income players:
Now, please fill out Decision sheet 2.
Remember that you are a high-income household with 36 water tokens, which is based on the average income of the neighborhood that you live in.
You are trying to reduce the total number of tokens from 112 to 56 tokens. You must decide which water-sharing principle to use.
You can choose either the Equal Water Use principle, the Equal Water Storage principle, or the Proportional Water Use principle.
The is no right or wrong answer and it is very important to make your own decision.
Your payout depends on both your choices and the choices of your group members. So, think carefully before making your choice. Remember, every water token you receive is worth R5.

For EARNED low-income players:
Now, please fill out Decision sheet 2.
Remember that you are a low-income household with 20 water tokens, which is based on the average income of the neighborhood that you live in.
You are trying to reduce the total number of tokens from 112 to 56 tokens. You must decide which water-sharing principle to use.
You can choose either the Equal Water Use principle, the Equal Water Storage principle, or the Proportional Water Use principle.
The is no right or wrong answer and it is very important to make your own decision.
Your payout depends on both your choices and the choices of your group members. So, think carefully before making your choice. Remember, every water token you receive is worth R5.

For the RANDOM high-income player:
Now, please fill out Decision sheet 2.
Remember that you are a high-income household with 36 water tokens, which is based entirely on luck.
You are trying to reduce the total number of tokens from 112 to 56 tokens. You must decide which water-sharing principle to use.
You can choose either the Equal Water Use principle, the Equal Water Storage principle, or the Proportional Water Use principle.

The is no right or wrong answer and it is very important to make your own decision.
Your payout depends on both your choices and the choices of your group members. So, think carefully before making your choice. Remember, every water token you receive is worth R5.

For the RANDOM low-income player:
Now, please fill out Decision sheet 2.
Remember that you are a low-income household with 20 water tokens, which is based entirely on luck.
You are trying to reduce the total number of tokens from 112 to 56 tokens. You must decide which water-sharing principle to use.
You can choose either the Equal Water Use principle, the Equal Water Storage principle, or the Proportional Water Use principle.
The is no right or wrong answer and it is very important to make your own decision.
Your payout depends on both your choices and the choices of your group members. So, think carefully before making your choice. Remember, every water token you receive is worth R5.

Thank you for taking part in this game! We would like you to now answer the following questions. Once again please remember that all your answers will remain confidential and are anonymous.

A2. Survey

INSERT HERE THE NAME AND ID OF THE PERSON:

NAME:

EXPERIMENT NUMBER:

ASKAFRIKA UNIQUE ID for PARICIPANT: ______________________

RESPONDENT DETAILS <if NOT original respondent; Yes in S1.2 >

S2. Please confirm participant gender:

Programming note: Ask if Yes in S1.2. Single mention.

Interviewer note: Spontaneous answer.

- ☐ Female
- ☐ Male
- ☐ Other
- ☐ Refuse

S3. In which age bracket do you fall?

Programming note: Ask if Yes in S1.2. Single mention.

Interviewer note: Read out.

- ☐ 18-24
- ☐ 25-34
- ☐ 36-44
- ☐ 45-64
- ☐ 65+

S4. What is your highest education level that you have completed?

Programming note: Ask if Yes in S1.2. Single mention.

Interviewer note: Read out.

- ☐ Primary school
- ☐ Grade 12 (Matric)
- ☐ Secondary school
- ☐ Tertiary education
- ☐ Other (Specify)

S5. What is the average monthly household income before any deduction (such as tax, UIF, pension, or medical aid contributions)?

Programming note: Ask if Yes in S1.2. Single mention.

Interviewer note: Read out.

- ☐ Below R4 999
- ☐ R5 000 - R9 999
- ☐ R10 000 – R14 999
- ☐ R15 000 – R19 999
- ☐ R20 000 – R24 999

- ☐ R25 000 – R29 999
- ☐ R30 000 – R34 999
- ☐ R35 000 – R39 999
- ☐ Above R40 000
- ☐ Refuse

S6. How many people, including children (please do not forget about babies) live in your household permanently?

Programming note: Ask if Yes in S1.2. Single mention.
Interviewer note: Spontaneous answer.

