

Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- | | | |
|-------------------------------------|-------------------------------------|--|
| ☐ | ☒ | The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement |
| ☒ | ☐ | A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly |
| ☒ | ☐ | The statistical test(s) used AND whether they are one- or two-sided
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☒ | ☐ | A description of all covariates tested |
| ☒ | ☐ | A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons |
| ☐ | ☒ | A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals) |
| ☒ | ☐ | For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ | For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings |
| ☒ | ☐ | For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes |
| ☒ | ☐ | Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated |

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection No computer code was used for data collection.

Data analysis The system dynamic model was implemented by means of code and mathematical algorithm developed using the computer programming language Matlab r2022b (license from Vrije Universiteit Amsterdam). Custom code is deposited in the following public Zenodo repository: 10.5281/zenodo.7664403

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

Qualitative data that support the findings on Cape Town, South Africa, are available on request from the corresponding author [ES]. The data are not publicly available due to them containing information that could compromise research participant privacy/consent. Quantitative data for monthly inflow, reservoir storage,

environmental flow, losses and evapotranspiration of Cape Town Water Supply System were obtained from the Hydrological Data Service of the South African Governmental Department of Water and Sanitation (<https://www.dws.gov.za/Hydrology>). Quantitative data for precipitation and temperature in Cape Town were obtained from the South African Weather Service of the South African Governmental Department of Forestry, Fishery and the Environment (<https://www.weathersa.co.za/>). Quantitative data characterizing Cape Town's urban demography are obtained from and freely available at the following link: <https://www.cogta.gov.za/ddm/wp-content/uploads/2020/11/City-of-CT-September-2020.pdf>. Quantitative data characterizing the water consumption of different social groups in Cape Town are freely available and retrieved from the Cape Town Open Data Portal at the following link: <https://web1.capetown.gov.za/web1/OpenDataPortal/> as well as from the public report "City of Cape Town Residential Water Consumption Trend Analysis" written by Viljoen, Nina and available at: <https://www.greencape.co.za/assets/Sector-files/water/Water-conservation-and-demand-management-WCDM/Viljoen-City-of-Cape-Town-residential-water-consumption-trend-analysis-2014-15-2016.pdf>.

Human research participants

Policy information about [studies involving human research participants and Sex and Gender in Research](#).

Reporting on sex and gender

Qualitative data used in this research was collected through semi-structured and unstructured interviews administered respectively to stakeholder of different sex (both female and men). However no sex- or gender- analysis was performed from these data because the study focused exclusively on the economic status of the stakeholder at household level.

Population characteristics

The research samples included adult urban dwellers (men and female) residing in different neighborhoods of Cape Town as well as stakeholders representative of the water and environmental sector, including government officials, water utility managers, small-scale water providers, consultants, charities and NGOs. The covariate-relevant population characteristics accounted for in this study included mostly economic status and location within Cape Town.

Recruitment

Households were selected using convenience sampling with the criterion of at least two blocks distance between each household and based on location (e.g. a neighborhood that were particularly affected by the drought). Stakeholders in the water and health sector, including government officials, water utility managers, small-scale water providers, consultants, charities and NGOs were selected based on the role they played in managing the drought event. Although selection criteria were put in place to avoid potential biases, this study still acknowledges the potential biases that might have been present when interpreting the study's findings. One of the main biases in this study can be classified as a self-selection bias, as the households that agreed to participate may differ from those who declined or were unavailable. Additionally, participants may provide socially desirable or expected answers, rather than their true beliefs or experiences, leading to social desirability biases.