______ people

S7. How many people, including children (please do not forget about babies), live on the property as tenants?

Programming note: Ask if Yes in S1.2. Single mention.
Interviewer note: Spontaneous answer.

______ people

SECTION A: HOME AND WATER USE IN AND AROUND THE HOUSE

We are now going to ask you some questions about your home and water use in and around the house.

1. Do you have a lawn/garden?
   Programming note: Ask All. Single mention.
   Interviewer note: Spontaneous answer.
   - ☐ Yes
   - ☐ No

2. What size is your lawn/garden?
   Programming note: Ask if "Yes" selected in Q1. Single mention
   Interviewer note: Read out.
   - ☐ Less than 5m by 5m
   - ☐ Greater than 5m by 5m
   - ☐ Greater than 10m by 10m

3. Do you have a swimming pool?
   Interviewer note: Spontaneous answer.
   Programming note: Ask All. Single mention
   - ☐ Yes
   - ☐ No

4. Has your household done any of the following when there are water shortages? Please tick Yes/No.
   Interviewer notes: Read out. Participant can choose MORE THAN ONE option.

Programming note: Ask All. Multiple mention.

	Yes	No
4.1 Make sure there are no leaks at home		
4.2 Only flush toilets when necessary		
4.3 Use less water in each toilet flush by putting something like a brick in the tank		
4.4 Take shorter showers		
4.5 Catch shower water with a bucket for reuse elsewhere		
4.6 Have fewer baths		
4.7 Have baths with less water		
4.8 Use water from washing for other things like flushing toilets or watering plants		
4.9 Installed a grey water system to reuse elsewhere		
4.10 Use a watering can to water gardens instead of a hose		
4.11 Water garden less frequently or when it is not so hot outside		
4.12 Only run the dishwasher or washing machine when it's full		
4.13 Turn off the tap when you're not using it, like when brushing your teeth		
4.14 Catch rainwater (e.g. with buckets or water tanks) for use elsewhere		
4.15 I took no action to reduce water use. *Programming note: Exclusive answer.*		
4.16 Other:		

5. Do you have any of the following on your property before the Cape Town Drought:
   Interviewer notes: Read out. Participant can choose MORE THAN ONE option.
   Programming note: Ask All. Multiple mention.
   - ☐ Borehole or wellpoint
   - ☐ Water tank(s)
   - ☐ Grey water system for re-using water (e.g., flushing toilet with bath water)

6. Do you have any of the following on your property during or after the Cape Town Drought:
   Interviewer notes: Read out. Participant can choose MORE THAN ONE option.
   Programming note: Ask All. Multiple mention.
   - ☐ Borehole or wellpoint
   - ☐ Water tank(s)
   - ☐ Grey water system for re-using water (e.g., flushing toilet with bath water)

SECTION B: MONTHLY WATER USE AS STATED ON YOUR LAST BILL

We would like to ask some questions about your Municipal Bill and ask you some questions about your monthly water use and your bill payments, as stated on your last bill.

7. Do you have your latest water bill with you?
   Interviewer note: Spontaneous answer.
   Programming note: Ask All. Single mention
   - ☐ Yes
   - ☐ No

8. Does your household receive a subsidy or discount for underprivileged households (indigent rebate)?
   Interviewer notes: Spontaneous answer. Please assist the participant in finding the latest amount of kilolitres used by this household, based on the latest Municipal Bill. Only answer "Don't Know" if this is not specified as per the briefing instruction manual.
   Programming note: Ask all. Single mention
   - ☐ Yes – verified on water bill
   - ☐ Yes – the participant advised
   - ☐ No
   - ☐ Don't know

9. Can we see your latest water bill to verify your municipal account number and household water consumption?
   Interviewer note: Spontaneous answer.
   Programming note: Ask if "Yes" selected in Q7. Single mention
   - ☐ Yes
   - ☐ No – *Programming note: skip to Q11*

10. IF YES – Please write down the Municipal Account number here:

    NUMBER: ________________________________

10.1 How many kilolitres (kl) of water does your household consume in the **month as stated on your bill?**
Interviewer notes: Spontaneous answer. Please assist the participant in finding the latest amount of kilolitres used by this household, based on the latest Municipal Bill.
Programming note: Ask if "Yes" selected in Q7. Mandatory numeric response ONLY. Min value = 1. Max value =60.

_____ kl/ month

10.2 Please confirm the **month as stated on your bill.**
Interviewer note: Spontaneous answer.
Programming note: Ask if "Yes" selected in Q7. Single mention

Month on Bill (select from options below)
September 2023

August 2023
July 2023
June 2023
May 2023
April 2023
March 2023
February 2023
January 2023
December 2022
November 2022
October 2022
September 2022
August 2022
An earlier date. Specify:

11. How many kilolitres (kl) of water would you estimate that your household consumes within a month?
    Interviewer note: Spontaneous answer.
    Programming note: Ask if "No" selected in Q7. Mandatory numeric response ONLY. Min value = 1. Max value =60.

    _____ kl/ month
    - [ ] Can't estimate
    - [ ] Refuse

12. When making a bill payment, how much of your bill do you normally pay:
    Interviewer note: Spontaneous answer.
    Programming note: Ask All. Single mention
    - [ ] The full outstanding amount
    - [ ] Only what is due for the month
    - [ ] Pay a fixed amount each month
    - [ ] Other:________

SECTION C: WATER USAGE IN CAPE TOWN

For each of the following two questions about water use in Cape Town, you could earn a R25 Shoprite or Takealot voucher. If your answer is within +/- 5% of the correct answer, you'll get the voucher.

Before the major drought in 2015, high-income households in Cape Town used an average of 27 kilolitres (kl) of water in January. In January 2018, during the drought, their usage dropped to 5.25 kl.

13. In 2023, **5 years after** the Cape Town drought how many kilolitres (kl) do you think **high-income households** used in the month of January?
    Interviewer note: Spontaneous answer.
    Programming note: Ask All. Mandatory numeric response ONLY. Min value = 1. Max value =60.

Please fill in the last block.

2015	2018	2023
Before the drought in Cape Town, high-income households used about **27 kl in the month of January**	**During the drought** in Cape Town, high-income households used about **5.25 kl in the month of January**	**This year in January** in Cape Town, high-income households used about **_______ kl in the month of January**

Before the major drought in 2015, low-income households in Cape Town used an average of 11 kilolitres (kl) of water in January. In January 2018, during the drought, their usage dropped to 7.7 kl.

14. In 2023, **5 years after** the Cape Town drought how many kilolitres (kl) do you think **low-income households** used this year in the month of January?
    Interviewer note: Spontaneous answer.
    Programming note: Ask All. Mandatory numeric response ONLY. Min value = 1. Max value =60.

Please fill in the last block.

2015	2018	2023
Before the drought in Cape Town, low-income households used about **11 kl in the month of January**	**During the drought** in Cape Town, low-income households used about **7.7 kl in the month of January**	**This year in January** in Cape Town, low-income households used about **_______ kl in the month of January**

SECTION D: INVESTING IN LONG-TERM WATER SUPPLY

So far, we've talked about how to fairly manage water use across the city. Now we are going to ask you some questions about the City's water supply.

15. How much do you think it costs the municipality to supply 1 kilolitre (kl) of water to your household? This includes operations and maintenance costs and the capital costs for the storage, treatment, and distribution of water to your home.
    Interviewer note: Read out.
    Programming note: Ask all. Single mention
    - ☐ R1-R10
    - ☐ R11-R20
    - ☐ R21-R30
    - ☐ R31- R40
    - ☐ More than R40
    - ☐ Don't know

To make sure there's enough water for a growing population, the city can either build new water infrastructure or focus on taking care of natural water sources:

Let's first consider built infrastructure. This would include:

- Dams,
- Desalination plants,
- Water treatment plants,
- Municipal boreholes

16. Imagine the Cape Town municipality wants to charge an extra R50 each month to build more water infrastructure.

    Would you be willing to pay R50 more for this additional infrastructure?
    Interviewer note: Spontaneous answer.
    Programming note: Ask All. Single mention

    - ☐ Yes
    - ☐ No

Now let's consider the second option that the City has to secure water for the City, which is to take care of the natural water sources. **Taking care of natural water sources includes:**

- Restoring wetlands (or "vlei" areas) to make water cleaner, increase water supply, and prevent floods.
- Using "green" options like rooftop gardens and special pavements that let rainwater sink into the ground, helping to keep the water clean and lower flood risk.

- Teaching people to protect soil, which helps keep water clean and stops it from washing away.

17. Imagine the Cape Town municipality wants to charge an extra R50 each month for **environmental projects** like restoring wetlands.

    Would you be willing to pay R50 more for these environmental projects?
    Interviewer note: Spontaneous answer.
    Programming note: Ask All. Single mention
    - ☐ Yes
    - ☐ No

18. Do you think all households should pay the same towards the City's cost of building more water infrastructure and taking care of natural water sources? [Choose 1 option]
    - ☐ Yes, all households should pay the same fixed amount per month
    - ☐ No, households should pay in proportion to their income
    - ☐ No, higher-income households should pay a much greater proportion of these costs

19. Rank from 1-6 what do you think poses the largest risk to Local Water Supplies **(1 being the largest risk and 6 the lowest risk).**
    Interviewer note: Read out.
    Programming note: Ask All. Rank from "1 – largest risk" to "6 – lowest risk"
    - ☐ Failing infrastructure (Leaking /Rusting pipes/Faulty pump stations/water treatment plants)
    - ☐ Corrupt officials/policymakers
    - ☐ Climate Change (droughts and floods)
    - ☐ Alien vegetation (These are plants and trees that are not from here. They can use more water than local plants, leaving less water for everything else).
    - ☐ People's excessive water use
    - ☐ Overpopulation

20. Please tick the option on **how you'd spend your money to make sure that your household has enough water during a drought.**
    Interviewer note: Read out.
    Programming note: Ask All. Single mention
    - ☐ I would rather buy things like a water tank, drill a well/borehole, or install a greywater system for my household.
    - ☐ I would rather pay extra on my water bill so the municipality and local government can invest in infrastructure to help long-term water supply for my household and the city.

☐ I would rather pay an independent third party (such as a private company that can deliver water) that can provide a long-term water supply for my household and the city.

SECTION E: PERSONAL VIEWS

21. Please tick only one of the options below that best describes how you think:

Interviewer note: Read out.

Programming note: Ask All. Single mention

☐ I believe people who work hard succeed in life.
☐ I believe success in life is often the result of good luck.
☐ I believe success in life has a lot to do with which family/race group you were born in.

22. Would you describe yourself as someone who often takes risks?

Interviewer note: Read out.

Programming note: Ask All. Single mention

☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly Agree
☐ Don't know

23. Before we end, we have a few quick questions about what you think. We'll read a statement, and you rate it from 1 to 5.

- 1= I Really Disagree
- 2= I Disagree
- 3= I Don't Feel Strongly One Way or The Other
- 4= I Agree
- 5= I Really Agree

	Scale 1 – 5 (Really Disagree to Really Agree)
Hierarchy	
23.1 Having clear rules and leaders is good for everyone.	
23.2 Keeping our old traditions helps our community stay strong.	
23.3 Some people are naturally better leaders than others.	
23.4 We should listen to and obey the people in charge.	
23.5 It's good for everyone to know their place in society.	
23.6 I think it's important to know who's in charge at home and at work.	
Individualism	
23.7 People should get rewards for their hard work.	
23.8 People should be free to say and do what they want.	

23.9 People should follow their own dreams.	
23.10 Encouraging new ideas and businesses is good for everyone.	
23.11 People should enjoy the money they earn, even if it makes them rich.	
23.12 I think each person's effort helps the whole community.	
Egalitarianism	
23.13 Companies should pay men and women the same for doing the same job	
23.14 Everyone should have good healthcare and schools.	
23.15 Rich people should pay more taxes to help others.	
23.16 No one should go hungry, there should be programs to make sure everyone has enough to eat	
23.17 Children from poor communities should get extra support to help them succeed	
23.18 It's fairer if everyone has about the same amount of money and chances in life.	
Fatalism (Ambiguity Aversion)	
23.19 Life can be unpredictable and out of our hands.	
23.20 I don't generally trust institutions and governments	
23.21 Unexpected things can change our plans and future.	
23.22 I've had times when things outside my control affected my success.	
23.23 Most people look out for themselves, so it's hard to trust them.	
23.24 Life can feel like a bunch of random events.	
23.25 No matter what we do, life mostly just happens on its own.	

24. We have come to the end of this survey. *Thank you for your time and valuable responses. Our experimenters will calculate your responses and will be in contact regarding the payout.*
We will pay the money to you in either a Shoprite or Takealot voucher, depending on your preference.
What would you prefer, a Shoprite or Takealot voucher?

Interviewer note: Read out.
Programming note: Ask All. Single mention

- ☐ *Shoprite voucher*
- ☐ *Takealot voucher*

25. May I please confirm your contact details to ensure we can reach you for the voucher?

I want to assure you that your personal information will be stored separately from the survey results and stored securely and not shared with anyone outside the research study.

Name and Surname	
Cell phone	*Programming note: Ensure the cell phone number provided is correct*

Thank you, enjoy the rest of your day.

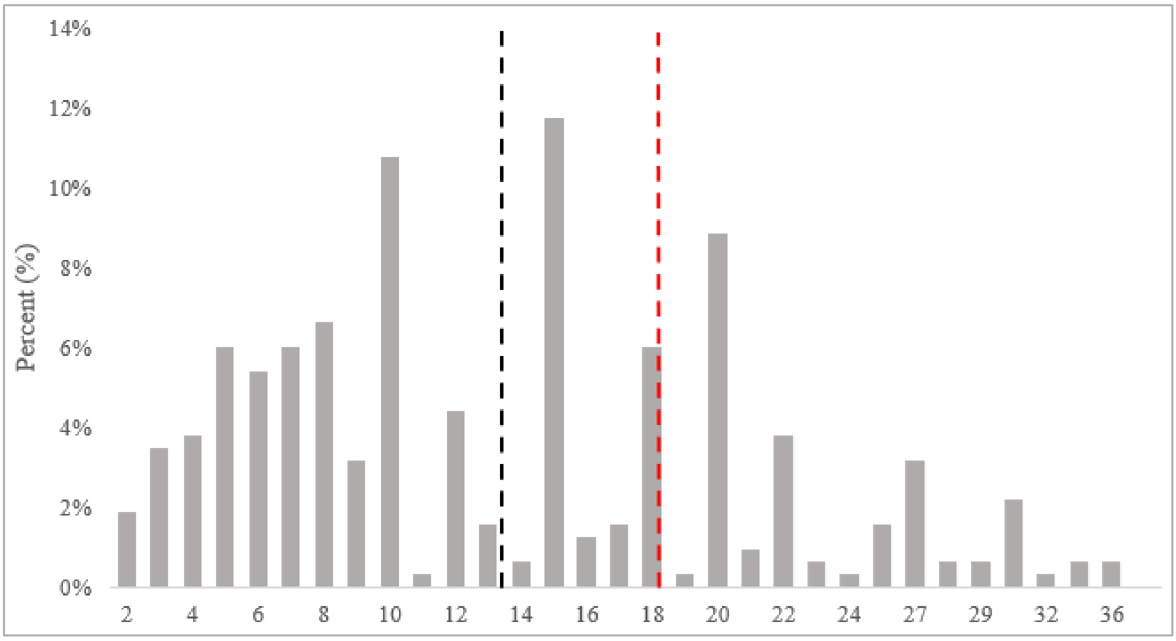
Appendix B. Perceptions of water consumption

This appendix provides additional details on participants' beliefs about water consumption for high- and low-endowment players in January 2023.

Figures B1 and B2 show the distribution of responses to the two belief questions for high- and low-endowment players, respectively (refer to Appendix A2, Section C, Questions 13 and 14). The average perceived consumption is indicated by a black line, while the actual consumption is represented by a red line.

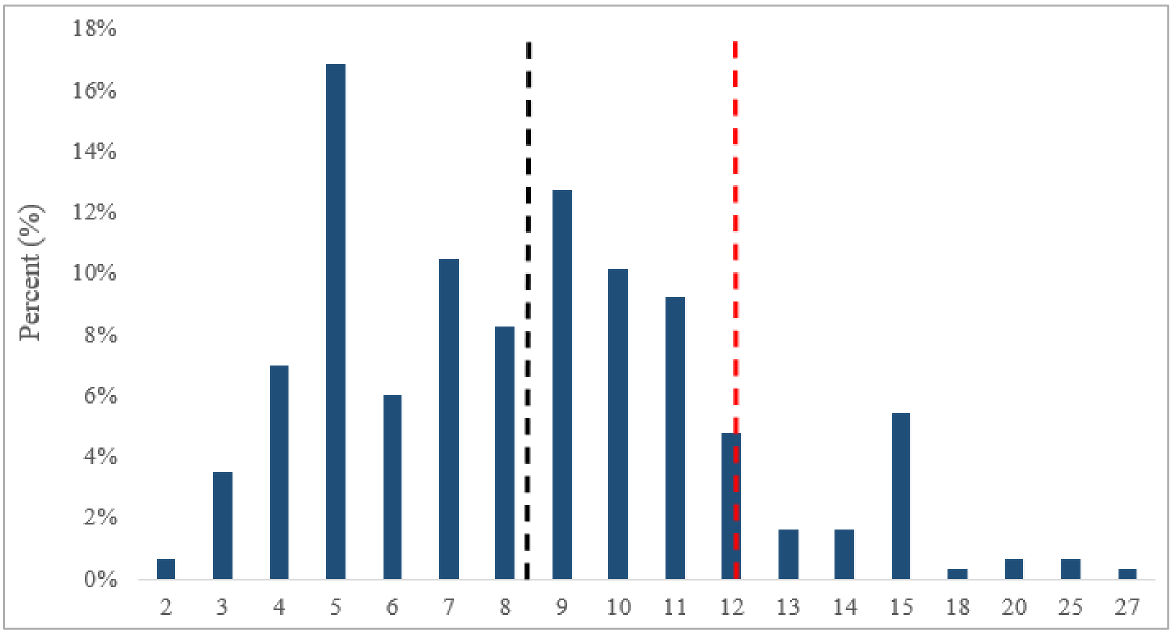
The average perceived monthly water consumption for high-endowment players in January 2023 was 13.15 kiloliters (kl), which is significantly lower than the actual consumption of 18.48 kl. The distribution of responses indicates that the majority of participants underestimated high-endowment players' water usage, with 53.7% estimating a value below the actual consumption. Meanwhile, 46.3% of participants overestimated it, making the responses more balanced.

Figure B1. Distribution of perceived water consumption for high-endowment players



For low-endowment players, the average perceived monthly consumption was 8.40 kl, compared to an actual consumption of 12.12 kl. Unlike high-endowment players, there was a stronger tendency toward underestimation, with 89.5% of participants estimating a value below the actual consumption and only 10.5% overestimating it.

Figure B2. Distribution of perceived water consumption for low-endowment players



These findings contrast with the results of Cappelen et al. (forthcoming), which examined perceptions of water usage during 2018, the height of Cape Town's severe drought. In 2018, participants estimated that high-income households used an average of 18.9 kl per month, which was considerably higher than their actual water consumption of 5.25 kl per month. Almost 99.4% of respondents overestimated the consumption levels of high-income households, while only 0.6% underestimated them.

For low-income households, the average perceived water consumption was 8.40 kl per month, which closely matched their actual usage of 7.70 kl per month. The responses were more balanced, with 54.3% of participants overestimating and 45.7% underestimating their water consumption.

The differences between the two studies may be attributed to the timing of the questions. The Cappelen et al. (forthcoming) study asked participants about water consumption in 2018, during the peak of the drought, whereas the current study asked participants to estimate water consumption in 2023, five years later. The shift in responses suggests that perceptions may have changed over time, possibly due to expectations that water-saving behaviours implemented during the drought would continue in the long run. However, actual consumption patterns show that water use increased post-drought, which was not fully reflected in participants' estimates.

Appendix C. Question from previous Cappelen et al. (forthcoming) study

The City of Cape Town municipality can take action to reduce the likelihood that a drought results in severe water shortage. To what extent do you agree with the following:

On a scale of 0-10 where 0 means completely disagree, and 10 means completely agree. You can also use any number in between

Question	Completely Disagree							Completely Agree			
1. The City must be able to legally force people to use less water through water restrictions.	0	1	2	3	4	5	6	7	8	9	10
2. The City should spend money to teach people how to use less water during a drought.											
3. The City should use the water bills to show people how much water they are using to encourage them to use less water during a drought.											
4. The City should increase the water tariffs (the cost of water) for everyone to encourage people to use less water during a drought.											
5. The City should reduce the water pressure for everyone when there is a water shortage (after giving citizens some prior notice).											
6. The City should reduce the water pressure for neighbourhoods that use more water than what they should during a drought (after giving citizens some prior notice).											

Appendix D. Testing for significance differences between Earned and Random treatment groups

Table D1. Man-Whitney U Test for Part 1 contributions between treatment groups

Comparison group	P value
Earned high vs Random high	0.886 (Not significant)
Earned low vs Random low	0.964 (Not significant)
Earned vs Random	0.078 (Not significant)

Note: A Mann-Whitney U test was used to test for significance.

The results in Table D1 indicate that the treatment did not have a significant difference in the number of tokens contributed in Part 1. Additionally, there is no statistically significant difference in burden-sharing principle preference across treatments as shown in Table D2 below.

Table D2. Chi-squared tests for the selection of burden-sharing principles between treatment groups

Comparison group	Chi^2 stat	P value
Earned high vs Random high	1.127	0.569
Earned low vs Random low	0.787	0.673
Earned vs Random	0.324	0.850

Table D3. Average contributions for high- and low-endowment players in earned and random treatments

	Endowment group			
	High-endowment		Low-endowment	
	EARNED	RANDOM	EARNED	RANDOM
Average contribution (mean value)	20.36	19.67	11.22	10.82
N	53	83	102	77
Total sample size	315			

Table D4. Burden sharing principles, by endowment group and treatment (%)

Burden-sharing principle	Endowment group			
	High-endowment		High-endowment	
	EARNED	RANDOM	EARNED	RANDOM
Equal water storage	28.30	25.30	21.57	16.88
Equal water use	20.75	28.92	33.33	32.47
Proportional water use	50.94	45.78	45.10	50.65
Sample size (n) = 315	53	83	102	77

Appendix E. OLS regression results for high and low-endowment players (Part 1-tokens expressed as an absolute value)

Table E1. Part 1- OLS regression results (tokens expressed as absolute value) for high and low-endowment players

	(1) High-endowment	(2) Low-endowment
Burden-sharing principle chosen in Part 2:		
(Equal water storage base)		
Proportional water use	-1.175	-1.364
	(1.842)	(1.017)
Equal water use	-0.337	-2.998***
	(1.946)	(1.072)
Family's financial situation (annual household income:		
(Low-income base):		
Middle-income	-2.450	0.651
	(1.842)	(0.846)
Upper-income	1.204	0.878
	(2.085)	(1.965)
Male	-2.959*	1.516*
	(1.620)	(0.821)
Highest level of education completed:		
(Grade 12 base)		
Secondary education	-0.967	0.207
	(1.659)	(0.867)
Tertiary education	-1.520	-1.844
	(1.810)	(1.325)
Age (years):		
(25-35 base)		
18-24	2.367	-2.061
	(3.296)	(2.154)
36-44	-0.810	-0.801
	(2.313)	(1.387)
45-64	0.025	-1.547
	(2.170)	(1.188)
65+	0.393	-1.073
	(2.985)	(1.550)
Household consumption beliefs:		
High-endowment consumption beliefs	0.143	-0.020
	(0.091)	(0.056)
Low-endowment consumption beliefs	-0.256	-0.048
	(0.197)	(0.118)
Cultural theory of risk:		
Hierarchy	-0.166	-0.342
	(1.971)	(1.073)
Individualism	-0.815	0.613
	(2.145)	(1.262)
Egalitarianism	2.870	0.379
	(1.863)	(1.063)
Fatalism	0.149	-1.316
	(2.140)	(1.048)
Policy preferences:		
Hard policies	0.989**	-0.136

	(1) High-endowment	(2) Low-endowment
	(0.437)	(0.218)
Soft policies	-0.567	-0.247
	(0.404)	(0.199)
Constant	16.057*	17.554***
	(9.565)	(5.514)
Observations	136	179
R-squared	0.196	0.112

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Appendix F. Multinomial logistic regression results for high and low-endowment players (Part 2-tokens expressed as an absolute value)

Table F1. Part 2:Multinomial logistic regression (tokens expressed as absolute value) for high and low-endowment players

	(1) High-endowment	(2) Low-endowment
Equal water use		
Part 1 token contribution	-0.007	-0.149***
	(0.034)	(0.057)
Family's financial situation (annual household income: *(Low-income base):*		
Middle-income	-0.502	1.425**
	(0.717)	(0.609)
Upper-income	0.844	1.450
	(0.879)	(1.251)
Male	0.822	0.840
	(0.780)	(0.543)
Highest level of education completed: *(Grade 12 base)*		
Secondary education	1.655**	-0.350
	(0.708)	(0.568)
Tertiary education	0.473	-1.695*
	(0.791)	(0.985)
Age (years): *(25-35 base)*		
36-44	-1.315	-0.465
	(0.940)	(0.924)
45-64	-0.980	-0.579
	(0.820)	(0.914)
65+	-0.992	-1.204
	(1.280)	(1.114)
Household consumption beliefs:		
High-endowment consumption beliefs	-0.047	-0.002
	(0.047)	(0.033)
Low-endowment consumption beliefs	0.010	-0.113
	(0.095)	(0.078)
Cultural theory of risk:		
Hierarchy	-0.246	-0.666
	(0.749)	(0.738)
Individualism	0.868	1.616*
	(0.813)	(0.847)
Egalitarianism	-0.378	-0.140
	(0.904)	(0.696)
Fatalism	-0.994	-0.150
	(0.844)	(0.610)

	(1) High-endowment	(2) Low-endowment
Policy preferences:		
Hard policies	-0.238	0.022
	(0.164)	(0.157)
Soft policies	0.349**	-0.141
	(0.160)	(0.126)
Constant	1.812	0.345
	(4.045)	(3.469)
Proportional water use		
Part 1 token contribution	-0.017	-0.060
	(0.033)	(0.047)
Family's financial situation (annual household income: *(Low-income base):*		
Middle-income	1.084	0.758
	(0.686)	(0.595)
Upper-income	2.468***	1.498
	(0.873)	(1.194)
Male	-0.460	-0.104
	(0.763)	(0.498)
Highest level of education completed: *(Grade 12 base)*		
Secondary education	0.808	-0.493
	(0.671)	(0.564)
Tertiary education	0.354	-0.656
	(0.743)	(0.755)
Age (years): *(25-35 base)*		
36-44	-1.001	-1.857**
	(0.797)	(0.835)
45-64	-1.355*	-0.908
	(0.780)	(0.760)
65+	-0.262	-0.993
	(1.195)	(0.897)
Household consumption beliefs:		
High-endowment consumption beliefs	-0.014	-0.032
	(0.038)	(0.033)
Low-endowment consumption beliefs	0.041	-0.051
	(0.081)	(0.070)
Cultural theory of risk:		
Hierarchy	0.396	0.394
	(0.676)	(0.703)
Individualism	0.601	1.859**
	(0.807)	(0.904)
Egalitarianism	-1.617**	-0.739
	(0.768)	(0.629)
Fatalism	1.065	-0.879
	(0.841)	(0.627)
Policy preferences:		

	(1) High-endowment	(2) Low-endowment
Hard policies	-0.406**	0.085
	(0.161)	(0.148)
Soft policies	0.655***	-0.114
	(0.156)	(0.110)
Constant	-3.426	1.231
	(3.671)	(3.586)
Observations	127	172
Pseudo R2	0.213	0.142

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The equal water storage principle serves as the base category. The number of observations in Part 2 is lower compared to Part 1 regressions, as individuals aged 18–24 were excluded. This age group was removed because its small sample size (7 individuals for low-endowment players and 9 for high-endowment players) significantly inflated some results.