Ethics oversight

The research protocol for this study was approved by the Municipality of Cape Town (PSRR-0259). The research team followed established guidelines and protocols for ethical research, including those provided by the Italian Research Ethics and Bioethics Committee (protocol 0043071/2019), the Swedish Ethical Review Authority (Dnr 2019-03242), and the European Union under Horizon 2020 (FAIR Data Management and EU General Data Protection Regulation). We obtained oral informed consent from all participants, which included clear and detailed information about the context and purpose of the interview, the expected duration of participation, the funders and lead researchers of the project, data protection, confidentiality, privacy, and the storage duration of personal data. We also made it clear to participants that they were not obligated to answer any questions and that they could withdraw from the interview at any time. Our team took great care to ensure that the ethical principles of the research were followed throughout the study, and that the rights and well-being of participants were protected at all times.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☒ Behavioural & social sciences ☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description

The project adopted a mixed method employing both qualitative and quantitative data. The mix of qualitative and quantitative research methods, included semi-structured interviews, unstructured interviews, observations, focus groups discussions. Different data analysis techniques were used (discourse analysis, life histories, summative analysis, historical and comparative analysis).

Research sample

The research sample is qualitative therefore it is not statistically relevant, meaning that the sample was not intended to be representative of any specific population or group, but rather to provide in-depth and context-specific analyses of social behaviors, cultural beliefs, institutional changes, and perceptions of different stakeholders. The research sample for the study included

households (male and female household members) belonging to a different economic status and living in different location within Cape Town. The study also included representative of national and provincial government, municipal officials, local public health and water sector organisations, and other stakeholders involved in managing the drought. The study does not focus on age as a demographic characteristic relevant for this research but no minors were invited to participate in the project. The rationale for the chosen study sample was to capture diverse water consumption patterns and differential responses to the drought event by engaging with a range of stakeholders who have different experiences, perspectives, and roles in managing the drought. By including a range of stakeholders, the study provides a comprehensive and nuanced understanding of how the drought affected various groups and how different stakeholders responded to the water scarcity.

Sampling strategy

Snowball sampling was used to ensure a variegated sample of stakeholders. We undertook about sixty-five interviews in Cape Town, including key public and private stakeholders in the water and environmental sector, consultants and non-governmental organization, allowing for a robust understanding of the water consumption patterns and differential responses to the drought events across Cape Town urban area. Saturation was achieved by including the complete range of stakeholders that were involved in managing the drought event. Households were selected using convenience sampling with the criterion of at least two blocks distance between each household and based on location (e.g. a neighborhood that were particularly affected by the drought). Where needed, permission from any relevant authority was asked (e.g. chiefs, local municipal authorities) to ensure they are duly informed. Household responses across intra-urban spaces revealed a number of consistent patterns, associated with income, coping strategies, technical specification of the network. We thus became confident that this category was saturated.

Data collection

Semi-structured and unstructured interview were undertaken by the corresponding author [ES]. As part of the informed consent procedure, the researcher asked permission for audio recording the interview, which was granted in the large majority of the interviews. Interviewees were informed that such practice would not affect the confidentiality and anonymity (if requested), and that data collected both through audio recordings and through text would be safely stored in virtual storage facilities provided by the university.

As most qualitative research, this study focuses on exploring participants' experiences, perceptions, and opinions in-depth. Unlike in quantitative research, where blinding can reduce the risk of bias and improve the reliability of the results, this qualitative study aims to interpret and understand the data, rather than to be objective. Whilst not being amongst its primary concerns this study set out to minimise biases by the use of reflexivity, or else a process of self-reflection and critical analysis of the researcher's own biases, values, and assumptions that may influence the research process and the interpretation of the data. Reflexivity in this study involved acknowledging and examining the researcher's positionality, background, and subjectivity, and considering how they may impact the research process and the findings. Moreover, throughout the research process, the researcher also worked to enhance the rigor and transparency of qualitative research by using a systematic approach to data collection and analysis, and by involving multiple researchers and stakeholders in the process. This enabled this study to ground its finding in the data and not being overly influenced by the researcher's personal biases or preconceptions.

Timing

In Cape Town, qualitative data were collected between May 2019 and March 2020. Quantitative data were collected from May 2019 to September 2022.

Data exclusions

No data were excluded.

Non-participation

No participant declined to participate.

Randomization

Participants were not allocated into experimental groups.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging